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Ethics in Education & Research

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Scientific ethics, defined as the standards of conduct for scientists in their professional endeavors, covers a broad spectrum of activities.

Ethics can be simply defined as norms for conduct that differentiate between acceptable and unacceptable behavior.

Just as ethics is about a vision of the good life, research ethics is about a vision of good knowledge. The term "research ethics" refers to a diverse set of values, norms and institutional regulations that help constitute and regulate scientific activity.

Science can be excellent only if its practitioners conduct their research in accordance with the accepted practices in their fields. For all scientific fields, ethical behavior includes adherence to the principles and practices of valid experimentation (the scientific method, accurate and sufficient sampling of data, accurate record keeping and reporting, etc.), education and mentoring, unbiased peer and expert review, and communication of results to the scientific community.

Ethics may be operationalized as good research practice. Good research practice entails that the aims of research do not violate common morality, ethics and respect for human dignity. Good research practice also entails that the researcher respects current regulations and principles of research ethics. Both the researcher and the research institution are responsible for accommodating and exercising good research practice.

The field of research ethics contains many elements. Research has a fundamental ethos, namely the search for truth. At the same time, research ethics emphasizes that research has a more general responsibility to society. Research ethics also concerns the internal relationship among researchers, as well as the relationship between researchers and others people. Research in addition has consequences for animals and the environment.

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Many different disciplines, institutions, and professions have norms for behavior that suit their particular aims and goals. These norms also help members of the discipline to coordinate their actions or activities and to establish the public's trust of the discipline. For instance, ethical norms govern conduct in medicine, law, engineering, and business. Ethical norms also serve the aims or goals of research and apply to people who conduct scientific research or other scholarly or creative activities.

Most societies have legal rules that govern behavior, but ethical norms tend to be broader and more informal than laws. Although most societies use laws to enforce widely accepted moral standards and ethical and legal rules use similar concepts, it is important to note that ethics and law are not the same. An action may be 'legal but unethical' or 'illegal but ethical'. We can also use ethical concepts and principles to criticize, evaluate, propose, or interpret laws. Indeed, in the last century, many social reformers urged citizens to disobey laws in order to protest what they regarded as immoral or unjust laws. Peaceful civil disobedience is an ethical way of expressing political viewpoints.

One may also define ethics as a method, procedure, or perspective for deciding how to act and for analyzing complex problems and issues. For instance, in considering a complex issue like global warming, one may take an economic, ecological, political, or ethical perspective on the problem. While an economist might examine the cost and benefits of various policies related to global warming, an environmental ethicist could examine the ethical values and principles at stake.

There are several reasons why it is important to adhere to ethical norms in research. First, norms promote the aims of research, such as knowledge, truth, and avoidance of error. For example, prohibitions against fabricating, falsifying, or misrepresenting research data promote the truth and avoid error. Second, since research often involves a great deal of cooperation and coordination among many different people in different disciplines and institutions, ethical standards promote the values that are essential to collaborative work, such as trust, accountability, mutual respect, and fairness. For example, many ethical norms in research, such as guidelines for authorship, copyright and patenting policies, data sharing policies, and confidentiality rules in peer review, are designed to protect intellectual property interests while encouraging collaboration. Most researchers want to receive credit for their contributions and do not want to have their ideas stolen or disclosed prematurely. Third, many of the ethical norms help to ensure that researchers can be held accountable to the public. Fourth, ethical norms in research also help to build public support for research. Funding agencies are more likely to fund research project if they can trust the quality and integrity of research. Finally, many of the norms of research promote a variety of other important moral and social values, such as social responsibility, human rights, animal welfare,

compliance with the law, environment and health and safety. Ethical lapses in research can significantly harm human and animal subjects, environment, students, and the public. For example, a researcher who fabricates data in a clinical trial may harm or even kill patients and a researcher who fails to abide by regulations and guidelines relating to radiation or biological safety may jeopardize his health and safety or the health and safety of staff and students.

Following is a rough and general summary of some ethical principals that ethical codes should address:

- Strive for honesty in all scientific communications. Honestly report data, results, methods and procedures, and publication status. Do not fabricate, falsify, or misrepresent data. Do not deceive colleagues, granting agencies, or the public.
- Strive to avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions, grant writing, expert testimony, and other aspects of research where objectivity is expected or required. Avoid or minimize bias or self-deception. Disclose personal or financial interests that may affect research.
- Keep your promises and agreements; act with sincerity; strive for consistency of thought and action.
- Avoid careless errors and negligence; carefully and critically examine your own work and the work of your peers. Keep good records of research activities, such as data collection, research design, and correspondence with agencies or journals.
- Share data, results, ideas, tools, resources. Be open to criticism and new ideas.
- Honor patents, copyrights, and other forms of intellectual property. Do not use unpublished data, methods, or results without permission. Give credit where credit is due. Give proper acknowledgement or credit for all contributions to research. Never plagiarize.
- Protect confidential communications, such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.
- Publish in order to advance research and scholarship, not to advance just your own career. Avoid wasteful and duplicative publication.
- Help to educate, mentor, and advise students. Promote their welfare and allow them to make their own decisions.

- Respect your colleagues and treat them fairly.
- Strive to promote social good and prevent or mitigate social harms through research, public education, and advocacy.
- Maintain and improve your own professional competence and expertise through lifelong education and learning; take steps to promote competence in science as a whole.
- Know and obey relevant laws and institutional and governmental policies.
- Show proper respect and care for animals when using them in research. Do not conduct unnecessary or poorly designed animal experiments.
- When conducting research on human subjects, minimize harms and risks and maximize benefits; respect human dignity, privacy, and autonomy; take special precautions with vulnerable populations; and strive to distribute the benefits and burdens of research fairly.

Ethical Decision Making in Research

Although codes, policies, and principals are very important and useful, like any set of rules, they do not cover every situation, they often conflict, and they require considerable interpretation. It is therefore important for researchers to learn how to interpret, assess, and apply various research rules and how to make decisions and to act in various situations. The vast majority of decisions involve the straightforward application of ethical rules. For example, consider the following case,

Case 1:

The research protocol for a study of a drug on hypertension requires the administration of the drug at different doses to 50 laboratory mice, with chemical and behavioral tests to determine toxic effects. A researcher has almost finished the experiment for Dr. Q. He has only 5 mice left to test. However, he really wants to finish his work in time to go on tour with his friends, who are leaving tonight. He has injected the drug in all 50 mice but has not completed all of the tests. He therefore decides to extrapolate from the 45 completed results to produce the 5 additional results.

Many different research ethics policies would hold that researcher has acted unethically by fabricating data. Actions that nearly all researchers classify as unethical are viewed as misconduct. It is important to remember, however, that misconduct occurs only when

researchers intend to deceive: honest errors related to sloppiness, poor record keeping, miscalculations, bias, self-deception, and even negligence do not constitute misconduct. Also, reasonable disagreements about research methods, procedures, and interpretations do not constitute research misconduct. Consider the following case:

Case 2:

Dr. T has just discovered a mathematical error in a paper that has been accepted for publication in a journal. The error does not affect the overall results of his research, but it is potentially misleading. The journal has just gone to press, so it is too late to catch the error before it appears in print. In order to avoid embarrassment, Dr. T decides to ignore the error.

Dr. T's error is not misconduct nor is his decision to take no action to correct the error. Most researchers, as well as many different policies and codes, would say that Dr. T should tell the journal about the error and consider publishing a correction or errata. Failing to publish a correction would be unethical because it would violate norms relating to honesty and objectivity in research.

There are many other activities that are not defined as "misconduct" but which are still regarded by most researchers as unethical. These are called "other deviations" from acceptable research practices and include:

- Publishing the same paper in two different journals without telling the editors
- Submitting the same paper to different journals without telling the editors
- Not informing a collaborator of your intent to file a patent in order to make sure that you are the sole inventor
- Including a colleague as an author on a paper in return for a favor even though the colleague did not make a serious contribution to the paper
- Discussing with your colleagues confidential data from a paper that you are reviewing for a journal
- Trimming outliers from a data set without discussing your reasons in paper
- Using an inappropriate statistical technique in order to enhance the significance of your research
- Bypassing the peer review process and announcing your results through a press conference without giving peers adequate information to review your work

- Conducting a review of the literature that fails to acknowledge the contributions of other people in the field or relevant prior work
- Stretching the truth on a grant application in order to convince reviewers that your project will make a significant contribution to the field
- Stretching the truth on a job application or curriculum vita
- Overworking, neglecting, or exploiting graduate or post-doctoral students
- Failing to keep good research records
- Failing to maintain research data for a reasonable period of time
- Making derogatory comments and personal attacks in your review of author's submission
- Promising a student a better grade for sexual favors
- Making significant deviations from the research protocol approved by your institution's Animal Care and Use Committee or Institutional Review Board for Human Subjects Research without telling the committee or the board
- Not reporting an adverse event in a human research experiment
- Wasting animals in research
- Exposing students and staff to biological risks in violation of your institution's biosafety rules
- Rejecting a manuscript for publication without even reading it
- Sabotaging someone's work
- Stealing supplies, books, or data
- Making unauthorized copies of data, papers, or computer programs

These actions would be regarded as unethical by most scientists and some might even be illegal. Most of these would also violate different professional ethics codes or institutional policies.

Finally, situations frequently arise in research in which different people disagree about the proper course of action and there is no broad consensus about what should be done. In

these situations, there may be good arguments on both sides of the issue and different ethical principles may conflict. These situations create difficult decisions for research known as ethical dilemmas.

The following are some step that researchers can take to deal with ethical dilemmas in research:

What is the problem or issue?

It is always important to get a clear statement of the problem. In this case, the issue is whether to share information with the other research team.

What is the relevant information?

Many bad decisions are made as a result of poor information. To know what to do, one needs to have more information concerning such matters as university or funding agency policies that may apply to this situation, the team's intellectual property interests, the possibility of negotiating some kind of agreement with the other team, whether the other team also has some information it is willing to share, etc. Will the science be better served by the additional research?

What are the different options?

People may fail to see different options due to a limited imagination, bias, ignorance, or fear. In this case, there may be another choice besides 'share' or 'don't share,' such as 'negotiate an agreement.'

How do ethical codes or policies as well as legal rules apply to these different options?

The university or funding agency may have policies on data management that apply to this case. Broader ethical rules, such as openness and respect for credit and intellectual property, may also apply to this case. Laws relating to intellectual property may be relevant.

Are there any people who can offer ethical advice?

It may be useful to seek advice from a colleague, a senior researcher, your department head, or anyone else you can trust.

After considering these questions, a person facing an ethical dilemma may decide to ask more questions, gather more information, explore different options, or consider other ethical rules. However, at some point he or she will have to make a decision and then take action. Ideally, a person who makes a decision in an ethical dilemma should be able to

justify his or her decision to himself or herself, as well as colleagues, administrators, and other people who might be affected by the decision. He or she should be able to articulate reasons for his or her conduct and should consider the following questions in order to explain how he or she arrived at his or her decision: .

- Which choice could stand up to further publicity and scrutiny?
- Which choice could you not live with?
- Think of the wisest person you know. What would he or she do in this situation?
- Which choice would be the most just, fair, or responsible?
- Which choice will probably have the best overall consequences?

After considering all of these questions, one still might find it difficult to decide what to do. The main point is that human reasoning plays a pivotal role in ethical decision-making but there are limits to its ability to solve all ethical dilemmas in a finite amount of time.

Promoting Ethical Conduct in Science

Even if misconduct is rare, it can have a tremendous impact on research. Consider an analogy with crime: it does not take many murders or rapes in a town to erode the community's sense of trust and increase the community's fear and paranoia. The same is true with the most serious crimes in science, i.e. fabrication, falsification, and plagiarism. There are many situations in research that pose genuine ethical dilemmas.

There are two main theories about why researchers commit misconduct. According to the "bad apple" theory, most scientists are highly ethical. Only researchers who are morally corrupt, economically desperate, or psychologically disturbed commit misconduct.

Misconduct probably results from environmental and individual causes, i.e. when people who are morally weak, ignorant, or insensitive are placed in stressful or imperfect environments. Many of the deviations that occur in research may occur because researchers simply do not know or have never thought seriously about some of the ethical norms of research. For example, some unethical authorship practices probably reflect years of tradition in the research community that have not been questioned seriously until recently. If the director of a lab is named as an author on every paper that comes from his lab, even if he does not make a significant contribution, what could be wrong with that? That's just the way it's done, one might argue. If a drug company uses ghostwriters to write papers

"authored" by its physician-employees, what's wrong about this practice? Ghost writers help write all sorts of books these days, so what's wrong with using ghostwriters in research?

Another example where there may be some ignorance or mistaken traditions is conflicts of interest in research. A researcher may think that a "normal" or "traditional" financial relationship, such as accepting stock or a consulting fee from a drug company that sponsors her research, raises no serious ethical issues. Or perhaps a university administrator sees no ethical problem in taking a large gift with strings attached from a pharmaceutical company. Maybe a physician thinks that it is perfectly appropriate to receive a finder's fee for referring patients into a clinical trial.

If "deviations" from ethical conduct occur in research as a result of ignorance or a failure to reflect critically on problematic traditions, then guidance in research ethics may help reduce the rate of serious deviations by improving the researcher's understanding of ethics and by sensitizing him or her to the issues.

Factors involved in Ethics:

The forces behind scientific integrity are social. That is, they are defined and applied through social interaction.

- *Childhood Socialization*. Children acquire their moral sense of what is right and wrong at home and in school. If they learn that it is wrong to lie, cheat, and steal, they can understand and accept professional standards about data falsification, fabrication, and plagiarism.
- *Scientific Socialization*. Scientific education has the responsibility to provide opportunities for student scientists to learn sound research practices and to impart standards of ethical conduct, if not through specific courses, at least through exposure to role models (professors, other students) in the educational setting.
- *Collegial and Professional Norms and Values*. Mentoring is a traditional approach for imparting norms to junior scientist, opportunity for observing and practicing good science. As with all professions and occupations, the sub-specialties of science form associations through which scientists with similar training and similar research interests share norms, values, and information. These external professional reference groups may well exert a stronger influence than workplace standards or rules.
- *Workplace Norms, Values, and Incentives*. Most scientists have workplace standards and rules that define responsibilities and accountabilities, including

maintenance of the research record and punishments for violations. The attitude toward these workplace standards and rules and the way in which they are managed depend on and are reflected in the workplace culture. By their own behavior and attitudes, the scientific leadership of an organization sets the culture and signals the importance scientists should place on scientific integrity. Workplaces can provide incentives or rewards for maintaining high levels of scientific integrity, as well applying appropriate and swift sanctions where misconduct has occurred.

Stakeholders in the Scientific Community

Those who have the ability to promote scientific integrity and roles to play in oversight of scientific research and in controlling scientific misconduct include:

- Scientists themselves, who serve not only as practitioners but also as reviewers, colleagues, consumers of other scientists' work, and members of professional associations
- Editors and publishers of scientific articles, who have an interest in being the first to publish ground-breaking science (and who therefore contribute to the pressure on scientists), but also have an interest in enhancing and maintaining the reputation of their publications and institutions
- Research project managers, who both conduct science and oversee the work of other scientists
- Institutional research program officials, who employ the scientists and therefore have direct line responsibility for ensuring compliance with regulatory and contractual requirements and a need to maintain a volume of research that supports those employees and the institutional infrastructure
- Officials in research funding agencies who commission the research and have responsibility for ensuring that the funds are used effectively and provide benefit.

These stakeholders have both competing and complementary interests. Effective oversight of science requires awareness of the dynamic created by these various interests and the roles they can play in promoting scientific integrity and a commitment to high standards of scientific conduct.

Self-Regulation

Self-regulation plays a major role in identifying and controlling errors and misconduct in science.

Professions have traditionally been granted relative autonomy to oversee and correct the behavior of their members; that is, to self-regulate.

Self-regulation is also seen as possible because the social nature of science creates a selfcorrecting process that maintains scientific integrity.

An important feature of self-regulation is the ability of other investigators to adequately judge the credibility and influence the acceptance of those findings. This feature is important since science comprises a multitude of sub-specialties, each with its own questions, evidence, and settings for establishing evidence, so that no single method can be used to judge all types of science – although the notion of a scientific method as an ideal hovers in the background.

Types of Problematic Behavior: Mistakes, Unethical Behavior, Noncompliance, and Misconduct

As systems for dealing with scientific misconduct have become more formalized, increasing attention has been given to the definition of misconduct. A brief review of the resulting categories of possible errors scientists can make and unethical behaviors in which they can engage illustrates that many gray areas exist. This increases the difficulty of teaching scientists or overseers the difference between innocent mistakes, dubious professional behavior, and misconduct. As a result of this definitional effort, four categories of problematic behavior have emerged:

- Honest mistakes
- Unethical behavior
- Noncompliance with legal or contractual requirements
- Deliberate deceit (scientific misconduct).

Sources of these behaviors vary from carelessness to deliberate attempts to mislead.

Theoretically, many are correctable by self-regulation.

Honest Mistakes

Scientists and their assistants, being only human, can make inadvertent mistakes of various kinds during design, calibration, logging, data entry, and so forth. Errors in interpretation might also fall into the category of honest mistakes. Honest errors and errors resulting from the sloppy execution of research can be corrected by the scientists themselves

– if they discover their own mistakes – as well as by those who review or try to replicate the research. Since the stakes are high – mistakes can affect future funding and careers—scientists are likely to take pains to avoid mistakes.

Unethical Behavior or "Scientific Misdemeanors"

- Improprieties of authorship, such as duplicate publication of a single set of research results or fractional publication
- "Gift" or "honorary" authorship
- Incomplete citation of previously published work
- Bias in peer review of proposals or manuscripts
- Skewed selection of data or results to hide or disguise observations that do not fit the author's conclusions.

Noncompliance

Noncompliance generally refers to failures to follow practices dictated by law. The regulatory requirements most commonly associated with scientific research include those governing the ethical treatment of human subjects and laboratory animals. Researchers are accountable to institutional review committees on these topics and generally need approval for their studies that involve human subjects and animals. In addition, the handling of dangerous materials is regulated, including biohazards, hazardous chemicals, the transfer of etiologic agents, and radioactivity. Research in recombinant DNA is also regulated.

In addition, some research contracts may require the research institution to have stringent procedures for protecting data and information.

Scientific Misconduct

In general, deliberate deceit is the central defining criterion for scientific misconduct, with erroneous information resulting from a deliberate attempt to be dishonest. Dishonesty can occur in the form of forged or fabricated data, falsified or invented results, and plagiarism. Of course, only the outcome of such behavior, and not an individual's motives, can be observed in most instances, so a scientist being accused of such behavior may claim it was an innocent mistake rather than intentional dishonesty. Careful investigation of the record of research often provides the basis for distinguishing between deliberate deceit and other, less serious errors.

Concern that scientific misconduct might be on the rise, or that its impacts might be more deleterious than in the past, has led research funding agencies to establish their own requirements for the institutions they support. Noncompliance with these requirements can result in the loss of research funds.

Guidelines for Research Ethics in Science and Technology

The institutions must accommodate ethical research practice, and they should have in place mechanisms, and potentially their own guidelines, that can address and resolve possible conflicts and dilemmas pertaining to research ethics.

These guidelines attempt to cover all the elements for everyone who is involved in research.

Overriding obligations of research to mankind:

- **Research must be in accordance with human rights.**

  Research must not violate the rights that are laid down in international conventions on civil, political, economical, social and cultural human rights.

- **Research must be in accordance with sustainable development and respect for the environment.**

  This entails that research should promote conservation of biodiversity and be in accordance with the Precautionary Principle. Caution should be exercised when conducting research that might have grave consequences for the environment or for humans, even though the existence of these possible threats has not been completely established with certainty.

- **Research must promote peace.**

  Research must create a security that is mutual for individuals, groups and nations. Research must not violate international conventions which are meant to ensure peace.

- **Research must promote greater global justice in the distribution of wealth through the spread of information.**

  Research results and their usage must be shared in their entirety to society at large, both nationally and internationally and with developing countries in particular. Information about research must in principle be made accessible to all.

Researchers have an ethical responsibility to spread information to disadvantaged countries, interest groups and concerned parties when such information may make a difference in rectifying an imbalanced distribution of wealth.

Good research practice

- The researcher and the research institution are responsible for exercising honest research practices.

Integrity, honesty and accountability are the fundamental demands of research ethics.

Research must not conceal, misrepresent or falsify anything, whether in regard to the planning, execution or reporting of the research. Fraud, however, must be distinguished from common mistakes in research, in that fraud implies a deliberate intent to misrepresent reality. Researchers who discover or are made aware of mistakes in their research must admit the mistake, rectify it and ensure that the consequences of the mistake are minimal. It is also dishonest to present as a result something the researcher knows or should know lacks empirical or theoretical substantiation, or to fail to present important new knowledge. Each researcher has an independent responsibility to not accept fraudulent research practices, either on behalf of him-or herself or others. The researcher has a responsibility to respect the research results of others and to cite relevant works conscientiously.

This entails that:

a) Researchers and research institutions do not accept scientific fraudulence, either in the form of forgery, manipulation or the selective presentation of data from research conducted by themselves or others.

b) Researchers and research institutions do not tolerate plagiarism of research.

c) Researchers and research institutions make data accessible to others for verification within a certain period of time.

d) Researchers present research done by others in a balanced and honest manner.

e) Research institution must have guidelines and routines for storing research data in such a manner that the data may be retrieved, also when the researcher has terminated his or her working relationship at the institution.

- The researcher is individually responsible for the activities, subject matter and method of his or her research, as well as for the quality of the results.

The researcher is responsible for critically assessing whether his or her research could potentially benefit society, either directly or indirectly. The researcher is independently responsible for the research being either directly or indirectly beneficial to society, and for ensuring that it does not cause damage. The researcher therefore has a duty to be critical when selecting research topics and research strategy.

This entails that:

a) The researcher has a critical awareness regarding the choice of subject matter in relation to goals, values and ethics.

b) The researcher's choice of method is in proportion to the goals and expenses of the research.

c) The researcher shows openness when reporting.

d) The researcher subjects him- or herself to peer review and other forms of quality control.

- The researcher must respect the contributions of other researchers and follow standards for authorship and cooperation.

The researcher should follow good publication practice. Honorary authorships are unacceptable. Rightful authorship is considered to be defined by three criteria:

a) All the authors must have made a significant and directly academic contribution to at least two of the four components of a typical research project:

   i. Concept or design

   ii. Data collection and processing

   iii. Analysis and interpretation of data

   iv. Written formulation of substantial parts of the work

b) Secondly, all the authors should have critically read through the different drafts and approved the final version.

c) Thirdly, all the authors should be capable of defending the work in its entirety (though not necessarily all the technical details).

Good publication practice entails that:

a) The researcher denotes all the source material and respects the original contributions of others through citations.

b) The researcher clarifies the individual areas of responsibility in teamwork and clarifies the rules of co-authorship. Co-workers who have contributed significantly to the work must not be excluded as co-authors.

c) The researcher respects the rights of others to use their own data in their own research within a reasonable limit of time (usually 1-2 years). When the relevant party does not use such data during that time span, the data may be used in other research with due citation of the given source.

d) The researcher as a peer reviewer must follow the following rules: i) The researcher must abstain from acting as a reviewer if he or she has been involved in a contentious dispute with the given author, or is directly involved in a collaborative or competitive relationship with the author. ii) The researcher must, when necessary, state the limits of his or her competence.

- When conducting research, the researcher must follow national and international regulations on ethics and safety.

Good research practice entails that national laws and regulations are adhered to, both at home and abroad. It also entails that the researcher should carefully consider whether it is ethically defensible to follow foreign laws and regulations if such laws are of a different ethical standard than in the individual's home country.

This entails that:

a) Researchers respect mandatory standards of safety for laboratories, and educate themselves and others in the use of the given equipment.

b) Researchers do not relocate parts of their research to other countries merely because the standards of ethics or security are lower there than in the individual's home country.

c) Researchers inform funding agencies of any potentially deviant standards of ethics or safety in countries where the research is being conducted.

Uncertainty, risk and the Precautionary Principle

Research may have far-ranging consequences for health, society or the environment. It is therefore important that the uncertainty and risk that often follow when research becomes practical and concrete is not neglected, and that decision-makers who use scientific knowledge achieve a good understanding of such knowledge in its correct context.

- The researcher must clarify the degree of certainty and precision that characterizes the research results. In particular, the researcher must take care to clarify the relative extent of the results' certainty and validity, as well as to indicate any elements of risk or uncertainty that may be significant for possible uses of the research results.

Researchers are traditionally accustomed to presenting knowledge demands critically and in context. Researchers are not as accustomed, however, to presenting elements of risk and uncertainty. It is part of the researcher's ethical responsibility and striving for objectivity to clearly depict the relative certainty and validity of the information. Whenever possible, the researchers should also use suitable methods to depict the research's uncertainty.

Research institutions are responsible for conveying such methods to their employees and students

- In cases where plausible, yet uncertain information exists that the use of technology or the development of a certain research field might lead to ethically unacceptable consequences for health, society or the environment, researchers within the given field must strive to provide information that is relevant for using the Precautionary Principle.

This entails that the researcher must cooperate with other relevant parties when using the Precautionary Principle. The Precautionary Principle is here defined in the following manner:

"When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm." This principle is important for large parts of scientific research, and researchers are co-responsible for facilitating deliberations regarding the Precautionary Principle.

Protection of research subjects

Even though openness is a deep-seated norm in research, there are also areas where there is a need to guarantee the research subjects' anonymity. This pertains in particular to cases where the personal information is sensitive and may have unfortunate consequences for the research subjects.

- The researcher must respect the demand for informed consent.

When research involves humans as the object of research, the researcher must follow

the rules of informed consent. Informed consent means that the person is briefed in a comprehensible manner on everything that pertains to his or her participation in the research project. Advice should be sought from a regional or national committee on research ethics in cases where there are doubts about the need or formulation of informed consent. General demands to informed consent entail that the researcher makes sure that people participating as research subjects:

a) Are competent and understand the project's purpose and consequences of participation.

b) Are capable of assessing their own situation.

c) Are capable of making an independent and voluntary decision to participate, based upon the given information and the individual's own preferences and values.

d) Are capable of voluntarily communicating their decision.

- Research must secure the privacy of the research subjects.

Information about the research subjects must be handled with caution. The researcher must state how the information will be protected and stored. The researcher must also provide confidentiality or anonymity to those who so wish. Confidentiality entails that information and materials are de-identified, i.e. that no outside parties know who has provided which information to the researcher. This gives the researcher him- or herself the possibility of linking information to the given person(s). With anonymity not even the researcher knows which individual has provided the given information and materials.

This entails that the researcher respects privacy in the form of de-identification or anonymization of research data.

Protection of animals in research

Some scientific research involves animals. It is accepted that also animals are moral objects that deserve respect. Animal welfare serves as a catch-all category for a number of ethical considerations towards animals. Considerations to animal welfare are also regulated in the relevant legislation.

Research concerns animals in at least two ways: either as test animals in a research process, or as the object of the research itself (particularly in veterinary medicine, agriculture and aquaculture). Both ways must be argued for on ethical grounds. It is accepted, however, that test animals may be subject to a lesser degree of animal welfare and greater

risk than normal livestock when the research serves an important purpose and animal testing is necessary to achieve the goal.

- The researcher must show due care and respect for animal welfare in the preparation and execution of animal experiments, and must account for the experiment's necessity to the relevant authorities.

This entails that:

a) A careful deliberation takes place regarding the classic three R's of animal testing ("Reduce, Refine, Replace").

b) The researcher cooperates with the relevant supervisory authorities and awaits permission to conduct research that involves test animals.

c) The researcher cooperates with the relevant supervisory authorities and follows current laws and guidelines when using test animals.

- The researcher must accommodate his or her research so that the use of research results is not contrary to the fundamental demands of animal welfare.

An example here is that research geared towards the breeding of livestock, whether this takes place with traditional methods of selective breeding or with advanced biotechnological methods, must not compromise animal welfare. In some select cases, periodical exceptions may be justified based on the animals fulfilling an important function in veterinary or human medicine.

- When questions may be raised concerning a researcher's animal testing on the basis of ethical considerations, the researcher must ask an independent ethics committee for their assessment.

Ethical dilemmas in animal testing go beyond questions of pain and suffering. Authorities and research institutions should ensure the existence of suitable panels and committees with the competence and capacity to assess such ethical problems connected with animal testing as well.

Relationship with traditional and alternative sources of knowledge

Traditional knowledge is a cumulative set of knowledge, skills, practices and descriptions that have been preserved and developed by peoples experienced in interacting with nature.

It is a set of perceptions that is contingent upon the given location and situation, based

on the personal experiences of a social group with relatively homogeneous interests and life situations, and conveyed through traditions and personal contact, where the informants' credibility and personal background form the critical threshold for acceptance.

Traditional knowledge among indigenous peoples is of this type, but we find such traditional knowledge in every society. Even though these forms of knowledge do not meet the usual standards for scientific knowledge, they can serve as a useful supplement when scientific or technological knowledge is applied in practice. The importance of traditional systems of knowledge has been increasingly recognized in scientific circles.

It is therefore when facing e.g. such alternative sources of knowledge that applied science and technology must attempt to engage the users in a mutual dialogue. Through participatory methods, research can simultaneously provide the necessary respect to the plurality of world views that characterizes every society.

- The researcher must whenever natural seek to incorporate and respect alternative sources of knowledge, such as traditional knowledge.

Much of today's knowledge is based on lay knowledge. Local knowledge, since it is based upon lengthy experience, can in many cases expand on and improve research results. It is therefore important that researchers seek to incorporate such knowledge in applied research.

This entails that:

a) When scientific knowledge or technology is applied, the researcher should be open to the potential use of relevant traditional knowledge.

b) Researchers who directly use or base their research on sources from traditional knowledge, which is often acquired through generations, are duty bound to respect both the economic and cultural value of such knowledge. In the degree that such research creates an economic profit, a fair distribution of this profit should benefit these sources of knowledge.

- The researcher should whenever natural seek to use participatory methods.

Participatory methods can enable a more thorough understanding of the subject matter and add knowledge that would otherwise have been inaccessible to outside parties. Many elements of applied science depend upon knowledge being incorporated from and accommodated for special user groups.

This entails that:

a) Researchers engage in an open dialogue with users.

b) Researchers use suitable methods to ensure the participation of concerned parties.

Openness, contract research and conflicts of interest

Openness is a goal in research, but with a greater degree of contract research and external financing of research projects, this principle may be undermined by increasing conflicts of interest. Particularly when such conflicts of interest arise, the project manager is obliged to publish, or in some other manner publicize, the research results in an objective and accountable manner.

When research is conducted on behalf of external employers, where it is the employer who usually determines the content and thematic demarcation of the research, several conflicts may arise that may affect either the research itself or its publication.

- The researcher is responsible for ensuring openness and scientific quality in research.

This usually entails that:

a) The researcher has the overall responsibility with regard to questions of method, data collection and interpretation of the results.

b) The research must be based on as much openness as possible.

c) The research results are made accessible to other researchers.

d) When a time-limited, exclusive right of use has been agreed upon, the researcher is responsible for ensuring that the research results are made public thereafter.

e) An exclusive right of use to research should not be granted for an unlimited duration.

- The researcher is obliged to be open about possible conflicts of interest.

Openness in research and about the researcher's role is important to ensure the quality of research. Researchers who are affiliated with for example political or religious interests, or who undertake contract work for industrial companies or the authorities, may be complaisant in creating uncertainty about circumstances that may have influenced the research results.

Openness about the researcher's varying roles and external affiliations may on the other hand help create greater assurance that the research results are independent and reliable.

This entails that:

a) The researcher makes information available regarding relevant financial aspects.

b) The researcher makes information available regarding involvement in political, religious or other value-based organizations that could possibly influence his or her research.

c) When a potential conflict arises between different roles, the researcher must clarify to what degree he or she is speaking as a researcher or in a different capacity.

Whistle-blowing and ethical responsibility

Sometimes conflicts arise between the individual researcher and senior authorities or persons.

This is particularly problematic when the conflict arises because the researcher considers it his or her ethical duty to act as a whistle-blower, sometimes contrary to the advice of senior authorities or persons.

Such instances of whistle-blowing might pertain to internal circumstances in the research, such as for example scientific integrity, or circumstances that are important to society at large. Since such whistle-blowing is based on value judgments, there is often a basis for unresolved conflicts.

- When the researcher in the course of work comes into conflict with what he or she considers to be his or her social responsibility, the researcher must have the possibility, and, according to the circumstances, duty, to act as a whistle-blower to society at large.

This means in practice that the researcher must carefully consider:

a) The possibilities for resolving the conflict internally in the organization.

b) The possible consequence for him or herself, as well as for the given research institution and for society, that such whistle-blowing might have if it is correct, or if it is incorrect.

c) The possible consequences of failing to act as a whistle-blower.

d) The channels for whistle-blowing that are best suited to minimize conflicts and optimize the proper actions for repairing the damage.

e) Whether there are other motives for acting as a whistle-blower that might influence one's objectivity.

- Research institutions are obliged to have in place independent mechanisms that can support employees in whistle-blowing situations.

It is important that all concerned parties in a whistle-blowing situation partake in a neutral process where an independent authority investigates the basis for the conflict, and where the whistle-blower is protected from unreasonable or untimely reactions.

This entails that:

a) Research institutions have in-place mechanisms where such an independent investigation of whistle-blowing conflicts in the institution may be conducted.

b) Such mechanisms are known among the institution's researchers.

Research and popularization

Since research fulfils different functions, and since the researcher also has a general social responsibility, popularization of research and participation in current public debates should be a routine part of research activity.

The extent of popularization that can be expected from the individual researcher will usually vary from field to field and issue to issue. It should nonetheless be expected that popularization is put on the agenda both by the individual researcher and by the responsible research institutions.

- Research institutions should have in place clear routines that reward researchers who popularize research and participate in research-related public debates.

This entails that:

a) General popularization of research becomes a standard criterion in any evaluation of research environments.

b) A system exists where popularization is counted among the meritorious qualities when hiring and promoting researchers.

- Researchers should actively use suitable modes of communication to reach relevant user groups with information about research results.

This entails that:

a) The researcher develops routines for assessing the relevance of the research for various user groups and society as a whole.

b) Researchers should routinely consider whether their research is suitable for popularization to a broader academic or non-scientific audience, and follow up with suitable courses of action.

Proposal for a compulsory scientific oath

Guidelines for research ethics should be familiar within research environments, and they should in particular be imparted to those who are adopted into the research community upon attaining a Ph.D. degree. Such guidelines should in addition demand a certain personal obligation from the individual researcher. It has therefore been proposed that research institutions should consider each individual to swear an ethical oath of science when attaining a Ph.D. degree. An example of such a pledge is the Hippocratic Oath in medicine.

A sample oath of research ethics:

I will conduct my activities as a researcher with integrity and honesty; I will use my scientific knowledge and skills for the benefit of humanity and for a sustainable development; I will show respect for animals and nature; I will act in accordance with research ethics, and I will not allow considerations based on ideology, religion, prejudices or material advantages to overshadow my ethical responsibility as a researcher.

Thank You !

Acknowledgement: A large number of websites, books have been used in preparing this speech. All such sites and books are thankfully acknowledged.

98th Indian Science Congress

January 3-7, 2011, Chennai

II

ABSTRACTS OF

PLATINUM JUBILEE LECTURES

PLATINUM JUBILEE LECTURES

Science, Technology and Engineering of Intelligent Robotics

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The role of Robotics in Civilian and industrial applications is well known and it has already created so much of use to mankind. Presently intelligence is being added in a big way to the robots to make them more useful, goal and result oriented and autonomous. Usage of these robots in military is being attempted in the field.

In general, Robotics refers to building machines to perform tasks which are normally performed by humans. They are also meaningful in performing repetitive and hazardous tasks. These kind of robots are built with pre programmed functionalities and when the robot is required to do yet another functionality, the same is added to the preprogrammed software.

When a robot is to do an autonomous task, it is not always possible to expect all the situations apriori so that they robot can be programmed in advance; situations may open up unexpectedly and all of a sudden. Can we provide the robot with a capability to analyze and take necessary action within its control and domain and face the new situation effectively to a large extent ? The answer is Yes.

To achieve the above, it is essential that a suite of technologies are examined in detail and the science behind these technologies are understood. We may say that science addresses the *What* and technology the *How* components. The suite extends over a large spread, covering Artificial Intelligence, Neural Networks, Image and video Processing, high speed data communications, Adhoc Networking , virtual reality, haptics etc. These would result in providing the functionalities like vision, locomotion, positional information, path planning, Obstacle avoidance etc to the robots. Communication technologies like wireless Lan, Line of sight and non line of sight communications, satellite hook ups with global Positioning System (GPS) are being used.

It is essential that the robots are engineered to make them work in an environment which has to be defined and also meet size, weight and power budget requirements. They are also required to operate under harsh weather conditions. Hence a rugged engineering solution is required to be developed and design aspects from Mechanical Engineering stream play a vital role. In fact the new field of Mechatronics has already become a subject of study in engineering schools.

The utility factor increases further when , instead of a single robot, a few of them can be made to perform as a *collaborative group*. Herein the new areas like swarm intelligence, Machine learning, Data mining and fusion, Image and Video fusion and Natural Language Processing are being studied. Frameworks to apply many of these areas into robots through a new paradigm ares being seriously looked into.

Military is keen to introduce robots into the battlefield. The immediate gain is the reduction in the loss of precious human lives; also the robotic machines can be controlled in centralized, semi autonomous and fully autonomous deployments. Already studies have been initiated to examine regarding equipping the robot with a weapon. It is also essential that when these machines are deployed in a battlefield, they must be in a total secure mode as far the information they exchange and disseminate amongst them. Latest advances in communication and information security are essential to be designed and developed. It is also important that the machines have an inbuilt destroy feature, in the event of getting captured.

The lecture covers the above science, technology and engineering aspects and issues thereof.

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III

ABSTRACTS OF

YOUNG SCIENTIST AWARD PROGRAMME

YOUNG SCIENTIST AWARD PROGRAMME

Techniques to Improve Flux While Treating Tannery Effluent Using Membrane

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Tanneries generate large volumes of liquid effluent after each processing steps. The use of membrane based separation process isconsidered for treatment of an industrial effluent discharged from degreasing unit of a tannery. In spite of various benefits, membrane based separation process has certain drawbacks during operation that leads to decline in flux due to concentration polarization and membrane fouling. Studies on flux enhancement techniques are attempted. Various methods have been used to reduce the effects of concentration polarization and fouling by improving the hydrodynamics of the cross flow over the membrane surface. More than 20%, flux enhancement is observed by using turbulent promoters compared to purely laminar flow and 50% flux enhancement is observed by using gas-liquid two phase flows.

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IV

ABSTRACTS OF

SYMPOSIUM/INVITED LECTURE

PROCEEDINGS

OF THE

NINETY EIGHTH SESSION OF THE

INDIAN SCIENCE CONGRESS

CHENNAI, 2011

PART II : ABSTRACTS OF SYMPOSIUM / INVITED LECTURE

SECTION OF

ENGINEERING SCIENCES

President : **Dr. Vipin K. Tyagi**

1. Ethics in Science and Engineering Education & Research

Y. Medury

COO- Education

Jaypee Education System, A-10, Sector 62, Noida

Ethic: A principle of right and good conduct.

Ethics: The rules or standards governing the conduct of the members of a profession; the study of the general nature of morals and of the specific moral choices to be made by a person; moral philosophy

Ethics (or morals) are the rules for differentiating between right and wrong, acceptable and unacceptable behavior. Most people learn ethical norms at home, at school, or in society. Generally people get their sense of right and wrong during their childhood, moral development occurs throughout life of a person. High complexity and competitiveness in research environments, the significance of interdisciplinary and international involvement in research, and the close coupling of money and academics have created an ethically

challenging environment for young researchers.. Although some professional societies and institutions have their own ethical code there is a need for an Ethical code for everyone engaged in education and research. We at Jaypee Education System give stress to morals and ethics in science and engineering education and research.

In the present talk, following essential principals for an ethical code are discussed, which should be compulsorily considered in defining Ethical code for Science and Engineering Education and Research

- Give due credit wherever required, Never plagiarize
- Honesty in all scientific Communications
- Avoid bias or self deception in research
- Integrity
- Avoid Careless errors and negligence
- Share resources and be open to criticism
- Responsible Publication
- Respect for colleagues
- Social Responsibility
- Avoid Discrimination against colleagues
- Promote Competence
- Obey Laws and Government policies
- Care of sustainable issues
- Care of living beings

2. Sustainibility Issues in Education and Research

N. J. Rao

Vice-Chancellor
Jaypee University of Engineering and Technology
Raghogarh – Guna (MP)

The human society is developing fast to improve the standard of living of people. This

is being done by creating new services and goods utilizing the resources available in nature. Humanity today stands at a defining moment in history confronted with disparities in living, growing discontentment and continuing deterioration of ecosystem. We today require sustainable development by which we ensure improving quality of life whilst living within the carrying capacity of life support systems and ensuring no overuse and no wastages.

Education is critical to providing a basis for sustainable development by improving capacity of the people to address to environmental and developmental issues. It is also critical to providing tools to improve environmental performance and ensuring ethical awareness, define values and attributes, improve skills and behavior consistent with sustainable development. Education will address environmental and development issues at multi stake holder level.

Science and engineering education should provide skills and tools to deal with sustainable development process with 'Holistic Approach'. The current decision making process needs to shift from Cost-Benefit analysis into 'Multi-criteria Decision Making' in the face of uncertainty.

The aim is to transform natural capital to human capital to social capital to well being. Tomorrow's engineers and scientists should be "Honest Broker". The business evaluation must include performance/productivity based indices, social responsibility based indices, sustainability based indices in addition techno-economic indices. We need to include in modern teaching and research the concepts of Green, Clean, Closed Cycle operational CSR, Ecological Foot Prints, Security. The Multi-disciplinary Stakeholder Approach must find place in research and teaching to ensure sustainable development.

3. Creating Research Hubs in Universities: Key Issues

Ravi Prakash

Vice-Chancellor
Jaypee University of Information Technology
Waknaghat, SOLAN (H.P.)

Research is an integral part of any higher education process. Every university teacher has to conduct research as an integral part of his/ her duties because a teacher is expected not only to assimilate and disseminates the knowledge but also to generate new knowledge, which is possible only through research.

We in India have a large pool of research personnel (i.e. very well qualified faculty members as well as the research scholars and higher degree students) at our institutions of higher learning viz. Universities and Colleges. We have more than 300 Universities and 30,000 Colleges imparting higher education and research training. The number of students in higher degree institutions is increasing very fast. There used to be about 7 million students in these institutions a decade ago and this number has now doubled to 14 million students. Such is the scenario of knowledge/research pool and we have to give proper guidance and directions to them for rapid economic growth through research.

Universities act as repository of knowledge. Basic research, which is the back-bone of any applied / industrial research, is usually done at universities and for such researches, manpower is always available at Universities as a part of education process and that too at very economical rate. Universities have to undertake basic research and in addition should go for directed research as well. If the research fructifies into a commercially viable product or process, IPR issues should be addressed too, for generating funds, for further research through royalties from the intellectual property rights / patents generated / obtained. However if the research work is unlikely to generate sufficient economic input (such as for research related to certain basic sciences where commercial interest may not lie), it would be better to opt for publishing results rather than going for IPR / patents. Also, even if the University has decided to go for patenting, after filing the patents, publications should be encouraged in the larger interest of scientific community/research.

It is a well known fact that researches done at the universities generally culminate into good quality theses or project reports. However, Universities right now are neither sufficiently equipped nor have the culture of going to the next stage i.e. development (such as development of a product or process). Institutions of higher studies have to pay attention to this aspect urgently. Could be collaboration with an industrial partner may help this process of development / scaling up of the research.

Universities are the main forum for seeding and breeding of ideas and this aspect has to be sustained. We should not loose sight of this aspect in our over enthusiasm for generating revenues through commercialization of research projects being carried out at these Institutions or in the process of development / delivery aspects of undertaking corporate sponsored research projects. For economic benefits of research being carried out at various universities, in addition to Research and Development, training in delivery aspect of research projects is very much required. As it is well known, industrial or corporate research is always linked to time bound delivery. Universities have to develop this culture for time bound delivery. Right now most of the research projects do not follow a time line

and such a practice may not be conducive for corporate research or even acceptance to the corporate world.

Another important related issue is research integrity and it should be given due importance to avoid issues like re-doing or copying someone else's research, stealing fellow researchers' research ideas, plagiarism, wrong reporting of findings, which do not exist, cooking up of data for publication etc.. Ethics is central to any strong research and every researcher has to abide by research ethics.

Certain other issues which need universities attention are research policy and strategy, research funding, funding opportunities, assessing research, dissemination and translation of research, developing professional research managers and administrators, management and organization of research support, developing research cadre, creating/enhancing positions of PDFs, Research Associates, SRF, JRF etc.

To boost research, we have to seriously create a parallel cadre of Research Professors, Research Associate Professors, Research Assistant Professors, Research Lecturers etc.

4. Rehabilitation of Century Old Man Entry Brick Sewer System (part) for the City of Kolkata

Nilangshu Bhusan Basu

Past President, Engineering Sciences,
Indian Science Congress
Principal Chief Engineer, KMC, Kolkata

Preventing deterioration of the environment and global warming has become easy coinage for quite some time. But the objectives for each problem area towards actual implementation is really diluted due to our indifference so far. The complexities are considerable, given the number of industries, organisations and influx of population. To achieve the objectives and the mix of instruments required in the form of legislations, regulations, physical incentives, voluntary agreement, educational agreement and information campaigns are well-known. Though the major emphasis is on increased use of regulation, but our focus on alternative state-of-art technology and applications are really lukewarm. There is an upward trend in environmental pollution due to lack of our civic conciseness.

Waste water is one of the worst assaulted to receive pollution from traditional economic wastes generated from industrial and domestic processes, chemical agents from fertilizers and pesticides and silt from degraded catchments. While it is estimated that 75% by volume of waste water generated from municipal as well as industrial wastes, though small in volume, contributes over 50% of the total pollutant and the major portion of this is coming from large and medium agglomerations. For class 1 cities of this country less than 5% of the total waste water generation is collected and less than 25% of this is treated.

Now, in a chance grown city like Kolkata management of sewers is a real difficult task in absence of any control over low civic awareness, associated with erratic use of its drainage channels. Anachronistically low sized conduits for combined sewer with abnormally low percentage of road areas (6%) compared to any planned city of the whole world coupled with highest density of population (24,461persons/ sq. km) has also added to the broth.

So going by trenchless technology was found to be only workable solution both for the present and future as well.

5. Decentralized Low-Cost Solar Photovoltaic Energy for Lighting and other Applications for Rural Households

Vijaya Agarwal

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Present situation demands harnessing solar energy for the benefit of rural masses for lighting and other household applications by installing decentralized solar photovoltaic systems in stand-alone mode. Concepts of photovoltaics, application of solid-state lighting technology, and a few case studies are presented to illustrate how a logical and philosophical approach to scientific and technological problems can help to meet societal needs.

6. Applicability Study of Roadside $PM_{2.5}$, SPM and PM_{10} Prediction Regression Models in Kolkata, India

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Due to its rapid development, human civilization is threatened in different forms of pollution. Out of these, air pollution is a major one to play vital role behind different diseases and also climate change. Pollutants like carbon monoxide and hydrocarbons emitted from vehicles cause severe damages to human health, while green house gases like carbon di oxide, methane, etc are responsible for climate change problem. Automobiles are single greatest source of air pollutants in city area, as numbers of simultaneously running vehicles on city roadways contribute to a huge amount of air pollutants. Among different air pollutants related with automobile emissions, particulate maters like $PM_{2.5}$, SPM and PM_{10} are very much responsible for the propagation of different respiratory disease. More specifically, these particulates lead to increased mortality, increased admissions to hospital for respiratory and cardiovascular diseases, increased frequency of respiratory symptoms and use of medication by people with asthma, and reduced lung function. In addition to these acute effects, evidence shows that recurrent cumulative exposure to these particulates increases morbidity and reduces life expectancy. Air pollution modeling is commonly employed as a step towards management of these problems. So the current study deals with establishing roadside $PM_{2.5}$ and SPM Concentration prediction regression model considering heavy, medium and light motorized traffic volume as the independent variables and measured pollutant concentrations as dependent variables. The study establishes the validity of the developed models and for roadside $PM_{2.5}$ and SPM concentration prediction and also a similar pre developed regression model for roadside PM_{10} concentration, focusing on the city of Kolkata, India.

7. Challenges in Science and Technology

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India is currently facing unemployment, poor infrastructure, destruction of the

environment and many health issues. These challenges become more important than ever because of high population growth, climate change consequences and worldwide economic crisis. To combat these challenges there is a need of public properly educated in science and technology. It is necessary to increase awareness of importance of science and technology in daily life of Indian people.

Indians aspire to have a science and technology-driven economy. This will be characterized by improved science and technology education, training and culture; increased commercialization of research and development (R&D); adaptation and promotion of new and emerging technologies; promotion of environmentally-sound technologies; existence of effective science and technology (S&T); and increased implementation and use of information technology.

In the present paper following strategic challenges and corresponding options to meet those challenges are discussed.

Improving Science and Technology Education, Training and Culture

Promotion and Commercialization of Research and Development

Promoting the Transfer and Adaptation of New and Emerging Technologies

Promoting Environmentally-Sound Technologies

Achieving Effective Science and Technology

Promoting Use of Information Technology

India is currently facing unemployment, poor infrastructure, destruction of the environment and many health issues. These challenges become more important than ever because of high population growth, climate change consequences and worldwide economic crisis. To combat these challenges there is a need of public properly educated in science and technology. It is necessary to increase awareness of importance of science and technology in daily life of Indian people.

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8. Total Quality Management of Higher Technical Education

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The entry point and span of bachelor and master degrees have to be re-engineered. Industry institutions, R & D organizations, professional societies interaction, system of governance and financing of higher technical education are prime concern today. Apart from knowledge, creation and dissemination, diversification, and stratification of specialized knowledge is very important in the context of the present knowledge based and future wisdom based society. IITs and other technical institutions of higher learning should play a lead role in the modernization of the technical education system in India.

India has some very bright spots of excellence in its technical education sector. The IITs and their alumni command great respect in the global market. India's second-tier engineering schools are also well-regarded, and have excellent faculty and student bodies. However, with an average of one new engineering college opening its doors a week, the AICTE appears to be struggling to maintain the standards of excellence set by India's top institutions. As the Rao, Committee report has pointed out the, AICTE needs to focus on ensuring that its standards are met at already existing institutions, new institutions are opened in areas that need them, substandard institutions are closed and that faculty shortages are reversed by investing in postgraduate education and encouraging talented students to remain in India to pursue careers in academia.

9. Autonomic Computing: Current way of handling Complex IT problems

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Nowadays, IT organizations have encountered growing challenges in the

management and maintenance of large scale heterogeneous distributed computing systems because these systems attempt to be active and available at all hours. Moreover, current programming languages, methods, and management tools are inadequate to handle complexity, scale, dynamism, heterogeneity, and uncertainty as the most important challenges in such systems. Therefore, researchers investigate new ideas to address the problems created by IT complexity. One such idea is Autonomic Computing (AC). Autonomic Computing Systems (ACSs) are systems that manage themselves. This paper provides a thorough survey of autonomic computing systems, their characteristics and effects on quality factors, their architecture, issues, and challenges.

10. Structural and spectroscopic studies on some nonlinear crystals

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Keywords: *Nonlinear optical crystal(NLO); DFT; Natural bond orbital analysis(NBO); hyperpolarizability*

Theoretical investigation and computer simulations have shown its potential as a powerful and cost effective tool for studying the material properties. Modeling can set targets for laboratory development and can reduce experimental failures by rejecting unworkable ideas. Once, established theoretical methods may predict values of measurable quantities within acceptable limits. Ab-initio, DFT simulations are playing an increasingly important role because of their ability to predict materials properties without the need for any experimental input. In the present communication, DFT studies on Nonlinear optical (NLO) crystals namely 4-chloro-4'dimethylamino-benzylidine aniline (CDMABA) and L-Lysine monohydrochloride dihydrate (LLMHCl.2H_2O) are being reported. Nonlinear materials with high optical nonlinearities have potential applications in harmonic generation, amplitude and phase modulation, switching and other optical signal processing devices and hence the subject for theoretical and experimental investigations for quite some time. 4-chloro-4'dimethylamino-benzylidine aniline (CDMABA) is a new benzylidine aniline derivative which shows a large third order nonlinear absorption while L-Lysine monohydrochloride dihydrate (LLMHCl.2H_2O) is a semi-organic NLO crystal which shows

a large second order optical nonlinearity. The geometry optimization and calculations of harmonic wavenumbers have been carried out using Density Functional Theory with Becke's three hybrid parameters functional (DFT/B3LYP). The optimum geometry was determined by minimizing the energy with respect to all parameters without imposing molecular symmetry constraints. Vibrational analysis is done using B3LYP/6-311++G(d) basis sets. Calculated wavenumbers along with assignments are reported and compared with experimental data. The natural bond orbital analysis (NBO) has been performed in order to study the intramolecular bonding interactions among bonds and delocalization of unpaired electrons. HOMO-LUMO and hyperpolarizability calculations have been done and predictive results are reported.

11. Women in Science & Technology : Issues & Challenges

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The gender dimension of science and technology has become one of the most important and debated issues worldwide. Over the past 30 years, the United Nations General Assembly and UN Economic and Social Commission (ECOSOC) have emphasized issues related to inequalities, insufficiencies and disparities in the access of women to education, training and the labor market. Various major international initiatives on the subject have been undertaken, including the United Nations Decades on Women and Development), and special attention has been directed towards the role of women in science and technology. Gender equality is one of the eight United Nations Millennium Development Goals, which clearly call for action related to science, technology and gender.

Women are identified as seriously under-represented in science, mathematics and engineering fields. They are an under-utilized pool of talent and resource that could contribute immensely towards the social and economic development of societies through participating in science and technology programs. Women comprise more than half of the population of any society.

The challenge is to find ways of changing the situation such that women can be used as a resource for science and technology. There is no doubt that countries the world over need to open up opportunities to bring more women to science and technology, thereby producing a critical mass of scientifically skilled women. It is important for ordinary women

to appreciate and access the findings of science and technology so as to improve the living conditions of families and that women scientists take up this agenda and develop projects to address the under-representation of women.

There is need to remove structural obstacles and barriers that continue to exclude girl children and women from the study of science and technology. There is urgent need for the development and mobilization of all segments of populations across cultures to contribute to the eradication of poverty, fighting diseases, stemming environmental degradation and improving global economic competitiveness through the application and development of science and technology.

Science and Technology have been an integral part of Indian civilization and culture. Over the years Indian women have overcome the traditional mindsets and have excelled in professions like teaching, medicine and pure sciences. Women have made important contributions in all walks of life and made inroads into new fields like engineering, information technology, biotechnology, nuclear science, space and many such specialized fields in the domain of science and technology. While these developments have been highly satisfying, constraints in the form of socio-cultural factors, discrimination, lack of self-confidence and disparity between the sexes continue to affect Indian women and their choices of career.

The gender gap in academic science, in technology and engineering is not only a topic of ongoing policy changes and scholarly debates, but also is of interest to policy makers and governments engaged in initiatives to narrow the gap between women and men in these fields.

Much progress has been made toward the empowerment of women through science and technology interventions, but much more needs to be done before women and men can be said to enjoy equal status. This paper makes an in-depth analysis of the role of women in science & technology education and career.

12. Challenges for Research Promotion in Electronics Engineering Sciences in India

Madan Gopal Sharma

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All developments in engineering have been based on results of research in basic sciences like physics, chemistry, mathematics, material sciences, bio-medicals, space sciences

etc. Countries, mostly developed ones, have been ruling the other nations directly or indirectly on the strength of their scientific researches converted in to manufacturing of base and vital devices needed for any engineering applications popularized in developing countries like India. There is therefore, all the reason for advanced science research to be carried out in India by Indians in full authority of Indian Industry and Indian Government. Then only we can consider ourselves to be fully independent and liberated.

Our country has made good progress in space exploration, atomic energy, agriculture and food processing, missile technology, and many other fields. In information technology and computer sciences, our manpower is recognized to be in the best group. However, all developments require refinements in material and devices provided by continuous basic research efforts in electronics sciences. The work in India this respect has been insignificant at present. It is therefore, proposed that all efforts be made to boost the research in electronics engineering sciences in India for survival of independence in its true perspective. It need not be mentioned that evolving developments in electronics will almost directly affect the developments in all other fields also because electronics has become an important ingredient everywhere.

13. Solid Lipid Nanoparticles Regulate Functional Assortment of Mouse Mesenchymal Stem Cells

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A rapid decline in self-renewability, viability and function, of isolated stem cells, are major hurdles in developing cell based therapies. Thus, there has been an increasing interest towards identifying a support material for maintaining stem cell features of the isolated cells. Pioneering observations of the present paper, demonstrate functionally diverse potential of Solid Lipid Nanoparticles (SLNs) en route for mesenchymal stem cell behavior. The evidences are provided to show the dual nature of the SLNs for being a scaffold for the stem cell attachment, to retain stemness, and as reagent for inducing stem cell differentiation. Scanning electron microscopic examinations together with expression analysis were used to conform to such observations. Results of the study thus suggest that Solid lipid nanoparticles can be used as a good support material when functionalized to achieve good

adhesive properties while as a molecular paradigm for studying the adipocytic differentiation. We envisage a new role of SLNs towards regulating stem cell character by orchestrating the structural alignment during preparation of Solid lipid nanoparticles

14. Research & Development in Solar Power for Energy Security & Clean Energy

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Key Words : *Research & Development, Energy Security, Renewable Eneregy, Clean Energy, Solar Energy, Concentrated Solar Power (CSP)*

Electrical Energy is one of the most important Index of Economic Development & Growth of a Nation in modern times. Its generation from various resources in an integrated & optimum manner, is a great concern posing challenges. Although the power generation capacity has grown steadily from a meager 1,367 MW in 1947 to 1,61,352 MW in May 2010, wherein the share of Renewable Energy is about 10% (17882 MW) only. However, the electrical energy being the prime mover for economic growth, the demand for electrical energy continues to grow unabated. Newer horizons are being explored for fulfill the same.

Environment friendly Renewable & Non-Conventional Energy resources have great relevance for India. The following options are relevant:

1. Hydro/ Small Hydro/ Mini Hydro.
2. Solar/ Solar Energy via Space/ Sun Tower/ Sun Disc/ Solar Tall Chimney/ Solar-Lunar.
3. Desert Power/ Concentrated Solar Power.
4. Wind Power/ Biomass/ Co-generation.
5. Nuclear Energy.

6. Ocean Power/ OTEC/ Tidal/ Waves/ Salinity Gradient.

7. Micro Power options/ Small Fuel Cells/ Natural Gas Turbines/ LED Lighting.

8. Futuristic Options/ Energy from Black Hole/ Fusion Energy.

Solar Power is the most important form of Natural, Environment friendly, Renewable Energy Source. The Sun is capable of producing at least 1 tillion times more Solar Energy than the total energy consumed on earth. Scientists all over the world are making efforts to tap Solar energy, not only on earth, but also in the Space i.e. to deploy the Solar plates in the Space for electricity generation & transmitting to earth.

Deserts are not entirely without their uses. Deserted Industrial Initiative has plans underway to transform swathes of Sahara Desert into a glimmering sea of Mirrors, with the goal of transmitting clean & efficient Solar Energy to entire Europe. This has been termed as Concentrated Solar Power (CSP). Desertec will create vast fields of Concentrated Solar Power (CSP) Plants – arrays of mirrors which focus the Energy of Sun to turn water into steam & then drive electrical turbines. Power will flow through a network of low loss transmission cables to pipe electricity into existing European grid via Spain.

Under the New Technology developed, Desertec is designed to operate 24 hours a day by superheating water to temperatures of 260ºC, sufficient to create steam at high enough pressures that will keep driving turbines & generating electricity long after the Sun has set. A single patch of Sahara, just 114,090 sq kms in area, receives enough Sunlight to meet the entire world's electricity demand through CSP.

India could potentially benefit by installation of CSP in Thar Desert of Rajasthan. Its condition would allow 37.5 MW Power to be generated for each One Sq km of desert & Thar Desert has a total area of 2,28,000 Sq kms, enough to produce around 9,00,000 MW of Power. The National Nehru Solar Mission is a major initiative of Govt of India & State Govts to promote ecologically sustainable growth while addressing the challenge of Energy Security of India.

In the midst of high pitch lobbying for Nuclear Energy, the Solar Power was almost forgotten. However, it gets due emphasis with allotment of Rs 4,337 crores upto the end of XIIIth Plan in 2022 & the target of 20,000 MW has been declared. Although we are producing very little Solar Energy, India is

blessed with a huge desert in Rajasthan & plenty of Sun Light is available for almost 300 days a year.

The cost of Solar panels has reduced by almost half in every decade, for the past 30 years. If this trend continues we can achieve a technological breakthrough of getting cheapest Solar Power in the next 20 to 40 years. This needs more investment in Research & Development of Green Energy, especially in the Solar Power, to the tune of 100 billion $ per year.

Solar Energy is important from Indian perspective.

We have ample Sun Power for almost 300 days a year.

Solar Power Stations do not require long gestation period of years & decades.

Solar Plants Stations do not call for large scale displacement of people.

Capacity of Solar Plants can be increased by adding new panels & controls to existing system.

Solar Power does not involve large scale expenses in transmission lines, it is available locally.

Solar Power is easily available at difficult far away hilly tracks & remote areas.

This paper highlights the salient features & benefits of Solar Power.

15. Green Computing

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In 1987 the UN Environment Commission defined sustainable development as, “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This gold standard presents a great challenge to the engineering fraternity. Need to reduce the carbon footprint, development and commercialisation of energy efficient and environment friendly systems are the key challenges of the future industry.

With the impact of climate change, comes the anticipated impact of green computing, hence the urgent need to reduce the carbon emissions produced by the information technology industry. Global carbon emissions from information and communications technologies are estimated as being roughly equal to those of the airline industry. A massive amount of electricity is needed to operate computers, search engines, and peripheral equipment. The manufacture of a computer chip can generate up to 4,500 times it's own weight in waste. Then there's the pressure of consumer demand. People want the latest, the smartest and the fastest technology.

Well-informed companies are now likely to have entire departments devoted to cutting electricity consumption, and carbon emissions. Information technology systems can account for up to 30% of a company's electricity bills, so some companies start their improvements with a reality check. They review their utility bills, carry out an energy walk, and calculate their carbon footprint.

The Carbon Trust is a not-for-profit organization specializing in advice for businesses. In a best practice partnership with the British computing society the trust has developed a simulation software tool to help companies understand energy use within data centers. A British computing society spokesperson said, "The scale of the problem is worrying. Forecasts based on the current growth of data and associated IT infrastructure translate into a picture of unsustainable power consumption in the long term and power supply capacity issues in the short term. It is crucial that we make effective tools available to enable companies to identify the right steps to take to reduce energy use and carbon."

With the challenges of climate change, peaking oil prices, and economic recession looming, businesses and individuals urgently need to adopt precautionary principles and learn from best practices if they are to lend vision to the anticipated impact of green computing.

Let me now count the global efforts required in this direction.

- The need to set environmental attributes as part of system specifications.
- The need to compare and select equipment based on environmental attributes.
- The need to share expertise in saving energy and green computing.
- The need for "e-cycling."
- The need for monitoring implementations.

- The need to manage technology retirement carefully.
- The need to address planetary problems at sufficient scale and speed.

The serious question we must ask is, will we each make the efforts to achieve these small needs, knowing that the direct benefits to us are small, but that the cumulative impacts to all are significant?

16. Energy extraction from galloping beams with D- and triangular cross-sections

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Galloping of a structure is characterized as a phenomenon involving low frequency, large amplitude oscillations normal to the direction of incident wind. Typically, it occurs in lightly damped structures with asymmetric cross sections. Galloping is caused by a coupling between aerodynamic forces acting on the structure and the structural deflections.

Den Hartog [1] explained the phenomenon of galloping for the first time in 1934 and introduced a criterion for galloping stability of a structure. Alonso et al. [2] conducted experiments on a prismatic bar with triangular cross-section, mounted on an elastic support. He determined the aerodynamic coefficients (sectional lift and drag) of the cross-section and demonstrated the dependence of quasi-steady angle of attack on the occurrence of galloping. Kazakevich and Vasilenko [3] determined the dependence of galloping amplitude on incident wind velocity by a means of a closed form analytical solution for a bar with rectangular cross-section. Experimental results obtained by Laneville et al. [4] on a D-section exposed to turbulent flow show that it is highly prone to galloping at higher angles of attack. These past studies have established the influence of various parameters such as wind velocity, cross-sectional geometry of the structure and angle of attack, on galloping. We have carried out a detailed study on D-section and triangular section with regard to their galloping behavior [5]. An axial fan was used to create the incident wind and the study has been conducted over a range of velocities upto 10.5 mph.

Galloping of structures has been considered as a harmful and destructive phenomenon. However, there exists potential to harness useful energy from this phenomenon. This lecture focuses on harvesting wind energy that is being transferred to a galloping beam. The beam has a rigid tip body with a D-shaped and triangular cross-sections. Piezoelectric sheets are bonded on the top and bottom surface of the beam. During galloping, vibrational motion is input to the system due to aerodynamic forces on the tip body, which is converted into electrical energy by the piezoelectric (PZT) sheets. The relative importance of various parameters of the system such as wind speed, material properties of the beam, electrical load and beam natural frequency are discussed. Experimental and analytical investigations of dynamic response and power output are performed on a representative device. A maximum output power of 1.14 mW was measured at a wind velocity of 10.5 mph on a prototype device of length 235 mm and width 25 mm. A potential application for this device is to power wireless sensor networks on outdoor structures such as bridges and buildings.

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17. Green IT

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Key Words: *Green IT, e-waste disposal, sustainable development, e-learning*

There are several motivations for organizations to go green, the chief among these being sustainable development that ensures environmental, economic and social benefits.

From this evolves green IT – the study and practice of using computing resources in an efficient, effective and economic way. The talk covers how IT itself can be cleaned up to go green and then help the rest of the organization to clean up its act. Practical steps that can be taken towards energy saving, safe e-waste disposal and return on investment are discussed. The design, education and management aspects of green IT are addressed. The talk also highlights corporate social responsibility of nations and industry to protect the health and well being of the common man. A case study highlighting the use of e-learning in an outreach programme to sensitize the illiterate manual workers dismantling hazardous waste is presented. The prevailing Government and industry drawn regulations are also listed. Recommendations to nations, industry and individuals that could be easily implemented are brought out.

18. Energy Management-the Way to A Sustainable Future

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Energy is the most important and critical of all resources for economic growth and human comforts. Modern industry is almost entirely dependent on electric power for its operation. Unless there is an adequate supply of energy, the development targets and economic growth can not be achieved. India has made rapid strides towards economic self-reliance over the last few years. Impressive progress has been made in the fields of industry, agriculture, communication, transport and other sectors necessitating growing consumption of energy for developmental and economic activities. India continues to suffer from shortages of energy in spite of substantial investments in the power sector. Due to serious constraints on adequate availability of conventional energy sources in India, non-conventional energy sources must be developed to the fullest extent. In view of the shortages, energy conservation assumes greater importance. The steps to create sustainable energy system begins with the wise use of resources, energy efficiency is the mantra that leads to sustainable energy management. Energy saved through proper energy management techniques and conservation measures is equivalent to energy produced.

19. Stacked Element Microstrip Antenna Array for Wide Bandwidth

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The principal limitations of microstrip patch antenna are its narrow bandwidth. Bandwidth of the microstrip patch antenna can be enhanced by increasing the electrical size of the antenna. There are different methods for increasing the bandwidth (BW) like arraying of elements. Stacking the patches horizontally or vertically is one of the methods for enhancing the band width. In stacked patch configuration parasitic patch is placed above the driven patch and in addition to that, the input impedance behavior can be easily modified by changing the separation between the upper and lower patches resulting of dual frequency operation with adjusted bandwidth. Arraying of the elements with the stacked geometry can enhance the properties further. The present work deals with the linear array of circular patches designed over a substrate and stacked above by parasitic circular patches using multilayer configuration. The lower array of the stacked antenna is fed through corporate feed network.

20. Biodiversity Resources – Scope & Opportunity for utilization in Biomass Energy

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Key words : *Global warming, biomass, gasification, producer gas*

In developing countries, the energy occupies a critical sector in view of the ever increasing energy needs requiring high investment. Energy is one of the major inputs for economic development of any country. The major concern for environmentally sound

sustainable development in India is fast depletion of fossil fuels. Besides, climate change is the most challenging threat faced ever by the human civilization. The present energy scenario depicts serious concern for depleting energy sources and associated environmental issues like global warming, green house gas emission leading us to contemplate on alternative sources of energy. India is endowed with vast potential of renewable energy source to meet the growing energy requirement in the country. Among the alternatives, biomass energy appears promising as renewable energy source being abundantly available and ensuring effective recycling of waste generated from crop residues, forestry resources and other bioresources.

Biomass resources include all forms of organic matters derived from waste & residues of plant, animal, forestry and municipal waste. In India and other developing countries biomass is one of the major energy sources in the form of fuel wood, agricultural and forest crop residues, cattle dung etc. and about two thousand million people depend almost entirely on biomass fuels for their energy needs. The biomass fuels represent the second largest source of energy used after fossil fuels all over the world. Studies have shown that such biomass can be conveniently utilized as alternative fuels with improved thermal efficiency by conversion to solid as well as gaseous fuels through effective thermochemical process which in turn can run engine or turbine substituting fossil fuel and produce electricity thereby.

21. Epoxide Resin Powder in the Perspectivef Green Technology

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It is often very difficult to maintain uniform distribution of particulate reinforcements during fabrication of syntactic foam based on particulate or microsphere filled polymer systems if the resin system is viscous liquid especially in the presence of organic solvent during development. Pollution caused by the process involving handling of solvents is considered as one of the most serious ecological problems. In this perspective, thermoplastic solid epoxide resins were synthesized from the controlled reaction of diglycidyl ether of bisphenol A and a series of anilines at 110^{o}C for 50 hrs with a purpose to prepare ingredients for hot-melt resin without involving any solvents; thus obeying the 5th principle of *green*

chemistry. The products hot melt resin (HMR) were designated as HMR_n, HMR_{25}, and HMR_{35} respectively depending upon the type of amine such as n-aniline, 2,5-dimethyaniline, 3,5-dimethylaniline used in the reaction. The glass transition temperature (T_g) and the first premelting transition temperature temperatures (T_{m1}) of HMR_n, HMR_{25}, and HMR_{35} were found to be 36.5°, 29.1°, 43.3° and 131.2°, 148.6°, 155.4°C respectively such that $1.35 < T_{m1} < 1.47$. Interestingly, it was observed that there was a particular melting zone comprised of four prominent and distinct premelting transitions (T_{mis}) in each of these HMRs. All these HMRs were miscible in polyethylene glycols (PEGs) of different molecular weight. Enthalpy of melting for the HMRs was found to be on the order of 2.6 J/g whereas that for PEG6K (PEG of mol. wt. 6K dalton) was found to be 188 J/g. It was observed that the temperature dependence of the friction coefficient of the chain segments of the respective HMRs expressed by a_T follows the order $a_{T,HMR35} > a_{T,HMRn} > a_{T,HMR25}$ where a_T is the shift factor representing the ratio of relaxation times at T and that at T_g within the limit of $T < (T_g + 100)$. It was also observed that all these HMRs were miscible with polyethylene glycol of mol. wt. 6000 (PEG6K) upto the limit of ca. 20 wt. % of PEG6K, beyond that limit formation of spherulite of PEG6K started with the generation of opacity in the texture. More importantly, the solid forms of HMRs are friable to produce powder of resin. Such powder resins are easy to handle and can be very useful to prepare syntactic foam and functionally gradient composite materials in presence of particulate fillers and reinforcements without any problem of distribution.

22. Nanotechnology in Modern Times

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Nanotechnology has made tremendous impact on modern life. The word “Nano” comes from the Greek word, which stands for “dwarf”. Nanotechnology is the science of manipulating matter, measuring a few nanometers (10^{-9} meters), called nanomaterials. Nanomaterials are those materials with components less than 100 nm in at least one dimension, including clusters of atoms, fibers, films, nanoholes, and nanocomposites that are composite materials with at least one component being a nanomaterial. Nanomaterials are endowed with unique and novel structural, optical, magnetic, electric as well as biological properties not shown by their bulk counterparts. Nanoparticles are being applied in various

industries, including data storage systems, medicine, fuel cells, optoelectronic devices and even in sports equipment. Some of these applications will be described and their importance in education, research, social life and economy will be discussed.

23. Privatization of Higher Educations in Madhya Pradesh: Challenges and Opportunities

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India has a very rich and long history of education: education which has been passed on from one generation to the next generation to the next thousands of years in various fields of knowledge. It has always been and continues to be one of the most important needs of mankind. It helps man to inculcate values and apply the technical know-how in real life situations. Today we can be proud that our country has made remarkable achievements in many fields. Our higher learning centres have produced a good number of scientists and professionals who are making waves in their own fields. India is widely recognized today as a potential knowledge hub. Due to the ever increasing populations and liberal view of Government policy has provided the platform for globalization of higher education. Today education is more or less considered as a marketable commodity.

Madhya Pradesh is considered as the heart of our country characterized by rich cultural, biological and natural biodiversity. It is a home of several types of ethenic groups inhabiting in close relationship with forest. The state is also very rich in many important ores like gold, coal, boxite etc. In addition, the state is also located centrally and well connected with all over the country. Despite of all the efforts made by the state Government, the enrollment ratio is quite low. One of the major reason of less enrollment is non availability of sufficient number and world loss higher learning institutions. To cope up with the demand for higher education as per the need of the state and limited financial resources, community and public participations may play important role in establishment of some excellent higher learning centres in the state. In this direction, M.P. Government has already established a Private Universities Regulatory Commission. Many private agencies are coming to established world class Universities. The present communication, thus, aimed to discuss various aspects related with possibilities and challenges in privatization of higher education in the context of Madhya Pradesh.

24. Ethics in Research: a Need of Time

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Just as ethics is about a vision of the good life, research ethics is about a vision of good knowledge. The term "research ethics" refers to a diverse set of values, norms and institutional regulations that help constitute and regulate scientific activity. Ethics should be operationalized as good research practice. Good research practice entails that the aims of research do not violate common morality, ethics and respect for human dignity. Good research practice also entails that the researcher respects current regulations and principles of research ethics. Both the researcher and the research institution are responsible for accommodating and exercising good research practice. Research is basically search for truth. Research ethics emphasizes that research has a more general responsibility to society. Research ethics also concerns the internal relationship among researchers, as well as the relationship between researchers and others people. Research may in addition have consequences for animals and the environment. The overriding norms of research can be formulated as openness, quality and accountability. Following points will be discussed in this talk to implement ethics in research:

1. Research must be in accordance with human rights
2. Research must be in accordance with sustainable development and respect for the environment
3. Research must promote peace.
4. Research must promote greater global justice in the distribution of wealth through the spread of information
5. The researcher and the research institution are responsible for exercising honest research practices
6. The researcher is individually responsible for the activities, subject matter and method of his or her research, as well as for the quality of the results
7. The researcher must respect the contributions of other researchers and follow standards for authorship and cooperation
8. Research institutions should have in place clear routines that reward researchers who popularize research and participate in research-related public debates.

25. Engineers for CYBER-AGE and Globalization

Prof. M P Chowdiah

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The phrase "Global Economy" are spoken over the globe. From aggressively successful Entrepreneurs and Steel Magnets to Bio-techies and even Management Experts, everyone is Talking about expanding their business across the Continents. This needs a well qualified and highly talented workforce, Countries across the World are investing in education and skill development. The new Engineering schools and large Universities are being set up and collaborative efforts across Educational Institutes are being encouraged. Increasing investments in higher education and greater emphasis on high-quality primary education will empower the biggest success stories in the next decade or two.

This paper encompasses the following topics:

1. Introduction.
2. Qualities of Cyber age Engineers Desired:
   - 2.1 Seven Technologies change generally proceeds on the following levels.
   - 2.2 Seven Technological Barriers which come in their way of new technologies.
3. Mega trends in Engineering Education in India.
4. Mega trends of Europe of knowledge
5. Seven Good And Competent Engineering Education Must Provide
6. Seven Qualities of Global Engineers desired.
7. Attributes of Global Engineers.
8. Seven ways to use invaluable software (Human Mind) for Success.
9. Need of full brain users.
10. Right Brain Behaviours.
11. Left Brain Behaviours.
12. Seven Ingredients of Brain for Success personality.
13. Seven Ingredients of Brain for Failure personality.
14. Conclusion.

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V

ABSTRACTS OF

ORAL/POSTER PRESENTATION

PROCEEDINGS

OF THE

NINETY EIGHTH SESSION OF THE

INDIAN SCIENCE CONGRESS

CHENNAI, 2011

PART II : ABSTRACTS

SECTION OF

ENGINEERING SCIENCES

President : **Dr. Vipin K. Tyagi**

1. Approach for the Biodegradation of Pretreated Coir Pith Using Trichoderma Viride for Cellulase Production

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Keywords: *Trichoderma viride, CMCase , Cellulase yield , Pretreated coir pith , Solid state fermentation, Response surface methodology.*

The present study is aimed at the synthesis of cellulase by Trichoderma viride using coir pith as chief substrate. The lignocellulosic biomass is known to be an excellent carbon source for microbial cellulase production under solid state fermentation. The rate of enzymatic hydrolysis is increased by alkali pretreatment with sodium hydroxide. The effect of fermentation conditions including coir pith weight, moisture content, initial pH and growth

temperature on cellulase activity and cellulase yield were investigated by response surface methodology (RSM) employing a four- factor- five- level central composite design (CCD). The results of Fourier transform infrared spectroscopy (FTIR), X-Ray diffraction (XRD) and Scanning electron microscopy (SEM) of coir pith showed structural changes through pretreatment, in favor of enzymatic hydrolysis. Maximum carboxy methyl cellulase activity and cellulase yield, 28.64 U/g and 66.32% respectively were achieved with 8 g coir pith, 70% moisture content, pH 5 and temperature of 40p C as evident from run numbers 25 and 30. Further Filter paper activity of 10.23 U/g and cellobiase activity of 4.31 U/g were observed on the 11th day after the inoculation.

2. Nuclear Submarine- A Review

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Key words: *Sonar sphere , VLS-Vertical Launch System, ballast and trim tanks, crew quarters, nuclear reactor , water treatment plant, engine room, rudder and the propellers.*

It is under water detector of the submarine with a maximum range. It works mainly on the basis of the principle “Doppler Effect”. Using which the crew members can find out the velocity of any vessel within its range and can also pinpoint the vessels location in the range. This design, visible in early submarines is sometimes called a “Teardrop hull”. It is major weapon of the submarine and a submarine carries torpedo’s which are completely enough to destroy another submarine. Now a days U-238,Pt-241 or Pt-239 heavy metals are used for these nuclear fission reactions and these reactions involve heavy release of kinetic energy, gamma radiations. And this principle is applied in the nuclear reactor.

3. Parametric Protocol for Energy Efficient Cluster Head Selection in Wireless Sensor Networks

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Energy Efficient Routing is a crucial issue in Wireless sensor networks (WSNs). This

paper proposes a novel algorithm, Parametric Protocol for Energy Efficient Cluster Head Selection (PPEECS) in WSN, which consists of two phases; Region formation phase and Cluster Head (CH) selection phase. In prior phase we divide the network into several regions depending upon node density distribution. The later phase allocates a CH per region. The CH selection depends upon relevant parameters related to energy dissipation of nodes. This routing protocol increases the overall lifetime of the network by uniform and effective energy utilization. Simulations show that PPEECS increases network lifetime by all metrics i.e. FND (First Node Dies) by 22%, HNA (Half of the Nodes Alive) by 60% and LND (Last Node Dies) by 50% when compared with an existing protocol, LEACH. Also, PPEECS has a better network lifetime when compared with multihop-LEACH; FND by 74%, HNA by 53% and LND by 43 %.

4. Sensorless Control of Permanent Magnet Synchronous Motor (PMSM)

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Key words *: PMSM, sensorless control, and SVM.*

This paper presents a sensorless control of Permanent Magnet Synchronous Motor (PMSM) drives and describes the design of a 3-phase PMSM sensorless vector control drive without position encoder coupled to the motor shaft. The speed sensorless control of non salient PMSM that uses estimated rotor flux instead of the transformation angle is designed. This paper introduces a new sequential switching control strategy for a current control of a three phase inverter. The key idea is to integrate the benefits of the variable structure system control design and the event-driven sequential control structures to raise the system performance and control efficiency. The design is applied to the control of three phase permanent magnet synchronous machine. The operation at low speed is improved

by reducing the disturbance impact. The estimation angle error at zero speed is limited by injecting the DC current that compensates the unknown load torque and enables operation at zero speed. The simulations were carried out using MATLAB/SIMULINK simulation package. This strategy can provide a complete electrical model of PMSM in real time with acceptable accuracy and fast response in current and speed control.

Evaluation was made based on the drive performance, which includes dynamic torque and flux responses, feasibility and the complexity of the systems. It is better technology in electric vehicles.

5. Producer Gas Based Power Generation System for Green Energy Production

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***Key words**: Producer gas, woody biomass, pellets, gasification, pyrolysis, thermo - gravimetric analysis, net present worth, payback period.*

Biomass based power generation system of 10 kW was evaluated for power generation using Prosopis juliflora and Leucaena leucocephala. Thermogram of Leucaena leucocephala and Prosopis juliflora suggested the quantum of lighter and heavier volatiles ranged from 55, 52 and 15, 17 per cent, respectively. On the basis of characterization it was suggested that biomaterial can be gasified effectively. Specific biomass consumption of downdraft gasifier during power generation was found to be decreased from 3.9 to 1.7 kg/kWh at different loading conditions. The tar content at the outlet of gasifier and after cleaning unit was 200 mg/Nm3 and 10 mg/Nm3, respectively. The system was found economically feasible and can be integrated for power generation on decentralized mode.

6. Bandwidth Enhancement of Rectangular Compact Dielectric Resonator Antenna (DRA) for Broadband Applications

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Keywords: *DRA, Microstrip patch antenna, Bandwidth*

The present day technology demands continuing growth in electronic systems operating in the RF and microwave spectrum. These systems are designed to provide high efficiency, wide bandwidth and reduced equipment size. Recent advances in wireless communications has resulted in development of antennas that can be embedded into wireless products. Since the last two decades two classes of antennas i.e., the microstrip patch antenna and the dielectric resonator antenna have been under investigation for modern wireless applications. However, compared with the microstrip antenna, DRA has a much wider impedance bandwidth. This is because the microstrip antenna radiates only through two narrow radiation slots, where as the DRA radiates through the whole antenna surface except the ground part. Therefore, in this presentation the main focus has been done on compact rectangular DRA for bandwidth enhancement for the application of wireless communications systems. The obtained results have been simulated using Ansoft HFSS.

7. Remote-Controlled Power-Off Switch Circuit

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Keywords : *Integrated Circuit (IC), Relay, Decade Counter, Timer, Voltage Regulator.*

This paper presents a new type of Remote-Controlled Power-Off Switch Circuit,

which can be used to switch off the electronic goods in the home appliances such as television, audio-video systems and many others. The circuit has been designed using IC NE555, IC HCF4017, IC TSOP1738, Relay, voltage regulator IC 7806 and some discrete components such as resistance, capacitance, diode, transistor and LED. These components are arranged in such a manner that our aim is satisfied. Timer IC 555 is configured as an a stable multi-vibrator. This model can switch OFF the appliance by remote-control provided for the appliance. Thus, efforts have been made to improve the electronic circuitry of the home appliances.

8. Application of Least Square Support Vector Machine (LSSVM) to Ultimate Capacity of Driven Pile in Cohesionless Soil

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Key Words *: Pile Foundation; Least Square Support Vector Machine; Artificial Neural Network; Sensitivity Analysis*

This study uses Least Square Support Vector Machine (LSSVM) for prediction of ultimate capacity (Q) of driven piles in cohesionless soil. LSSVM is firmly based on the theory of statistical learning, uses regression technique. An equation has been developed for the determination of Q. Sensitivity analysis has been also performed to investigate the importance of each of the input parameters. A comparative study has been presented between the developed LSSVM and Artificial Neural Network (ANN) model. This study shows that LSSVM is a robust model for determination Q of driven piles in cohesionless soil.

9. Application of GSM Technology in Home Automation

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Keywords: *Home Automation, GSM, Embedded System, and Mobile Communication*

In the present paper, we have designed and implemented a typical and simple Home Automation System using GSM (Global System for Mobile Communication) technology that controls electrical devices at home from a remote location by a simple mobile phone. This is achieved by sending an SMS to receiver present at home which is in turn connected to a hardware kit. The SMS received by the receiver is transmitted to the microcontroller, which reads the message and controls the appropriate device. This operation is performed by program written in assembly language code that is stored in the flash memory, which is in-built into the microcontroller. The practical implementation of the present prototype has been successful to control some electrical devices using an embedded circuit via SMS.

10. Reduction of CO_2 Emission by Hybrid Absorption

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Key words: *Green House Gas (GHG), Sterically hindered amine, and Hybrid absorption.*

Conventional amines have some inherent problems like low resistance against oxidative degradation, low absorption capacity and high vapor loss. To overcome these, the capture of CO_2 from the flue gas carried out by combined adsorption enhanced absorption route in

a hybrid absorber. 2-amino-2-methyl-1-propanol (AMP) was used as a sterically hindered amine and its performance was compared with conventional amines like MEA and DEA. The experimental results confirm that fine activated carbon particles can increase the CO_2 absorption rate significantly in aqueous MEA, DEA and AMP solutions under the conditions of the present work. Such enhancement in the rate of absorption is found to be most pronounced for MEA and AMP. In case of absorption of CO_2 into activated carbon slurry, the maximum increase in the rate is as high as about 9 times the rate in the clear liquid.

11. Machinability Studies of Ti-8Al-4V by Coated and Uncoated K20 Inserts

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Keywords : *Coolant, K20 coated & uncoated insert, Machining, Power consumption, Titanium alloys.*

Application of titanium alloy has increased many fields since the past 50 years. The major drawback encountered during machining was difficult to cut and the formation of BUE (Built up Edge). This paper presents the tool wear and surface roughness study of Ti-8Al-4 with K20 Tantalum thin film hard coated and uncoated carbide insert at moderate speed with the application of coolant. Titanium alloy is highly refractory metal and machining titanium is challenging to the manufacturers Experiments were carried out at medium duty lathe. Application of coolant tends to improve tool life and minimize adhesion of the work material on the cutting tool during machining. Result provides some useful information.

12. Comprehensive Risk Assessment of Chlorine and LPG Storage

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Keywords: *Risk assessment, LPG storage, Chlorine storage, Gas cylinder rules etc.*

For many industries safely handling and storing chemical is important and complex issue. Therefore it is necessary to supplement the codes of handling and storing chemicals with an imaginative anticipation of hazards involved. Many accidents can be avoided if existing systems are checked for errors. For the present study we have selected two potential materials LPG and chlorine. Risk assessment is done for storage facilities of these materials. A software is used to visualise hazard for these facilities. Risk assessment study includes identification, evaluation, estimation of hazard followed by suggesting preventive measures and giving plan to avoid or minimize hazard.

13. Transient Radiation from Simple Current Distributions

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Keywords: *Current Distribution, transient radiation, electromagnetic radiation*

In this paper we have considered the transient radiation from two simple, filamentry current distribution that are frequently used to more than practical antennas as for example

the travelling wave element and the standing dipole. Exact analytical expressions were presented for the electric and magnetic fields of these distributions when the excitation was a general function of time. These expressions apply in both the near and far zone. For an excitation i.e. Gaussian pulse in time, exact analytical expressions were obtained for the energy leaving the filament per unit time per unit length, the total energy leaving the filament per unit length, and the total energy retained.

14. A Novel Method of Harnessing and Storing Of Wave Energy

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Keywords : *Waves, pneumatic energy, converter, compressor, power generation, automobiles*

The Wave Energy exists at on-shore and off-shore shall be converted into Pneumatic energy and stored by a novel method.

The Pneumatic energy stored in cylinders shall be transported and put into air turbines to produce mechanical energy which shall be converted into electrical energy by conventional method, using generators.

Further, to have smoke-free automobiles for mitigation of air pollution, they shall be operated with pneumatic powered engines, utilizing the pneumatic energy which is eco friendly and also a substitute for fossil fuels.

Utilizing Pneumatic energy, desalination of sea water can also be done by reverse osmosis process.

Thus, the usage of fossil fuels could be eliminated in both power and automobile sectors and a potential solution obtained for environmental impacts.

15. Bone Remodeling: an analysis of nature's adaptively using ANSYS

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Living bone continually reshapes itself as it adapts to varying loading conditions. The process which regulates this relationship between mechanical stimuli and bone density is called 'bone remodeling'. Mechanical loading is a particularly potent stimulus for bone cells, which improves bone strength and inhibits bone loss with age. The molecular mechanisms by which bone adapts to loading and repairs damage are starting to become clear. Many of these processes have implications for bone health, disease, and the feasibility of living in weightless environments (e.g., spaceflight).

ANSYS which is a widely used FEM(finite element method) analysis software package in mechanical engineering is used to predict the bone density behavior after applying a certain load. This paper describes a method incorporated into ANSYS which simulates the biological mechanism of bone remodeling.

16. Determination of the Minimum Fluidization Velocity of Binary Mixture of Solids in Inverse Fluidization using Non-Newtonian Liquids

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Based on the data for the minimum inverse fluidization velocity for binary mixture of solids of different size and shape, a dimensional correlation has been developed to determine the value of u_{mrf}, as a function of the mass fraction of the coarse, x_c, in the mixture and different parameters that affect the system. The different solids include spherical LDPE-1(low density polythene) of density 915 kg/m^3 and cylindrical LDPE-2 of density 919 kg/

m^3, cylindrical HDPE (high density polythene) of density 944 kg/m^3 and disc shaped PP (polypropylene) of density 900 kg/m^3. The average diameters of LDPE-1, LDPE-2, HDPE and PP are 5.64 mm, 4.18 mm, 4.79 mm and 3.13 mm respectively. Non - Newtonian fluids include aqueous solution of sodium salt of carboxy methyl cellulose (SCMC) of different concentrations. The proposed correlation is:

$$u_{mrf} = A + Bx_c + Cx_c^2 + D$$

$$A = 2.6806X10^{-2}\left(Ar_m\right)^{0.0185}\left(\overline{\Phi}_s\right)^{-2.117}\left(\frac{d_t}{\overline{d}_p}\right)^{-0.976}$$

$$B = 2.4075X10^{-5}\left(Ar_m\right)^{0.0489}\left(\overline{\Phi}_s\right)^{1.354}\left(\frac{d_t}{\overline{d}_p}\right)^{1.852}$$

$$C = 1.3155X10^{-7}\left(Ar_m\right)^{0.0084}\left(\overline{\Phi}_s\right)^{-0.439}\left(\frac{d_t}{\overline{d}_p}\right)^{0.269}$$

and D = 0.00509

The proposed correlation has got a standard deviation of ± 22.4% for 217 numbers of experimental data.

17. III-V Nitride based *Lo-Hi-Lo type* ATT diode: A novel device for high-power generation in THz-regime

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Keywords: *III-V Nitride, IMPATT/MITATT mode operation, Lo-Hi-Lo type doping profile, Terahertz-source, high-power generation, prasitic effects.*

The dynamic-characteristics of *flat* and *lo-hi-lo* type III-V GaN-based IMPATT

devices are compared in the light of high-power operation in the THz regime. Study reveals that *lo-hi-lo* type device may generate ~$43x10^{10}$ Wm^{-2} (efficiency ~ 20%) of RF-power which is much higher than its flat-profile counterpart ($30x10^{10}$ Wm^{-2}, efficiency ~ 17%). The parasitic-resistance, including ohmic-contact resistances, degrades the performance of the THz-IMPATTs, significantly. This parasitic-resistance decreases by 30% with the modification of the doping-profile from *flat* to *lo-hi-lo* type through the selective incorporation of charge-bump. This study establishes the novelty of *lo-hi-lo* type GaN-IMPATT as a high-power THz-source for application in space-communication.

18. Prediction of Linker Region in Protein by Hidden Markov Model: An Alternative Approach to Delineate Domain Boundary Region

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Keywords: *Protein domains, Domain Boundary Prediction, Linker Index, HMM*

Proteins are composed of smaller building blocks, called ‘domains’ or ‘modules’. These building blocks are distinct regions in 3D space resulting in protein architectures assembled from modular segment, which evolved independently during evolution. The modular nature of proteins has great benefits, which allows them to make new cooperative interaction and function. Large proportion of proteins in higher organisms especially eukaryotic extracellular proteins, consist of multiple domains as a result of the duplication and mutational evolution of these building blocks through various gene rearrangement and purifying selection mechanisms. Knowledge of protein domain architecture and domain boundaries is essential for the characterization and understanding of protein function. Domain boundary prediction has applications in many areas of protein science e.g. protein engineering, protein structure prediction, and protein structure determination etc.

It is much convincing to identify a domain region rather than identifying whole protein structure. Most of the methods of clustering proteins perform better when we gave segmented sequences of single domains. An alternative approach is to find out the linker region of protein which allows us to find nonlinker region of protein. As sequence based complexity is very low in linker region comparatively less complex model can be used for identifying linker and thus domain region boundary. Here we applied a simple probabilistic model based on **linker index,** which generates probabilistic output for the linker and

nonlinker region of proteins. For this we build a Hidden Markov Model which discriminate the protein sequence in to linker and non linker region. This non linker region contains domain region. This model seems to be very useful to identify domain boundaries by sequence only without the knowledge of any known homology. It can also be used to separate proteins in to families by clustering them.

19. Evaluation of the Hardness and Corrosion Resistance of Manganese Phosphate coating on Alloy Steels

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Key words : Conversion coating, Manganese phosphate, Hardness, Corrosion resistance, EN24, Mild steel and D2

Chemical conversion coatings are adherent, insoluble, inorganic crystalline or amorphous surface films, formed as an integral part of the metal surface by means of an electrolytic chemical reaction between the metal surface and the dipped in solution. In such coatings, a portion of the base metal is converted into one of the components of the resultant protective film, which is much less reactive than the original metal surface. Manganese phosphate coating is the treatment of iron or steel by immersion in a dilute solution of phosphoric acid and other additives. In the resulting chemical reactions, the surface of the metal is chemically converted to an integral protective layer of insoluble or manganese and iron phosphate crystals. Depending on the physical characteristics of the substrate and the pre-treatment methods used, the translucent crystals and black to dark grey in colour for

manganese phosphates. The aim of the present work is to evaluate the hardness and corrosion resistance of Mild steel, EN24, D2 substrates and to determine how much hardness and corrosion resistance is the manganese phosphate coating imparting to the surface of the alloy steels. Focus is given on D2 steel, which is one of the most widely used alloy steel for manufacturing tools, dies and punches, as one of its important characteristics being exhibition of mild resistance to corrosion at hardened condition though it has considerable chromium content in it.

Improvement corrosion resistance of hardened D2 steel has been made possible using manganese phosphating.

20. Novel Method of Producing Hydrogen from Biomass

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Key Words: *Biomass – Gasification - Chromatography – Palladium – Charcoal*

Hydrogen is a most important alternative fuel which doesn't make any pollution when it burns. Biomass is present in our world in large amount as a degradable waste, also one of the valuable source of hydrogen. In our process we took downdraft gasifier, using gasification technique biomass was burnt under high temperature. Here the water gas shift reaction which is exothermic formed producer gas which had hydrogen, carbon monoxide, carbon dioxide. The producer gas was analyzed by chromatographic technique and passed through a cell packed with palladium tubes. Here hydrogen alone is adsorbed, diffused and comes in pure form at another end of the membrane. The pure form of hydrogen gas thus formed is absorbed by activated charcoal and stored in a safe manner. By this method we converted 50-85% hydrogen from biomass.

21. Qualitative Aspects of Population Interaction with Nonlinear Dispersal

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Keywords: *Prey-Predator Model, Ecology, Habited, Stability.*

A system of differential equation of dispersion between two populations in habitats separated by a barrier with a predator feeding indiscriminately on this population is considered. In this paper, we have extend the result of [1,5] in terms of more nonlinearity. A region in the $\varepsilon_1 - \varepsilon_2$ plane where equilibrium points exist is studied. The stability properties of these equilibrium points are investigated.

22. Five Level Parallel Inverter for DTC-SVM of Induction Motor- Its Application for Solar Bike

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Keywords : *Multilevel inverter, DTC-SVM, Converter, Electric Vehicles, Reliability, SVPWM, 5 Level H-Bridge Inverter.*

Direct Torque Control is a control technique used in AC drive systems to obtain high performance torque control. The conventional DTC drive contains a pair of hysteresis

comparators, a flux and torque estimator and a voltage vector selection table. The torque and flux are controlled simultaneously by applying suitable voltage vectors, and by limiting these quantities within their hysteresis bands, de-coupled control of torque and flux can be achieved. However, as with other hysteresis-bases systems, DTC drives utilizing hysteresis comparators suffer from high torque ripple and variable switching frequency.

The most common solution to this problem is to use the space vector with multilevel inverter depends on the reference torque and flux. The reference voltage vector is then realized using a voltage vector modulator. Several variations of DTC-SVM with low cost multilevel inverter or parallel inverter (five level) have been proposed and discussed in the literature. The work of this project is to study, evaluate and compare the various techniques of the DTC-SVM with parallel inverter applied to the induction machines through simulations. The simulations were carried out using MATLAB/SIMULINK simulation package. Evaluation was made based on the drive performance, which includes dynamic torque and flux responses, feasibility and the complexity of the systems. It is better technology in electric vehicles.

23. dbSSR: A Database of Simple Sequence Repeats

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Keywords: *Molecular markers, SSR, Motifs, Microsatellites, Database*

Molecular markers are required in a broad spectrum of gene screening approaches, ranging from gene-mapping to genotyping and haplotyping studies. Simple Sequence Repeats (SSR) or microsatellites are the regions of DNA where one to few bases are tandemly repeated for few to hundreds of times having immense utility as molecular markers in different fields like genome characterization and mapping, phylogeny and evolutionary biology due to their abundance, hyper variability, and suitability for high-throughput analysis, high polymorphism and transportability. An inventory of the simple sequence repeats in the genome is not available as a single resource. There is a need to develop a species specific SSR database to facilitate researchers working in the area of genome mapping and characterization.

Here we have developed a **database named** dbSSR, which is implemented through **MySQL** as the **database** management system. dbSSR employs **Apache** for its web server,

and PERL CGI to implement the dynamic web pages. Currently, the dbSSR **database** contains SSR information for three organisms, *Neurospora crassa, Citrus sinensis, and Aspergillus fumigatus,* and supports search capabilities to facilitate easy access and utilization of the information regarding SSR, motif, start and end position of SSR, and length etc.. Biologists involved in genome characterization and mapping, phylogeny and evolutionary biology studies could make use of this database. Database is available for academic use at http://www.bioinfoindia.org/dbSSR.

24. Denoising of Complex Signals using Multiband Complex Wavelets with Improved Thresholding

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Key Words : *Wavelets, complex wavelets, 2- band dual- tree, M-band dual tree, Hilbert transform pairs, thresholding, Improved thresholding method.*

The dual-tree complex wavelet transform (DT-CWT) which utilizes two 2- band discrete wavelet transform (DWT) was recently extended to M- band. In this paper we provide a simple construction method for an M-band DT-CWT, with M = rd where r, d “Z. In particular, we show how to extend a given r- band DT-CWT to an rd – band one. For convenience, the case where r = 2, d = 2 is considered.

However, the scheme can be extended to general {r, d} pairs straightforwardly. There are so many methods to denoise complex noisy signals, but this paper proposes an improved threshold method (soft thresholding with improved thresholding rule) used with M-band DTCWT to Denise the complex signals.

Finally, the results obtained using the proposed algorithm is compared with the 2-band DTCWT algorithm.

25. Study The Dielectric And Emissivity Properties Of Soils At 10.45 GHZ Microwave Frequency

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***Key Word**: Dielectric constant , Dielectric loss ,Emissivity*

The real ($\varepsilon^{|}$) and imaginary ($\varepsilon^{||}$) parts of the complex dielectric constant of soil with varied moisture content have been measured experimentally under laboratory condition at 10.45 GHz using infinite sample method. The value of $\varepsilon^{|}$ and $\varepsilon^{||}$ first increase slowly and then rapidly with moisture content. From this data the emissivity properties of soil is calculated using microwave emissivity model(calla opn et al 2000) it is found that emissivity depend on frequency and moisture content of soil . it is found that emissivity depend on frequency and moisture content of soil .

26. Mathematical Model for Microbial competition in Bioreactors

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***Keywords:** Bioreactor, Microbial fermentation, Mixed cultures, Competition.*

Competition for nutrients and other resources is an interaction common among microbial species growing together in the same environment. Such an environment can be created in the laboratory in a bioreactor in order to study these types of interaction and its effect on the microorganisms. Competition tends to eliminating species from the system. The main question then is whether the competing microbial species can coexist and under what conditions. The number of nutrients for which the microorganisms compete plays an

important role, while periodic oscillations and spatial heterogeneity have a favorable le effect on coexistence. In this paper we have developed a mathematical model and its stability analysis.

27. Societal Transformation for A Sustainable Future: The Power of Higher Education and Research

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Keywords: *Social Development, Social Cohesion, Society, Ethical Values, Sustainable Future.*

Higher education and research is a driving force in furthering environmental, social and economic development for the achievement of international development goals. Higher education institutions, as centres of research, teaching and intellectual debate, are instrumental in fostering social cohesion and perpetuating democracy, peace and justice throughout the world. They also develop ethical values amongst students strengthening their responsibility toward society and their sensitivity to local, national and global realities. Higher education and research can thus make a difference to the key challenges facing today's world, by playing a strategic role in forging a more sustainable, inclusive and development-oriented future.

28. Air Engine

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Keywords: *air, engine, non-polluting, compressed, embedded system, R.T.O.S.*

Most of the engines of today pollute the atmosphere and cause enormous harm to the

environment. All of them are based on the conversion of linear mechanical energy of the piston to rotary mechanical energy of the axle. The piston is made to move by expanding gases due to combustion of fuel such as gasoline, diesel and bio-fuel. This same motion of the piston can be achieved with highly compressed air by injecting it into the respective cylinder at appropriate time intervals, controlled by an embedded system which constantly takes input from the user and is based on an R.T.O.S.

29. Blending Effect of *Terminalia belerica* biodiesel with basic properties of mineral diesel

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Keywords: *Biodiesel, fatty acid profile, oxidation stability, EN14214*

Terminalia (*Terminalia belerica* Robx.) is a tree available in northeastern region of India. *Terminalia belerica* is one of such oilseed which yield about 43% of oil by weight of its kernel. The fatty acid profile shows that about 39.5 % oil is saturated and 60.5 % is unsaturated. Alkaline transesterification was the most suitable process to convert the oil into fatty acid methyl ester. All the properties of fatty acid methyl ester were tested and found that almost all the properties conform to the existing standards. Fiver blends *viz.* 5%, 10%, 20%, 30% and 40% were prepared with mineral diesel obtained from Numaligarh refinery and the properties were being evaluated. According to EN14214, the oxidation stability of pure biodiesel sample should be 6 hrs. Oxidation stability of terminalia biodiesel along with the different blends was also studied. The study reveals that the problem of oxidation stability can be minimized in blending with mineral diesel.

30. Classification of Odour in MOS Gas Sensors Using Artificial Neural Network

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Keywords: *Gas-sensors, Principal Component Analysis(PCA), Neural Network, Multilayer Perceptron(MLP), Radial Basis Function(RBF), Odour Analysis.*

Classification of different sample gases based on the dynamic responses of MOS based gas sensors was achieved in this work using artificial neural network. The dynamic responses achieved by modulating the temperature profile were used for further analysis. Principal Component Analysis (PCA) was used to visualise the different sample gas patterns . Data classification was performed using supervised neural network classifiers; namely the Multi-Layer Perceptron (MLP) network and Radial Basis Function (RBF) network and the classification accuracy for each of the two methods was determined.

31. Anti-Car Theft Security System

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Keywords: *Cars, Finger print, Security level, Pressure Sensors, Microcontroller, Mobile phone, Theft control.*

ACTSS is abbreviated as Anti-Car Theft Security System, which provides a high security level to cars. In this system, we are using four major devices. In this, every device plays a major role to protect the car from the breakers. Finger print recognizer is attached under the door handle so as to trace the finger print whenever the door is to be opened. If the finger print does not matches with the finger print in the owner's database, then the door will not open rather it raises the power alarm. If anybody breaks this, he enters the next security level. In the next level, the face recognizer focuses the person in the driver seat and once again checks with the database so as to match the face. If it does

not match, the ignition of the car will not activate. Incase this level fails, he enters the major part of the security level. In this level, we use the combination of pressure sensor, microcontroller & mobile phone. When the ignition starts and the car moves a foot, the pressure in the car tire changes, at once the pressure sensor sends a signal to the microcontroller which in turn alerts the owner through the mobile phone. As soon as the owner receives the alert, he sends a signal to the microcontroller which suspends the fuel flow and locks the doors. So the car halts within a few mile distances. Once the car halts, the owner can find the location of the car using GPS transceiver and grab his car back.

32. Magnetic Core Engine

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In the current era of technological development, the most important problem that our society faces now is energy crisis. Energy in which ever form is to be tapped. So it is necessary to utilize the available resources properly and also find new sources of energy. In this process one should never forget the importance of reusing of energy.

Magnetic core engine is an engine which is designed to work on electricity. This can be considered as an alternative to the already existing combustion ignition engines as it made from the junk engines which are disposed each day. Second thing is that we are using an even cleaner form of energy i.e. electricity.

The engines works with the principle of magnetic attraction and repulsion. For the same the engine is made of piston and dead centers which are magnets. The orientation of the magnets are so done that the piston gets simultaneously repelled from the top and gets attracted from the bottom. Again it gets attracted from the top and repelled from the bottom. The combined effect will help for greater utilization of energy conversion.

Thus this engine is related to the energy through different ways.

1. Reusing of the junk engines.
2. Using of electricity as fuel.
3. A new method to convert electricity to mechanical energy.

33. Ferro Electric RAM memories for Space

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Keywords: ***FRAM, EEPROM, LEO, ECC, SEU, SEL, Checkerboard algorithm***

This paper presents the reliability and advantages of using FRAM memories over the EEPROM and Flash memories for space. FRAM has significantly low power consumption than other memories for its operating speeds. FRAM's are found to be reliable at high temperatures [1] and radiation. FRAM's store the data as dielectric polarization making it less affected by the radiation than EEPROM. LEO satellite SRMSAT-1 will be launched with a COTS FRAM memory. Checkerboard algorithm is executed to find the SEL and SEU in each bit positions. This data along with ground test data will be used to infer the reliability of FRAM memories in space.

34. Analysis on Suppression of EMI On CUK Converters For Various Duty Cycle With Passive Snubbers

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This paper is about the study and analysis of effects of passive snubber circuits such as RLD, RCD and mixed (RLD+RCD) circuits over the conducted ELECTROMAGNETIC INTERFERENCE on power MOSFET in cuk converters. In this paper, for various duty cycles, suppression of conducted EMI is done with the help of snubber circuits. The analysis is done for various duty cycles from 0.5 to 0.6 with a switching frequency of 50 KHz using ORCAD PSPICE software. The simulated results are then compared with respect to their duty cycle.

35. Power generation in India Vision year 2022 & Expected contribution of Nuclear power and its safe waste disposal methods

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Key words: *Atomic power, BWR ,PWR,CANDU LMFBR Reactors*

At the time of independence of our country on 15/8/1947 total generation capacity was 1362 MW No atomic power generation was available. Since then Progress in power sector started in phased manner by five years plans Present power generation as on Jan 2010 (11th five year plan 2007to 2012)is 1.50,000 mw (68% Thermal +Gas+ Diesel) and 19% Hydel + 3% nuclear+10% non conventional(wind + cogeneration +pv thermal+ biomass +MSW +others) the per capita consumption reached is 600 units/year now in India and by 2012 it would be 1000 units/year has been planned to go ahead with power generation .It is proposed that in year 2012 the power generation to be raised to 2,15,000 MW an increase of 65,000 MW and in 2017 it is proposed to be 3.15 (LAC)MW and 2022 5.0 (LAC)MW

Present power generation by Atomic Energy by 17 Reactors is 4120 mw and by 2012 it would be4650 MW and by 2022 we propose to go for 20,000MW Atomic power generation for which we are in MOU with USA, FRANCE, Germany RUSSIA and other nuclear countries and 2030 we propose to go by 40,000 MW As u are aware that Present generation of USA is 5(LAC) MW total and by ATOMIC generation is 1 (lac) MW which is 20% of total OF USA World is generating 4(LAC) MW from ATOMIC POWER GENERATION by 435 reactors working .in 30 countries are generating 4,00,000 MW France is generating 50,000MW by atomic power which is 75% of its requirement.

This paper will discuss in brief the Technology adopted in world and in India. This paper will also discuss the Three Types of nuclear reactors(.)viz Power ,Research &,Fast

Breeders Reactors (Generating more Fuel then consumed) The five categories are BWR PWR, CANDU ,Gas cooled and LMFBR (Liquid metal Fast Breeder Reactor)

Estimation of waste generation is also done and their safe disposal methods of India and other countries shall be detailed . The Environmental Concern is developed due to the minor and major accidents recorded and suitable action for safe operation of reactors are discussed.. The world concern is ruled out by adopting advanced methods of operation and safe disposal methods specially in our country. Best suited Technology based on Thorium for our country is also discuss in brief, The uranium and thorium chain reaction which take place in Fast breeder reactors .and the Technology is also explained in this paper.

36. Antioxidant activity of Nanomaterials and their utilization in Biodiesel storage

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Keywords: *Carbon nanotubes, Iron oxide, Oxidation stability, Rancimat method, antioxidant*

This article presents a comparative study on antioxidant potency of iron oxide and iron oxide incorporated carbon nanotube (Fe_2O_3-CNTs). A modified DPPH method was used to investigate the antioxidant potency of Fe--$_2O_3$ and Fe_2O_3-CNTs. Finally, Fe--$_2O_3$ and Fe_2O_3-CNT were used to study the oxidation stability of plant derived oils using Rancimat method. It is found that the antioxidant potency of Fe_2O_3 is higher than Fe_2O_3-CNT.

37. Synthesis of carbon nanotubes (CNT) from Mustard oil

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Keywords: *Brassica nigra Oil, Natural renewable precursors, Carbon nanotube, CVD*

The aim of this paper is to explore a natural renewable precursor for the synthesis of multiwalled carbon nanotube (MWNTs). Mustard oil (*Brassica nigra*) is used as a precursor for the synthesis of MWNTs by Chemical Vapour Deposition (CVD) technique. Nitrogen gas is used to maintain inert condition as well as a carrier for the evaporated precursor (flow rate: 100 cc/min). The synthesized MWNTs are characterized by Transmission Electron Microscopy (TEM) and Raman spectrometry. The diameters of the synthesized nanotubes are in the range of (50 nm to 55 nm) under optimum conditions.

38. Enhanced visible active rutile TiO_2 nano photocatalyst for the degradation phenol

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Keywords: *Sol-gel, TiO_2, anatase, rutile, phenol*

Visible active rutile TiO_2 nanophotocatalyst has been synthesized using sol gel technique for the degradation of phenol. The catalyst was characterized using XRD, SEM, UV-DRS and PL. The crystallite sizes were estimated to be 34nm and 55nm for anatase and rutile phase respectively. The absorption spectra of rutile phase showed a red-shift in the optical response covering a small portion of the visible spectrum compare to anatase phase. The enhanced photoactivity of the rutile TiO_2 catalyst can be attributed to the extended absorption

in visible range and reduction in recombination due to trapped state as revealed by PL analysis.

39. Design of a Compound Parabolic Solar Reactor with Cylindrical Absorber used for Photocatalytic Detoxification

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Key words: *Concentration ratio, acceptance angle, photocatalysis.*

Compound parabolic reactor (CPR) is a device used for solar photocatalytic applications. It is designed according to the design criteria analogous to that of compound parabolic concentrator (CPC). A design of CPR with high concentration ratio and high acceptance angle is reported to achieve maximum efficiency. Truncation has been done to reduce the material cost. In the present work the design has been done to use it for photocatalytic detoxification application which utilizes the UV part of the solar spectrum as well. The design has been modified to collect maximum diffuse radiation for photocatalytic detoxification of contaminated water.

40. A Review on Sun Tracking for Optimization of Power Output of PV Panel

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Keywords: *PIC, tracking, PV panels, gear, stepper motor.*

One of the foremost challenges in the coming century is to satisfy the energy demand

by searching & harnessing the energy resources efficiently. Solar energy will play a vital role in meeting the future energy needs. Average diurnal solar irradiance over India is about 800 W/m^2/day, which makes it a solar rich location on the globe. The most important tool for conversion is solar energy efficient devices for optimization of power. The daily and seasonal movement of earth affects the radiation intensity on the solar systems. The sun trackers for Photovoltaic Panel compensate for these motions keeping the best orientation relative to the sun. This paper aims to investigate and identify tracking systems for photovoltaic panels/modules for their appropriateness for a particular application. The most efficient and popular sun-tracking device was found to be the polar-axis and azimuth/ elevation type for most of the application.

41. Reliability of Nor Flash Memory in Low Earth Orbit

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Keywords : *NOR Flash, EEPROM, NAND, Polar LEO, Equatorial LEO, Checkerboard algorithm*

The present paper provides a way of testing the reliability of the commercially available off the shelf Nor flash memory in space. At present, the Nor Flash memory is widely used in embedded systems due to its low cost, low power consumption and high memory density. In spite of this, the commercial Nor Flash memory is not popularly used in space due to its high susceptibility towards SEE and TID. Expected radiation exposure on the satellite in low earth orbit has been approximated based on mathematical calculations of earlier study. The experiments have been planned to be performed with different degree of exposure of radiations on the ground. SRM will launch an LEO satellite SRMSAT-I on which the NOR flash test is going to take place using checkerboard algorithm. This data along with ground test data will be used to infer the reliability of NOR Flash memories.

42. Modeling of Roller Burnishing Process on Tool Steel using Empirical, Surface Response Methodology and Artificial Neural Network

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Keywords: *roller burnishing; response surface methodology; optimization technique; neural network; back propagation; empirical model.*

The roller burnishing tool is used in CNC lathe to super finish the turning process. The tool and the work piece materials are Tungsten carbide and Tool steel respectively. The input parameters are burnishing force, feed, speed and number of passes. The output parameters are surface roughness and surface hardness and they are modeled using response surface methodology, empirical model and neural network. The Pearson product moment correlation coefficient is used for validating the output of the various techniques. Neural network model yields better results than other models.

43. Improving Thermal Energy storage in Domestic Geyser

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Key words: *geyser, thermal storage system, PCM encapsulated balls*

Abstract: Heat energy is the vital source of energy being utilized in various fields. Melting and solidification of phase change materials (PCM) in a capsule is of practical

importance in latent heat thermal energy storage (LHTES) system which are considered to be very promising to reduce a peak demand of electricity. Here heat energy is stored in domestic geyser with encapsulated PCM, it has been planted inside the geyser. The encapsulated PCM balls used as energy conserving or storing unit.

Heat energy is to be stored in the geyser by providing phase changing materials as latent heat thermal storage, when power supply is given to geyser then water is heated by heating rod up to a temperature range of 55°C to 60°C at the same time heat is transferred to number of encapsulated PCM balls inside the geyser. Since large amount of heat is stored in that PCM material. This stored energy can be retried by pouring water for next usage of hot water without giving heat supply again. Modified geyser is different from the conventional geyser PCM encapsulated are used inside it to increase the efficiency of geyser by giving better heat storage unit.

PCM material can store 5 to 14 times more heat per unit volume than conventional geyser. PCM encapsulation inside the modified geyser can hold or conserve heat energy for a much longer time as compared with ordinary geyser, in this paper to improve the thermal capacity of domestic geyser an experiment has done and examined.

44. Rich Client Search Engines

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Keywords: *Search engines, thick client, rich client, updation delay, crawler.*

Traditional search engines use a thin client, distributed model for crawling. This crawler based approach has certain drawbacks which could be removed with a proposed rich client based model. The rich client based search engine offers faster crawling and better updation time using lesser resources than thin client model, and it covers more of the World Wide Web than normal crawler based search engines. Although modern day search engine giants have improvised on various features such as ergonomics and utilities, along

with several added goodies, little work is done to improve energy efficiency of such Large Scale Search Engines. As the Internet is increasing exponentially the search engines will involve more and more servers thus costing more and more energy. This ever increasing demand of search engines needs to be curbed down. Rather than multiplying server resources it is better to use existing servers which work in a congenial environment, using communication methods to reduce redundant downloading of data from different servers by the crawlers.

This paper proposes a rich client based architecture for search engines along with analysis and comparison with present search engines. This could help into reducing the challenges of global warming, keeping up the speed and efficiency requirements.

45. Smart Web Crawling Agent

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Keywords: *Web Crawling, Database, Smart agent, E-commerce.*

B2C e-commerce has been evolving for years. There are many comparative systems that connect to multiple vendors and extract the required information from their databases and provide multiple interfaces for the user. Web crawler is a program or automated script that browses the World Wide Web in a methodical and automated manner and this process is known as Web crawling. A good web crawling agent must be communicative: able to understand your goals, preferences and constraints. This paper discusses about the framework of smart web crawling agent that takes the users request in the form of natural language and extract all the keywords and constraints from it. These extracted keywords and constraints are further used to extract the data from the data base and replied back to the user in the form of a list with the complete detail of the given request and with various extracted headers from database like seller's name, location, contact no. and price of item, etc.

46. Experimental Investigation of Castor Oil and Mahua Oil as Biodiesel on CI Engine

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Keywords : *Bodiesel, Tansesterification, Methylester.*

Biodiesel is becoming increasingly popular because of their low environmental impact and potential as a green alternate fuel for diesel engine. An experimental study is conducted to evaluate and compare the use of various diesel fuel supplements at blends (B10, B20) of Castor Oil and Mahua Oil in comparison to diesel. Experimental study has been conducted on a single cylinder water cooled CI engine. The engine speed was varied from 800 to 1000 rpm. Methyl ester of Castor and Mahua Oil are derived by transesterification process. The performance parameters such as torque, effective power, specific fuel consumption and effective efficiency for each blend at various conditions are calculated depending on the experimental data. Results are indicated that B20 have clear performance to diesel.

47. Analytical Studies on the Oxidation Combustion Kinetics of Jet Fuels

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Keywords*: Ignition delay, Reaction mechanism, jet fuel.*

A detailed study on the ignition of jet fuel has been conducted analytically using a kinetic scheme with 925 elementary reactions and 124 species. A program has been developed in MATLAB for the calculation and prediction of the concentration of 124 intermediate species and the ignition delay time in the combustion of jet fuel. The various

initial conditions considered was in between the temperatures of 1200K to 1900K with pressures ranging from 1 atm to 4 atm at various composition of species, and argon is considered as the diluent. The criteria for determination of ignition delay times are based on the complete decomposition of H_2O_2 concentrations. The ignition delay times are obtained by varying initial conditions of the mixture in the combustion of jet fuel. The results on ignition delays have been found to be acceptable with those of previous studies. Cantera (object oriented software for reacting flows) is used in this study.

48. Secure Storage Multi-Tenancy and Measuring ROI for Cloud Computing

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Keywords : Storage, Multi-tenancy, ROI, virtual storage container.

Cloud computing is an emerging computing model by which users can gain access to their applications from anywhere, through any connected device. Cloud Computing can be thought of as a way to make the world of computer resources seamlessly scalable. It has provided a reliable, cost-efficient, cutting-edge infrastructure for advanced software delivery models such as Software-as-a-Service (SaaS). The term multi-tenancy enables sharing of resources and costs across a large pool of users for any cloud architecture or infrastructure element (application, server, network, storage) in that architecture that supports multiple tenants. However, many organizations hesitate to share their data to cloud computing or commit such data to cloud storage because of concerns about security in cloud environments where infrastructure elements may be shared among many different organizations

This paper is primarily concerned with various key infrastructure elements and the requirements for secure and effective storage multi-tenancy in a cloud environment and various ways to measure return on investment (ROI) for cloud computing from business perspective.

49. Grid of the Future: Smart Grid An Innovative Grid Operation for India

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Keywords : *RES, Distributed Generation, Smart Metering*

In the present day generation, transmission and distribution of electrical energy has posed several challenges in three primary areas namely geographical location, congestion, and the system reliability which has restricted for further expansion. Moreover, the present grid has imposed constraints on the deployment of new Renewable Energy Resources (RES) such as wind and solar power which has necessitated the development of "Smart Grids". A "Smart grid" helps in delivering electricity from suppliers to consumers using advanced technologies and control techniques to save energy, reduce cost and increase reliability which would help us to achieve the goal of energy independence and combat global warming. This paper discusses about the different control strategies of smart grid and their relevance in Indian context.

50. Space Based Solar Powered Satellites

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Keywords : *Adequate, Conventional, Conveying, sustainable, Equinoxes*

In the 21st century expanding human population and declining natural resources makes earth face inadequate supply of clean energy.

Our current practices (Thermal, Hydro and nuclear power plants) are not able to meet the world energy demand.

As the era of conventional fuels is ending so capturing solar power in space and

conveying it to earth by wireless means will provide a carbon free and sustainable environment.

The space solar power satellites (SSPS) would operate in geosynchronous orbit where they will be illuminated 24 hours a day (except for short eclipse periods around the equinoxes).

We discuss the architecture of using a SPS in geosynchronous orbit (GEO) to enable 24 hours a day operations, transmission and distribution of that power generated.

This technology is a breakthrough concept for addressing the large demand of power, degrading climate, and economic issues of this century.

51. Finite Element Modeling and analysis of Zigzag type Single Wall Carbon nano tubes

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Keywords: *FEA, Single wall carbon nano tube, Stress analysis*

Carbon Nano Tubes possess a great significance in various field of engineering and material science due to its superior mechanical, structural and electrical properties. This paper aims at finite element model for zigzag single-walled carbon nanotubes (SWCNTs) is proposed. The model development is based on the assumption that carbon nanotubes, when subjected to loading, behave like space-frame structures. The bonds between carbons atoms are considered as connecting load-carrying members, while the carbon atoms as joints of the members. To create the FE models, nodes are placed at the locations of carbon atoms and the bonds between them are modeled using ANSYS spring element. The influence of tube wall thickness, diameter is used to evaluate the FE model of the SWCNT. The stress analysis results will demonstrate that the proposed FE model may provide a valuable tool for studying the mechanical behavior of carbon nanotubes and their integration in nano-composites.

52. Novel Nitrifying Microbial Fuel Cell for Waste Water Treatment - An Alternate Source for Power Generation

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Keywords *: Wastewater treatment, Power generation, Nitrifying MFC, Nanoparticles.*

Wastewater treatment is an energy intensive process that removes contaminants and protects the environment. While some wastewater treatment plants recover a small portion of their energy demand through sludge handling processes, most of the useful energy available from wastewater remains unrecovered. Efforts are underway to harness energy from wastewater by developing microbial fuel cells (MFCs) that generate electricity. Microbial fuel cells (MFCs) are emerging as promising technology for the treatment of wastewaters. To date, MFC technology based on wastewater treatment has focused on utilizing energy from carbon metabolism; despite its potential benefits, this approach has been plagued with inefficiencies. We propose to overcome these problems using nanoparticle-enhanced anode designs that can improve the transfer of electrons from cells to the anode. Furthermore, we propose to expand the matrix of bacterial metabolisms that can be used with MFCs to include micro aerobic nitrification. Nitrifying MFCs can help treatment plants meet reduced nitrogen discharge goals and provide a revenue stream that offsets the large cost of achieving reduced nitrogen loading. As the wastewater industry enters the nutrient trading era, having alternative, revenue-generating nitrogen removal technologies could provide a substantive incentive for sustainable wastewater management.

We have developed a novel nitrifying MFC that contains a nanostructure-enhanced anode, which has successfully achieved power generation of 43 mW/m2 over 9 hours (comparable to early achievements by carbon MFCs). Overall, this technology has the potential to significantly reduce wastewater treatment plant operating costs and make the larger-scale implementation of MFC technology far more feasible. The outcome would be a technology that could produce at least 1.4 GW-hours/day (30% efficiency assumed) of the ammonia in domestic sewage water.

53. Indian Maritime Research – Strategic Importance and Opportunities

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Shipping industry caters to the 95 % of India's exim trade by volume and 70% by value. We are ranked 15th in the list of maritime nations in the world and our national tonnage of 8.32 million tones GRT forms 1.18% of the Global tonnage. Our shipping has three regions of operation viz. overseas shipping, coastal shipping and inland water ways shipping. The shipping industry is not merely a means of transport but is much more than it. It has a huge growth multiplier effect, most importantly in terms of strategic importance the national tonnage forms a second line of defense to the country in times of war and crisis. Thus in the current geo-strategic equation shipping becomes a matter of National security whose importance cannot be overemphasized. Indian has a vast coastline of 7517 km having 12 major and 187non-major ports which serve the Indian shipping.

So how are we poised in this critical industry in the global scenario? As we go through the paper we find very dismal picture of the shipping Industry plagued by several problems. We will analyze the problems in details and try to find out a solution. Can maritime research and its facility development provide some of the critical answers being sought? Yes perhaps. We will go into the detailed study of the solutions that can be provided and utilized. We will also compare our research facilities with those in the leading maritime nations like the USA, Russia, Norway, Japan, china etc and find out where we stand and where we need to reach and carry out gap analysis and suggest remedial steps.

India traditionally has the longest traditions in shipping among the present maritime Nations; starting from 3rd millennium B.C. (3000 B.C.). the reference to ship building can be found in our Vedas. Our shipping fleet started developing massively from the time of Northern king Chandra Gupta Mauyra and by the time our king Ashoka was in power; massive diplomatic missions were sent to Distant countries. In the Southern part of India the tradition was no less glorious. From the time of the King Krishna dev raya of vijaya nagar who built the massive port of Hampi , our merchant fleet and navies ventured to distant lands. Most noteworthy in this context was the contribution of the Chola kings, who

led the Naval expedition to Malayasia, captured Srilanka in total and established Kingdom in Sumatra islands of Indonesia, We had active trade between Egypt, Singapore, Australia and China etc.

In the above perspective it can be summed up that our shipping had a glorious past, a bleak present and a uncertain future. The British empire had a slogan " those who rule the waves rule the world ", CAN WE MAKE A DIFFERENCE??

54. Role of Nanotechnology in Sensors

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Sensors are structures that indicate the presence of particular molecules or biological structures, as well as the amounts that are present. Sensors are already present in our society but the best sensors are made from nanostructures.

Natural Nano Scale Sensors:

Sensors are crucial in communications, and communication with other organisms is one of the central characteristics of life. Signals come into a variety of formats including molecule, sound, smell, touch and they also come in electromagnetic forms such as heat and light. As likely the exquisite nano sensors in the nasal bulb of some animals especially dogs, is crucial to their survival and to some of the ways in which they help people.

Electro-Magnetic Sensors:

The term electromagnetic refers to any form of energy that is propagated as a wave (radio waves, infrared waves &…). The simplest electromagnetic sensors respond to a physical condition like photo electric cells that are used to turn the lights on when the sun

goes down. These work with measuring the intensity of light coming from the sun. Photo electrochemical cells use molecular dyes that are excited by capturing sunlight.

Biosensors

They are not just natural sensors that are part of life; they are sensors for biological entities including proteins, drugs and even specific viruses. Nature does have a variety of schemes for approaching the detection of these entities. One common method is the allergic response of human body towards antibodies.

Electronic Noses:

In an artificial nose the most common replacement for the nasal membrane is an electrically conducting polymer. When the polymer is exposed to a given molecule in vapour phase, its conductivity will change a little bit. In the electronic nose, a random polymer, or mix of polymers, is spread between electrodes.

55. Advanced Storage Techniques of Electrical Energy

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A device that stores energy is sometimes called an accumulator.Energy storage as a natural process is as old as the universe itself - the energy present at the initial formation of the Universe has been stored in stars such as the Sun, and is now being used by humans directly (e.g. through solar heating), or indirectly (e.g. by growing crops or conversion into electricity in solar cells). Storing energy allows humans to balance the supply and demand of energy. Energy storage systems in commercial use today can be broadly categorized as mechanical, electrical, chemical, biological, thermal and nuclear.

56. Contactless Smart Cards

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Keywords : RF/ID, RF/DC, radio waves, close proximity

The contactless smart card dispenses with the contact plate on the surface of a smart card and instead uses some from of electrical coupling.

Generally, contactless smart cards will be placed in close proximity to a read less then 3centimeter.

An inductive(transformer)or capacitive coupling is used to transfer energy and power the card. The clock may be internally derived and input/output is achieve by modulating the power signal.

There are several different processes that can accomplish this, including inductive coupling and capacitive coupling.

RF/ID: A method of identification without physical contact. Accomplished through the use of radio waves.

RF/DC: A method of communication without physical contact. Accomplished through the use of radio.

57. Generation of Electricity by Using Water through Domestic Pipelines

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This paper demonstrates how electricity can be generated from running water domestic pipelines. With the increase in demand of energy and population it is essential to save every bit of energy. There is a need to find unconventional and renewable sources of energy which can be used in both small and large scale. These resources should fulfil the growing demand of energy. Taking into account the above stated points a prototype has

been developed which is an conceptual idea where in it is shown how energy can be generated using the water flowing through the pipelines in the domestic use. The energy that is generated can be used to light the bulbs and can also be stored. The generated supply is DC thus it can also be used for the charging of batteries and mobile phones. Implementing the above project will help us to the save energy as well as to use the generated energy. This will help us to meet the future needs and also keep the world clean. It is a form of GREEN ENERGY.

58. Design of Shared Aperture Antenna for L and X Band

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The Shared Aperture Technology has explored the development of wide band multifunction arrays capable of simultaneous and time interleaved radar, electronic warfare and communication functions. Progresses in the design of wideband radiating elements have made possible the demonstration of high performance arrays operating over L and X bands. In X-band the shorter wavelengths allow for higher resolution imagery from high-resolution imaging radars for target identification and discrimination. The L band wavelengths are used for telecommunications.The present study involves the design of annular ring and circular path microstrip antenna element for L and X band operation. The antenna will provide a basic unit for designing the array of L and X band shared aperture antenna.

59. Practical Projects of PLC-Based Process Control System from the View Points of Environmental Countermeasure

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Keywords: *PLC, Process Control System, Environment*

In 21s t century, it is sure that the earth environment will be closed-up much more

than now. The overall changes that are conscious of environmental problems will be required by individual consciousness, social organization or in the process of technical development.

In these changes, many customers are selecting PLC-based Process Control System (PBPC) because this system has a good balance of both its functions and costs. With this good balance, PBPC is used in wide areas.

Through this series, we explain how PBPC is used, and how PBPC changed the existing system by introducing the PBPC applications that are related to “Environment”.

60. Application of Hurdle Technology in Food Preservation for Process Industries

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Keywords: *Hurdle Technology, Food Preservation, Haccp*

Hurdle technology has developed as a new concept for the production of safe, stable, nutritious, tasty and economical foods. It advocates the intelligent use of combinations of different preservation techniques (‘hurdles’) in order to achieve multi-target, mild, reliable preservation effects with predictive microbiology and HACCP.

Recently, the influence of food preservation methods on the physiology and behavior of microorganisms in foods, i.e. their homeostasis, metabolic exhaustion, stress reactions are taken into account and multi-target food preservation has emerged. Application of hurdle technology became more prevalent, with preservative factors for foods like temperature, pH, a_w, high pressure, and their interactions.

61. Increasing Role of Lactic Acid Bacteria as Bio-Preservatives in Food Processing Industries

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Keywords: *Lactic Acid Bacteria, Bio-preservation, Bacteriocin*

In recent years interest in antimicrobial compounds like bacteriocin (nisin) has grown substantially. It's potential as natural substitute for harmful chemical food preservatives with enhancement in the shelf life and safety of food material. There is growing consumer awareness of the link between food and medicine. LAB can modulate host immune system with increased production of immunoglobulin. It acts as biopreservative with the ability to dominate the micro-flora of food during storage. It can also withstand the thermal processing or can be inoculated onto the product after heat treatment. LAB acts as hurdles to improve the quality under packaging condition.

62. Grounding Scheme of SRMSAT

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Keywords: *grounding, interference, EMC*

This paper highlights the challenges faced by the electrical power subsystem in designing and implementing a suitable grounding scheme for the SRMSAT nano satellite. Designing a grounding scheme for a small satellite is a big challenge as there are many restrictions in terms of low line voltage which limits allowable voltage drop in the line, interference between the various components, and also EMC and EMI considerations which arises due to the miniaturized nature of the satellite.

63. Electrical Power Subsystem of SRMSAT

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Keywords: *SRMSAT, ISRO, EMC, grounding, autonomous operation.*

SRMSAT is the flagship nanosatellite of SRM University for a proposed nanosatellite bus in collaboration with ISRO. This paper highlights the challenges faced in designing a suitable and efficient power production, storage and distribution system to support payload and other onboard subsystems in a low earth orbit satellite. The system designed, in parallel provides a semi autonomous protection against any faults in the loads/subsystems. Manual switching on/off of the loads is possible with the help of onboard computer. It also deals in detail with the problems encountered in system level implementations such as grounding, EMI considerations.

64. Attitude Determination And Control Systems Of Srmsat

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Keywords*: Attitude Determination, Control, Sensing, Actuator, Three axis stabilization, magnetic control, state vector Determination*

ADCS (Attitude Determination and Control System) is a subsystem of a satellite responsible for stabilizing and orienting the satellite in desired direction. The entire control architecture of the satellite is optimized by this subsystem to safeguard the satellite's operation on-board and to provide appropriate pointing accuracy to the Payload. Attitude analysis may be divided into determination, prediction, and control. When the orientation

along all the three mutually perpendicular spacecraft axes is controlled, the spacecraft is said to be three-axis stabilized.

65. Designing and Optimization of Magnetorquers for the Attitude Control of a Nano-satellite

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Keywords : *Magnetorquer, ADCS, magnetic control hardware, actuator*

SRMSAT is a nano-satellite with a payload to monitor greenhouse gases over India. Attitude Determination and Control System (ADCS) is responsible for the 3-axis stabilization and control of the satellite against the disturbance torques of the Low Earth Orbit (LEO). SRMSAT uses magnetorquers and control algorithms as the means of attitude control. The mission and payload of the satellite requires a high degree of accuracy. In this paper we have discussed the importance of the hardware accuracy and the design and optimization techniques for these. The hardware used for magnetic control is magnetorquer coils for SRMSAT.

66. Orbit Proliferation and Prognosis for a Nano-Satellite

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Keywords : *TLE, orbit, coordinate system*

This paper highlights the orbit propagation and the elucidation of the position and velocity vector of a nano-satellite by predicting its contemporary position. The Orbit model is clearly been viewed as a powerful tool for the generation of the position of a spacecraft when considered in the absence of a GPS. This document explains the effectiveness of an onboard model for the computation of Latitude and Longitude from multitudinous information obtained from the Ground Station.

67. Optimization and Augmentation of Solar Cell Utilization for Nano-satellites

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Keywords : *Solar cell data management, attitude determination, nano-satellite, Angle-current variation*

Solar cells are employed as attitude determination sensors that use trigonometric measurement techniques to determine orientation of satellite in space. Although accuracy can be a limitation but can be improvised by implementing one cell in each axis. The function of this module is to compute sun vector that determines the orientation of the satellite under changing attitude. As the angle of incidence changes with atitude of satellite, current produced also changes proportional to attitude change. Current sensors are employed for the purpose. A look up table can be developed to constantly verify the current values

68. Design of Satellite Ground Station For SRMSAT

Sandeep Mani Tripathi[1], Sanjay Srikanth [2], Sindhu Mannava [3], Vikash Kumar [4], Vishal Shekar[5] Sunny Kumar [6], V.S. Siddarth [7]

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Keywords : *SRMSAT, Ground Station, Tracking*

This paper will address the development of SRMSAT ground station from design to operational phase including testing using the COTs components. The ground station uses the amateur frequency bands for sending the telecommands and to receive payload and beacon data from the satellite. The ground station is operated in VHF and UHF band. It uses the quad stack circularly polarized crossed yagi uda antenna for downlink and a simple circularly polarized yagi uda antenna for uplink. The ground station design also addresses the in house development of the telecommand software and graphical user interface for various data interpretation and analysis.

69. Prediction of Groundwater Vulnerability of A Coastal Region Using Neuro-Fuzzy Technique

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Key words : *Ground water vulnerability, Fuzzy logic, Neural Network.*

Delineation of vulnerable areas and selective applications of agricultural chemicals in those areas can minimize contamination of ground water. There is a need to develop new modeling techniques that assess ground water vulnerability with less expensive data and which are robust when data are uncertain and incomplete. The specific objective of this study is to develop a model using neruo-fuzzy technique to be developed in JAVA program using four reasonable parameters deemed critical in transporting contaminants in and through the soil profile. These parameters include hydrologic soil group, depth of soil profile, soil structure of the soil horizon and land use. The model is to be validated using nitrate-N concentration data. In the Neuro-fuzzy modeling trapezoidal membership function and training data sets were used. A program is written in NEFCLASS-J. It is used to export the output vulnerability map.

70. Implementation of Line Stability Index for Steady State Stability Analysis and Enhancement Using Facts Devices

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Keywords : *Loading Margin, Voltage Stability Assessment, Contingency Analysis, Voltage Collapse, Voltage Stability Index, Upfc Device, Stability Enhancement*

Estimating the margin in the loadability of the power system is essential in the real time voltage stability assessment. Voltage stability is currently one of the most important research areas in the field of electrical power system. The condition of voltage stability in

a power system can be known using Voltage Stability Indices (VSI). The loading margin is one of the most widely known and accepted VSI. Voltage Stability Indices can be useful for estimating the distance from the current operating point to voltage collapse point. The indices can either reveal the critical bus of a power system or the stability of each line connected between two buses in an interconnected network or evaluate the voltage stability margins of a system. Flexible Alternating Current Transmission Systems (FACTS) devices have been proposed as an effective solution for controlling power flow and regulating bus voltage in electrical power systems, resulting in an increased transfer capability, low system losses, and improved stability. However to what extent the performance of FACTS devices can be brought out highly depends upon the location and the parameters of these devices. Unified Power Flow Controller (UPFC) is the most promising FACTS device for power flow control. The performance of this index is presented and the effectiveness of the analyzed methods is demonstrated through simulation studies in IEEE 14 bus reliability test systems.

71. Synthesis of Polymeric Plasticizer from Pet Waste and its Application in Nitrile Rubber and Nitrile-PVC Blend

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Keywords: *PET waste, Plasticizer, Depolymerization, Nitrile rubber, Nitrile-PVC blend, DOP, Compounding*

The Polyester Plasticizer for Nitrile rubber and Nitrile-PVC blend was obtained by the depolymerization of PET waste with 2-Ethyl 1-hexanol. The PET waste was depolymerized until a polymeric plasticizer with the average molecular weight in the range of 450-900 was obtained. The prepared polymeric plasticizer was used in the preparation of Nitrile rubber and Nitrile-PVC blend sheets. The Nitrile rubber and Nitrile-PVC blend sheets thus prepared were tested for Compatibility, Tensile strength, Elongation at break, Hardness and ageing properties. Nitrile rubber and Nitrile-PVC blend sheets were also prepared by using DOP as a Plasticizer and a comparative study with the synthesized polymeric plasticizer (PP_1) was made. It was observed that synthesized polymeric plasticizer provides excellent tensile properties and ageing resistance for high performance applications as compared with that obtained from DOP.

72. Fault Tolerant Multistage Multicasting Interconnection Networks

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Keywords : *Multistage Interconnection Networks (MINs) , Multicasting , Fault Tolerance*

Multistage Interconnection Networks (MINs) are used to interconnect different processing modules in various parallel systems or on high bandwidth networks. It provide a way to construct a larger switching network using smaller switching elements. The behavior of the interconnection networks plays an important role in the performance of multiprocessors. Multicast communication involves transmitting information from a single source to multiple destinations, and is a requirement in high-performance networks. Current trends in networking applications indicate an increasing demand in future networks for multicast capability. In the present paper, we will present a class of MINs which can support a substantial amount of well defined multiple multicast connection in a nonblocking environment.

73. SVM QSTR Model for Classification Of Dermal Toxic and Non-Toxic Compounds

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Key words: *QSTR, Dermal LD50, SVM, Toxicity*

The growing desire of the people to look younger and have healthier skin has gratified the curiosity of dermatologist, cosmetologist and various industries dealing with skin care

products. They are in search of new and improved drugs. For this large number of chemicals are screened for their toxicity. Chemicals are tested on animals and their Dermal LD50 value is calculated. Based on dermal LD50 value chemicals are identified as toxic or non-toxic. The method adopted is costly, time consuming and has various ethical problems related to animal testing. The solution to above problem is QSTR, it relates physiochemical properties of a chemical to their toxicity. In the present work an effort has been made to develop a QSTR model that can classify dermal toxic and non-toxic chemical compounds. For this a diverse dataset was compiled. The physiochemical properties of chemical compounds were calculated using e-DRAGON. The dataset was divided into training set and testing set using Kennard- Stone Algorithm. The selection of most suited descriptors for classification of compounds was done using iPLS Algorithm. SVMlight was used to develop classification model. The evaluation of the best model was done by calculation error, recall and precision. The QSTR model developed will be useful in disburdening the toxicity testing load on animals, is faster and cost effective.

74. A Comparative Study of Different Training Algorithms for Enzyme Classification

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Keywords: *Enzyme classification, Neural network, Multiplayer Perceptron, Training algorithms.*

The purpose of this novel study is to infer the new approach for classification of various important non annotated proteins, based on neural networks. Enzymes are a subclass of proteins that are specialized in catalytic activity which play a vital role in biochemical reactions and cell functioning. Correct enzyme class prediction is still a exigent problem in protein functional annotation. The major concern for enzyme classification is to deduce the function of an unknown enzyme by analyzing its structural similarity to a given family of enzymes. A comparative study has been performed for the identification of best learning algorithms in order to achieve the highest accuracy. A novel codification scheme was devised to convert the primary structure of enzymes into a real-valued vector. The proposed

system has been tested with different number of neural networks, training set and training epochs. The overall successful prediction of proposed system achieved a high accuracy rate of 82%. Our method outperforms the existing methods when compared with the methods found in the literature designed to predict enzyme class. This study demonstrated the prospect of implementing fast and efficient structure prediction of peptide sequences using neural network.

75. Smart Braille Reader

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***Keywords**: Braille reader, Braille printed books, Technology for blinds*

We all take our sight for granted and tend to forget how fortunate we are that we can experience an entire visual existence that those with no sight will never know. There are an estimated 45 million blind people and 135 million visually impaired people worldwide. For the blind, content on the web is like a giant gaping void because they have no way of navigating. Monitors are useless for conveying information to the blind. They basically live in a different world just parallel to our own, one that we will never know. In this paper we are developing a platform which, when connected to a computer, can convert an e-book into its proper translation into Braille and enable the person to detect the letters by moving his/her hand over that platform.

76. Context based Search

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Context is an information that characterizes the situation of an entity. In this paper

we present a context based image search approach that exploits the notion of the context for image retrieval. This image context helps us to associate different meaning to the same query image. For modeling complex query concepts, we contextualize the target image, which otherwise would have been difficult to represent. The context based model is simple and associates a set of images (that might be irrelevant to the query image) or some textual description of the query image that describes the user semantics. A feedback system is used in this context model which makes the query context dynamic in nature depending on the retrieved images judged as relevant by the user. This feedback system narrows the semantic gap every time the query context assumes a dynamic nature providing the best search result. We, by the help of contextualizing the query image, have tried to feed the high level semantics of humans to the system as its low level semantic for every image search.

77. Fingerprint Feature Extraction Algorithm on Different Databases

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Keywords: *Biometrics, Minutiae, Binarization, ROI, Feature extraction, Sensitivity and Specificity.*

A fingerprint is the reproduction of a finger tip epidermis, produced when a finger is pressed against a smooth surface. The feature extracted from fingerprint image often has a direct physical counterpart, but some time they are not directly related to any physical traits. Fingerprint identification is based on two basic premises: (i) persistence: the basic characteristics of fingerprints do not change with time; and (ii) individuality: the fingerprint of every individual is scientifically proved to be unique so far. The representation of the fingerprint feature represents the most important decision during the design to a fingerprint verification system and a good representation largely determines the further use and accuracy of the system. In this paper we studies fingerprint features at global level, local level and very fine level, we propose a feature extraction algorithm at local level and find sensitivity and specificity on different databases.

78. Methodology to Improve TCP Performance Using RED

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Keywords: *RED, TCP Reno, TCP Venoplus, Congestion loss, Received Signal Strength Information (RSSI), TCP Vegas, Busty network*

In order to curtail the escalating packet loss rates caused by an exponential increase in network traffic, active queue management techniques such as RED have come into picture. RED queue management aims at alleviating this problem by detecting incipient congestion in advance and communicating the same to the end-hosts, following them to trim down their transmission rates before queues begin to overflow and packets start dropping. For this very purpose, RED maintains an exponentially weighted moving average of the queue length which it used as a congestion detection mechanism. On exceeding a minimum threshold decided for the average packet length, packets are either marked with an explicit congestion notification (ECN) bit or they are dropped randomly. But when the average queue length surpasses a maximum threshold level, all packets are dropped or marked. In order to be efficient, RED must ensure that congestion notification is conveyed at a rate which sufficiently suppresses the transmitting sources without underutilizing the link.

79. A Survey on Wireless Sensor MAC Protocols

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Keyword: *Wireless Sensor Networks (WSN), Sensor MAC (S-MAC), Sleeping waking mechanism*

Energy Efficiency is the crucial issue in designing of Wireless Sensor Networks (WSN)

MAC protocol. S-MAC (Sensor MAC) is WSN MAC protocol based on listens and sleep mechanism to reduce consumption of energy. Synchronous Frame in S-MAC protocol belongs to control information so it's better if we can decrease it as much as possible extent, so that when data is get transmitted there should be minimum control information overhead. Now if we talk about wireless sensor network then this network consists of many dense distributed sensor nodes. Thus we use S-MAC protocol which decreases the listen time by sending node in to periodic sleep state so each node will sleep for a while and gets wake up to listen if any node wants to talk to it. During sleep time the node closes its connection with network channel which makes the wastage of energy low. There are some scheduling mechanism through we can reduce the power consumption. In the case of Synchronization for scheduling, if all nodes are sleeping together and waking up together then we have provided some control on that so this waste the capacity of Network by control overhead mechanism. By the help of MAC protocol all nodes are free to choose their own wake up and sleep schedules .To reduce the overhead and increase the channel capacity we should provide neighboring node to synchronize together, i.e. they used to listen at same time and sleep at same time. In Having Invalid Sending Mechanism, whenever sender sends the request to receiver and expects that it should get ready signal from receiver side but if sender doesn't get the signal means receiver is not ready to receive the sender's packet. Now, sender still sends the data then it is wasting of energy, thus it should be provided invalid sending mechanism to save network energy.

80. Energy reduction in real-time Systems using Greedy Approach

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Keywords: *DVFS, DPD, Power management, Embedded Systems, Real-time Systems, Scheduling.*

Energy management in embedded system is very important where we are not able to change the battery of the system and due to limited power, system may crash. In this paper we consider periodic task and non periodic task. We have proposed a greedy energy aware dynamic voltage frequency selection algorithm which reduces the energy consumption in comparison to other algorithm. In this algorithm we use one or more than one processor and adjust the number of processor according to the cast of processor and cast of energy

saving. In simulation result we shall see that we can save energy up to 80% in comparison to other algorithm.

81. Efficient way of using Model Driven Architecture Framework

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Keywords : *AGILE,XP, Metamodel,MDA,MDSD, PIM, PSM, DSL.*

Agile software development is in used in greater extend from recent few years, but successful in small organizations only. While Model Driven Architecture is suitable for large organizations but yet not standardized. In this paper we had study the pros and cons of model driven architecture (MDA) and Extreme programming method of Agile Methodology. As both of them have some limitations and cannot be used in both large scale and small scale organizations we proposed a new software development architecture for large scale and small scale organizations. In this model we tried to opt the advantages and important values of them by overcome the limitations of both the software development procedures.

82. Energy Intensive Computing System towards Green Computing

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Key words*: Carbon emissions, green computing, green chemistry, recyclability, biodegradability*

As 21st Centaury belongs to computer's gizmos and electronic items, energy issues

will get a serious ring in the coming days, as public debate on carbon emissions, global warming and climate gets hotter. If we think computers are non-polluting and consume very little energy we need not to think again. But, it is estimated that out of $250 billion per year is spent on powering computers worldwide only about 15% of that power is used for computing and the rest is wasted idling. It is worth emphasizing that, this "Green Technology" should not be just about sound bytes to impress activists but concrete action and organizational policy is needed. Green computing is a study and practice of using computing resources efficiently. The goals are similar to green chemistry during the product's lifetime, and promote recyclability or biodegradability of defunct products in IT Industry. The paper addresses the energy intensive computing system right from manufacturing to operation and maintenance. The steps for this include replacing petroleum-filled plastics with bio-plastics, use of plant-based polymers for recycling computers, replacing hard drives with solid state or flash memory devices, switching off idle-pc's , use of low power devices developing hardware as services etc

83. Novel Method on Ecalene Production – A Bio Fuel

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Keywords: *Fossil fuels, Ecalene production, novel method*

As technology has reached miles and miles far away from human imagination their negative effects has also become monsters threatening even in their mere existence. To save even human life and also achieve a sustainable development, People are in ardent need of an alternative that can best replace existing fossil fuels and equally help men in this competitive race of technological development. Analyzing various conventional fuels, the fuel called ECALENE, gives fascination.

Analyzing various production methods adopted by Power Energy Fuel, Inc, a precursor in Ecalene production and Eco Fuel Corporation, a US based company, their strategies

gives a common man a question of why ECALENE not in India. Awareness about this miracle fuel that is out of limelight in our Indian environment makes scientist to think, Is technology outdated in India? So this work has been done basically on improving availability of Ecalene production in India, by using a novel method that can be easily adaptable to Indian industrial environment.

84. A Novel Physical Approach of Recovery the Oil Spill

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Keywords **:** *Oil spill, Conical Shaped Apparatus, Helical shaped pipe, Reynolds's number*

The aim of this paper is to give an efficient, time saving, costless, mechanism which can be used along with the Conical Shaped Apparatus (a mechanical instrument used for recovery the oil spilled in Mexico) to recover an oil spill.

Our present study is based on how to get pure oil in minimum time from this Conical Apparatus. We have tried to get pure oil by achieving stream line flow with the help of helical shaped pipe along with this apparatus. This is done by analyzing the flow of oil in helical pipe considering always Reynolds's number (R) less than or equal to 2000.The study is carried out on different combinations of Reynolds's number and different sized helical pipes to get pure oil in minimum time.

The model study of this mechanism is performed with different densities of oil considering thickness of oil, working temperatures and working conditions- static & wavy water. Thus we have found out the efficiency of this mechanism with respect to time and purity of separated oil up to 90%.

85. Turning of GFRP Composite using PCD Insert to determine Optimal Cutting Parameters

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Keywords : *GFRP, Turning, PCD, Power consumed, Surface finish, Tool wear*

Composites are replacing conventional metals due to their superior properties such as high strength to weight ratio, high stiffness to weight ratio, better impact characteristics, and corrosion resistance and design flexibility. In the recent years, the utilization on GFRP composite materials has increased appreciably. Thus machining of these materials play a vital role in the manufacturing industry especially in automobile and aerospace applications. Thus turning is the most widely used machining operation. In this study, GFRP Composite is machined using PCD Insert at three different cutting speed, feed rate and depth of cut using Design of Experiments (DoE). Surface roughness, Power consumed by main spindle and Tool wear are the parameters to be considered here. Results showed that PCD performed well at low speed, low feed and medium depth of cut.

86. Lossy Compression of SAR Images in Multiwavelet Domain

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Keywords : *Discrete Wavelet Transform, Gaussian Pyramidal Coding, Mutiwavelet Transform, Synthetic Aperture Radar.*

Synthetic Aperture Radar (SAR) System generates a large volume of data and the ability to transmit it to the ground, or to store it, is not increasing as fast, due to practical

constraints imposed in the system design. This shortfall prompts interest in compression-decompression strategies for rapid transmission of images. Wavelets have been introduced as a signal-processing tool and they are widely used in image compression applications. The wavelet transform has got more importance due to its manifold characteristics i.e. high compression ratio, multi-resolution in nature, use of different basis functions that lead to the desirable property of characterizing and localizing signal features in frequency domains. In this paper, we have evaluated the performance of Discrete Cosine Transform (DWT), Block Truncation Coding (BTC), Gaussian Pyramidal (GP) and Multiwavelet Transformation (MWT). Mean Squared Error (MSE), Maximum Absolute Error (MAE), Signal to Noise Ratio (SNR), Peak Signal to Noise Ratio (PSNR), Compression Ratio and Compression Percentage (CP) are used as objective performance criteria. Based on the observation of the above performance evaluation system, the promising result has been depicted. At decomposition level1 on average compression percentage reported are 23 to 36 %.At Decomposition Level2 , Level3 and Level 4 on average reported results are 39 to 55 %, 41 to 66 % , 51 to 73 and 51 to 77 % respectively i.e. on an average compression 70% to 77% and Retain Energy (RE) 96.Objective of exploiting features of Multiwavelet Transformation for compression of SAR images has been shown.

87. Vertical Double Blade Wind Turbine

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Keywords: *Wind turbine, VAWT, AVR Control System, Blades.*

This paper describes about a new design of a wind turbine which is a small scale turbine which has the ability to generate around 15 kw power output. Energy crisis has been a major problem and Indian homes have regular power cut or power shortage. So implementing this small turbine on roof tops would compensate the energy need by the people at their houses. It would be able to cover almost 90% of the need by an individual home. Technology has been increasing and the need of power is increasing day by day. So this new design would solve half of the energy problem for the people. As well in India energy crisis has always been a hitting the back stage for having such a huge population. To meet the requirements of that population, energy is needed which will solve almost major part of the problem. This wind turbine is specially designed looking forward to the economy and the scalability of the current status of India. Hope this works out well.

88. Energy Harvesting From National Highways through Piezo – Electric Material for Night Lighting

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Keywords : *Power harvesting, piezoelectric material, Variable load.*

Piezoelectric materials can be used as a means of transforming ambient vibrations (or) variable load into electrical energy that can be stored and used to power other devices. Piezoelectric produce a measurable voltage when load is applied on it. If this piezoelectric material can placed some place like under the surface of the roadways where variable is present due to vehicles it can produce enough energy to power the streetlight power generation that is can produce energy in both day and night condition. In my research one piezoelectric disk can produce 2mJ so arrays of piezoelectric materials can produce enough energy which can light the street and stored in battery.

89. Atmospheric lifetime determination of CH_3OCH_2F (HFE-161)

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Keywords : *CH_3OCH_2F, Transition State Theory, Ab initio, Rate coefficients, Atmospheric lifetimes*

Rate coefficients for the reaction of the hydroxyl radical with CH_3OCH_2F (hfe-161) were computed using Transition State Theory(TST) coupled ab initio methods viz. MP2,G3MP2 and G3B3 theories in the temperature range of 200 and 400 K. Structures of the reactants in their Ground State (GS) and Transition State(TS) were optimized at MP2(FULL) and B3LYP level of theories. The potential energy surface was scanned at both the level of theories. Five different transition states were identified for each rotamur. Intrinsic Reaction Coordinates (IRC) calculations were performed to confirm the existence

of all the transition states. The kinetic parameters due to all different transition states care reported in this paper. The rate coefficients for the title reaction were computed to be $k=(9\pm1.08)*10^{-13}exp[-(17113\pm33)/T]$ cm^3 $molecule^{-1}S^{-1}$ at MP2 ,$k=(7.36\pm0.42)*10^{-13}exp[-(198\pm16)/T]cm^3molecule^{-1}S^{-1}$ at G3MP2 and $k==(5.36\pm1.57)*10^{-13}exp[-(412\pm81)/T]cm^3$ $molecule^{-1}S^{-1}$ at G3B3 theories. The atmospheric lifetimes of CH_3OCH_2Festimated at MP2,G3MP2 ,G3B3level of theories to be 20,0.1 and 0.3 years respectively.

90. Biosorption Using Rice husk For Enhanced Removal of Basic Dyes

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Keywords: *Malachite, Fuchsin, Freundlich and Langmuir Isotherm*

Batch sorption experiments were carried out for the removal of basic dyes (Methylene Blue, Malachite Green and basic fuchsin) from aqueous solutions using raw rice husk and NaOH treated rice husk based carbon as adsorbents. The operating variables studied were initial pH, initial dye concentrations and contact time at room temperature. The equilibrium data were fitted to both Freundlich and Langnuir Isotherm equations and the experimental data were found to be well represented by Langnuir Isotherm. The sorption kinetics was analyzed using pseudo first order and pseudo second order model. The coefficient of determination values suggests that the basic dyes uptake was found to follow pseudo second order kinetics. The rate constants, equilibrium uptake and the initial sorption rate were estimated at different initial dye concentrations. The sorption process was found to be control by both surface and port diffusion at the later stages. The intraparticle diffusion coefficient was found and analysis of sorption data using Boyd's plot confirms that external mass transfer is the rate –limiting step in the sorption process. The effective diffusion coefficient was found for the different initial dye concentration using the Boyd's constant.

91. Inland Water Transportation in India Scope & Challenges : A Comparative Study

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Inland Water Transportation(IWT) is a well proven cost effective and environment friendly mode of transportation . In ancient India , especially during British period , IWT was very much in use and was considered as an important mode of transportation . But during the post-independence period , during the country's growth IWT has been totally neglected which has led to its extinction in many regions and marginalization in other regions .Only during the last two decades , the Central Government realizing that IWT being very important to the country's growth , should be developed as one of the major means of Transportation besides roadways and railways .

Aim of this paper is to highlight the features of IWT , to present the facts and make a comparative study of IWT scope & challenges at international level . Advantages of IW mode of transportation , factors for slow growth & need for improvement right from policy making to ground level are to be discussed .

Authentic Data collected from various internet based websites of Ministry of Shipping, India , IWAI , INE , Hinduonline , annual reports of IWAI , reports of NTPC & CIL , reports of various Parliamentary committees , reports on Parliamentary question & answer sessions on IWT , reports of past studies conducted by some individuals/ organizations etc. was grouped and analyzed .

Analysis proves that inspite of wide spectra of opportunities in the IWT sector , the development of IWT sector , both in absolute as well as comparative terms has been taking place at extremely slow rate . Proper review of factors impeding the development of IWT as a whole is to be done at the current stage . The short term & long term goals are to be well defined & Central governments , State Governments and other Public and Private bodies have to coordinate towards achievement of the set goals .

92. Assessment of Techniques for Protein Structure Prediction

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Keywords: *Secondary structure prediction, Neural Network, Genomics, Proteomics.*

The origin of natural life which decides specific characteristics of each creature is protein. Protein prediction is a promising research trend in Biology and Medicine. The research concentrates on understanding and exploiting protein's functions. Bioinformatics was born to bring the successful and the strength from Information Technology to support these research works of Biology. Protein structure prediction is one of the main purposes of Bioinformatics, it aims to construct protein database in order to help biologists understand functions and meanings of proteins. This paper presents in general some common techniques used in the world for predicting protein structure. Some protein secondary structure prediction techniques will be focused – from early generation methods to third generation methods but the prediction accuracy is relatively less. A critical assessment of protein structure prediction techniques has been done through Dataset RS126. More research works and innovations will be needed in the future for increasing prediction accuracy.

93. Ethanol as Renewable Sustainable Auto Fuel

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Key Words : *Ethanol, Power Alcohol, OPEC, Petrol, Diesel, Characteristics of Fuels, C.D.M., Climate Change, Global Warming, Sustainable Developments*

Alcohol/Ethyl Alcohol is very versatile in mainly energy, chemical, medical and also in

other sectors. As a renewable energy source, its absolute necessity is seriously felt in Indian Economics as well as in the fresh context of emerging debate in the world between 'Food Security Versus Fuel Security' which is also entering into India.

After transferring invention of car to road, to cater to its auto fuel needs, Brazil had first conceptualized ethanol/power alcohol for transport in 1926 and passed Government Resolution in 1931 for it and started its use; thus set an ideal in world by adopting renewable energy in transport. After 'oil shock' from OPEC in 1973, constantly increasing petrol and diesel prices compelled us to opt for alternative, indigenous, renewable auto fuels like ethanol, biodiesel. So, on 10-12-01 Parliament passed its Bill to launch 5% ethanol-blended petrol in 1st phase from 1-1-03. Present Indian and World Ethanol Scenarios are discussed with shares of renewable sources, provoking the challenges to meet vast scope of ethanol ahead. Worldwide how legally ethanol-mixing has been made mandatory in petrol and diesel on the way gradually to reduce dependence on OPEC countries to countercheck their monopolistic business of crude oil and how they have launched long term massive programmes to encourage it, being renewable.

The entire presentation on Ethanol is segregated and proceeds right from the brief history; developments of gasohol; types of alcohol; World and Indian Ethanol Scenarios; large benefits of ethanol as auto fuel in the context of interfaces between Energy : Environment : Economics; raw materials; comparison between India and Brazil to learn from them; production technologies; ethanol in diesel : diesenol; biofuel policies; role of ethanol in environmental protection; and finally, sustainability of ethanol industry. The salient issues therein, will be explained in detail wherever necessary.

94. Analysis on Suppression of EMI on CUK Converters for Various Duty Cycle with Passive Snubbers

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This paper is about the study and analysis of effects of snubber circuits such as RLD, RCD and mixed (RLD+RCD) circuits over the conducted ELECTROMAGNETIC INTERFERENCE on power MOSFET. In this paper, for various duty cycles, suppression

of conducted EMI is done with the help of LISN circuit. The analysis is done for various duty cycles from 0.5 to 0.6 with a switching frequency of 50 KHz using ORCAD PSPICE software. The simulated results are then compared with respect to their duty cycle.

95. Ultrasonic Preservation of Foods

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Keywords: *Ultrasound, Preservation, Food*

Ultrasound is primarily associated with cell disruption or disintegration. During the disintegration very high temperatures (approx 5000 K) and pressures (approx.2,000 atm) are reached locally. The resulting shear forces break the cell envelope mechanically and improve material transfer. The utilization of ultrasonic cavitation for extraction and food preservation is a new powerful processing technology that cannot be applied safely and environmentally friendly but also efficiently and economically. The homogenizing and preserving effect can be easily used for fruit juices and purees (e.g. orange) as well as for vegetable sauces like tomato sauce or asparagus soup.

96. A Technique to Implement ICT in Science Education

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Keywords: *ICT, Emerging Technologies, Key Challenges, Integrating ICTs in Education*

ICT has great potential for enhancing teaching and learning outcomes. The realization of this potential depends much on how the teacher uses the technology. The new digital ICTs are not single technologies but combinations of hardware, software, media, and delivery

systems. There is a need of exploring ICT Trends in Education, Trends in Educational Technology, Key Emerging Technologies, Issues in Teacher Training, The uses and issues in the use of ICTs in Education, Key challenges in integrating ICTs in Education. This paper addresses the above mentioned issues and Implications of the trends, in terms of prospects for the future.

97. Low Cost Industrial Waste Water Treatment Technique Using Constructed Wetland

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Key words: *Constructed Wetland, Industrial Wastewater treatment, Organic impurities.*

Water and wastewater treatment facilities for metropolitan areas are mainly 'concrete and steel' constructions, leading to high treatment costs for conventional treatment processes. Semi-urban and rural areas cannot afford such high costs and therefore they normally just dump the wastewaters after minimal treatment, leading to pollution of surface and groundwater bodies. The search for cost effective and environmentally sound ways to control water pollution has led to renewed interest in constructed wetlands. Many small communities abroad are finding it easier and less expensive to go in for wastewater treatment through constructed wetlands, and research on the treatment process is also fast increasing. The constructed wetland consists of a basin or channel with a barrier to prevent seepage. The bed is filled with a suitable depth of porous media. The media also supports the root structure of vegetation. Thus a constructed wetland is made to mimic the function of a natural wetland, and which is allowed to mature naturally over a number of days. A preliminary study was done on a pilot-scale constructed wetland planted with Typha species to treat industrial wastewater at SRM University. The results show good reduction in the organic impurities. The advantage of this system is that it can be used where some land is available, and blends with nature. Even a small-scale treatment system will be enough to prevent the contamination of the natural water sources.

98. Automated Tram System(ATS)

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The Automated Tram System (ATS) is an attempt to facilitate movement for general people in a township or a campus with large areas in a much more simple, modern and effective way, which is not only economical but also is eco-friendly (free from pollution) and is independent from the usage of fuel energy (non-conventional sources) as is operated by electrical energy.

Automated Tram System comprises of electrically driven small tram cars moving on a specified rail/track which are intelligibly employed with sensors for a fully effective automated operations.

99. Quality Aspect for VOD of Small Columns of Explosive Charge

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Explosives, only a few percent, is being used for research and space application purpose. It is self sustained and speed of reaction. Mainly two indicators are measured for the performance of explosives, they are: Detonation velocity and pressure. VOD is a function of the explosive configuration, charge diameter and confinement. Charge diameter and confinement are generic environment variables for any given blast. Unconfined velocities are often approximately 70 to 80 percent of confined velocities. Explosive velocity is increased with smaller particle size, increased charge diameter, and increased confinement. This paper brings out a comparison of VOD measured by various methods. Experiments data were obtained for detonation of small columns of PETN for finding out the velocity of detonation of explosive. It is obvious that a large positive heat of formation of the explosive favours a high Temperature. Another important property of an energetic material

is its density. Based on a number on results it was seen that for a constant length there was no deflagration from a charge density of 0.7gm/cc to 1.45. Here the velocity of detonation of boosters are taken into consideration. The detonation velocity in cylindrical charge decreases with decreasing diameter because of radial expansion and loss of energy. When the diameter approaches infinity it is termed as ideal detonation velocity. This decreases with decreasing initial density (†) and the velocity reaches maximum when the density equals the crystal density. The equation in circular shape given by Friedrich (1933) as:

$$D = 2.8 + 2.8 \quad (\dagger) \wedge 1.3 \qquad 1$$

Where D is velocity of detonation in Km/Sec. † is the density in gm/cc.. From the above equation we will get D = 6.5Km/sec. So theoretically this velocity is required for a density loading of 1.25gm/cc to have a stable detonation. The VOD of PETN at various densities 0.25, 0.50, 1.00, 1.77 are 2.83, 3.60, 5.48, 8.30.So from the equation of Friedrich we can compare the velocity for the corresponding densities. With minor variation the results of both methods are nearly same.

100. Ethics in Engineering Pertaining to Educational Research

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Keywords: *IEEE Code of Ethics, Educational Research, Space Shuttle Challenger disaster, IEEE Code of Ethics, TQM.*

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, integrity, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.It is argued that, as society becomes increasingly dependent on technology, it is more and more incumbent on the masters of technology to assume the

responsibility for protecting the public from technology gone awry. It is pointed out that a comparison of the actual events of the Space Shuttle Challenger disaster with the IEEE Code of Ethics reveals that this Code is not widely implemented in the engineering workplace. It is further noted that, although the TQM (total quality management) movement helps by creating a corporate atmosphere of openness, it is up to the engineering schools to empower their graduates with the skills and the determination to live up to the IEEE Code of Ethics. Some proposals for engineering ethics education, including (1) establishing an engineering oath modeled on the Hippocratic oath and (2) increasing requirements for courses in ethical engineering and effective communications, and provide on-the-job training for practicing engineers. Contemporary approaches to educational research have come under attack from the more conventional schools of research on the grounds that their methodology and approach to research inherently contravenes some of the basic and fundamental principles of ethics. Hence, it is important to look specifically at these nuances of approach within the field of educational research.

101. Experimental Investigation on Unattended Methyl Ester of Cashew Shell Oil as Fuel in Direct Injection Diesel Engine

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Keywords : *MECSO, DIESEL ENGINE, BIODEIESEL*

Efforts are under way in many countries, including India, to search for suitable alternative to diesel fuels that are environment friendly. The need to search for those fuels arises mainly from the standpoint of preserving the global environment and the concern about long term supplies of conventional hydrocarbon based diesel fuels. In this work viscous vegetable oil from cashew shell had been tested for feasibility as engine fuel. The oil was transesterified with Methyl Alcohol and various blends of Methyl Esters of Cashew Shell Oil (MECSO) were prepared. The blends were tested in a conventional Direct Injection Diesel Engine without any modification on the engine part. The performance, combustion and emission characteristics had been studied. The MECSO developed up to 96% of indicated power that of diesel. The Brake Thermal Efficiency drooped by 6 % with increase in Specific Fuel Consumption. The power output of the engine decreased with the increase in percentage of in the blend. The peak combustion pressure was slightly higher than diesel.

102. Brain Chip- "Boon to paralyzed patients"

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New technology will soon allow paralyzed patients to operate bionic limbs with the aid of implanted brain transmitters. The technology relies on tiny microprocessors that will sense nerve impulses, decode the signals, and then transmit them to the bionic limbs. All this takes place wirelessly, which makes this technology unique.

Spinal cord injuries cause paralysis by cutting off connection between the brain and limbs. However, such patients still posses the ability to "think" commands from the brain, The guy can see the object he wants to reach, the guy can have the intention to reach to the object, the brain can send a command to the arm but is unable to move his limbs. If we can get the signals from these neurous and interpret them with what is called decoding algorithms, then we can move a robot device placed on the paralyzed arm.

In fact, the zenith of the technology will be to provide an artificial link between the limb and the brain, bypassing the damaged nerves (or centers) that are causing the paralysis. A possible way to do this would be by transmitting signals from the brain implant to another implant, a simulator in the spinal cord.

103. Generation of electricity from the sewage

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Technology has been developed. Unusual has become usual, many advantages and many disadvantages.

Really to be viewed. With more concern on our country we are here to save our country in a way of "USING SEWAGE TO PRODUCE POWER". Seriously entering into the population strength, reusable has to be used repeatedly.

104. Interactions between cationic gemini/conventional surfactants with hydroxypropylmethyl cellulose

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Cellulose ether derivatives are water-soluble uncharged polymers that interact with cationic surfactants in solution resulting in special surface properties to the system. The purpose of this study was to investigate the interaction between a nonionic polymer, hydroxypropyl methylcellulose (HPMC) and cationic Gemini surfactants, bis (hexadecyldimethylammonium) hexane dibromide (16-6-16), bis (hexadecyldimethylammonium) pentane dibromide (16-5-16) and their corresponding monomeric counterpart cetryltrimethylammonium bromide (CTAB) by using conductivity technique. The conductivity runs were carried out at different weight percentages of HPMC and at temperatures ranging from 25°C to 40°C. The critical aggregation concentration, cac, and critical micelle concentration, cmc, values are less for Gemini surfactants which indicate that the Gemini surfactants interact strongly with HPMC as compared to conventional surfactant CTAB. The results also reveal that the Gemini surfactant with longer spacer interacts weakly as compared to the surfactant with shorter spacer. The free energies associated with aggregation, $\ddot{A}G_{agg}$, micellization, $\ddot{A}G_{mic,}$ and transfer, $\ddot{A}G_{t}$ associated with the binding interaction between surfactant and polymer, have also been evaluated. The negative values of $\ddot{A}G_{t}$ confirm the feasibility of interaction between the surfactant and polymer. As the polymer concentration increases, the cac increases, however,

not much, this shows weak interaction between the polymer and surfactant. Increasing the temperature results in the increase of both cac and cmc values.

105. Simplified Approach to Compute Reliability for Mobile Ad-hoc Network

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Keywords: *MANET, Mobility, Node survivability, Qualifying Subset (QSS).*

Communication reliability is an important parameter for improving the quality of communications in wired/wireless network. Present paper is related with reliability evaluation of two terminal mobile wireless ad hoc network (2T-MWANET). A mobile ad hoc network (MANET), sometimes called a mobile mesh network, is a self-configuring network of mobile devices connected by wireless links. Each device in a MANET is free to move independently in any direction. This movement may leads to the frequent disconnection of the links involved in the communication between source and destination. Therefore, computation of communication reliability in mobile environment is more challenging in comparison to the wired networks. So far a scattered literature is available on this topic. Due to dynamic nature of nodes joining network and their failures, reliability computations methodology should adapt itself for the changing conditions. We are enhancing the performance of existing work on reliability computation proposed by J. L. Cook et. al. in 2007. In this paper, we propose a computationally faster and efficient method to compute two-terminal reliability with the help of qualifying subset (QSS) concept. Our method considers both the probability of disconnection due to mobility and node survivability.

106. An E-Laboratory Framework for the Motion Control of Stepper Motor

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Keywords : *E-Lab., Stepper Motor, Motion Control, PID Controller.*

With the complexity and interdisciplinary nature of emerging engineering designs and solutions, it is vital that groups working in academics as well as in industry may share information at a rapid pace. The rapid growth of global internet connectivity, coupled with the improved security norms and standards, gives us a powerful tool to achieve our goals. This paper presents a remote experiment for controlling a stepper motor using *Simulink.* In this work, a laboratory of remote access is proposed to perform experiments using the Internet. A remote controlled stepper-motor has been developed for the control studies. This system is able to solve the time and spatial limitations of laboratories that rely on real physical systems used in control courses. In the proposed framework PID(proportional–integral–derivative controller) algorithm along with signal generator programmed in Matlab/ Simulink environment. A remote user can test stepper motor for its various parameters. In this work we report the core use of stepper motors in remote laboratories which will be controlled by PID controller programmed in simulink. A software program has been developed in Matlab using simulink which provides suitable visualization possibilities for user interface and also provides a simple way for network connections programming. Through this system users can remotely observe how a PID controller works on a stepper motor.

107. A Strategy for Reducing Delays in a Networked Control System

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Keywords : *Time Delay, Stability, MAC Layer, Real-Time, NCS.*

Recent researches have made it possible to implement the concepts of control via communication networks. As a result of this new trend Networked Control System (NCS) has emerged as a popular research domain. This paper discusses the effect of delays on the performance and stability of the Networked Control System. Mostly, all types of delays are undesirable and degrade the performance of the system. Ultimately these delays make the system unstable. In this paper a comparative study of two popular technologies i.e. devicenet, firewire has been made. It has been observed that both of these are not suitable for the strict real-time applications. Our approach proposed is based on controlling the traffic rate at the MAC layer that gives a better solution for delay. Results show that this approach is able to improve the delay performance and also enhances the stability of networked control system.

108. Comparison of rapid moulding solution for plastic components

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Keywords *: Plastic components, rapid moulding, dimensional accuracy, hardness*

Rapid prototyping (RPT) is being widely used as rapid moulding (RM) solutions. The aim of the present investigations is to compare two RM solutions namely polyjet printing

and silicon moulding for plastic components. The comparison has been made on the basis of dimensional accuracy (as per IT grades), mechanical properties (namely surface hardness, surface roughness) and production cost. The comparison of experimental results will serve as yard stick for future selection of process for industrial applications.

109. Clean fuel from Family Size Biogas plants

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Biogas is a clean biofuel produced by microorganisms or bacteria during anaerobic digestion of organic matter (like cattle dung, poultry droppings, pig excreta, human excreta etc.). The biogas produced is rich in methane (55-65 %) and can be used directly for heating purposes, cooking, lighting or power generation. The anaerobic digestion produces biogas on renewable basis, eliminates foul smell and reduces harmful bacteria of organic wastes, improves nitrogen and phosphate content of resulting slurry to yield highly enriched fertilizers. India has potential of more than 12 million family size biogas plants. More than 30 % of this potential has already been exploited. The present paper discusses about advantages of biogas and family size biogas plants along with the approximate cost and economics of various capacity deenbandhu biogas plant. It also discusses about the requirement of daily feedstock for biogas plants of different capacity along with the number of cattle required for this purpose. The programme of Ministry of New and Renewable Energy, Government of India of providing incentive to the farmers for the installation of biogas plants has also been discussed.

110. Surface Alloying with Tungsten and Carbon using Electrical Discharge Machining process

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Keywords : Electrical Discharge Machining, Powder-mixed EDM, Tungsten Powder, AISI D2 die steel, Surface alloying

Electrical Discharge Machining (EDM) process is extensively used in tool and die making industry for accurate machining of internal profiles in hardened materials. Although it is essentially a material removal process, efforts have been made in the recent past to use it as a surface treatment method and / or an additive process. Eroding tool electrode or fine powders suspended in the dielectric medium may contribute alloying elements to the workpiece surface. This paper investigates the surface modification of AISI D2 die steel by electrical discharge machining with tungsten powder-mixed dielectric using L9 orthogonal array of Taguchi experimental design. Results show improvement in micro-hardness by as much as 116%. Scanning Electron Microscopy (SEM) and X-ray Diffraction (XRD) analysis of the machined surfaces show transfer of tungsten and carbon in the form of a double carbide (Fe_6W_6C) and tungsten carbide (WC). Chemical composition of the machined surface has been further checked on an optical emission spectrometer to verify the results.

111. Interaction between Cationic Gemini Surfactants/Conventional Surfactants with Hydroxypropylmethyl Cellulose by Specific Conductivity

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The purpose of this study was to investigate the interaction between a nonionic polymer,

hydroxypropyl methylcellulose (HPMC) and cationic gemini surfactants, bis(hexadecyldimethylammonium)hexane dibromide (16-6-16), bis (hexadecyldimethylammonium) pentane dibromide (16-5-16) and their corresponding monomeric counterpart cetryltrimethylammonium bromide (CTAB) by using conductivity technique. The critical aggregation concentration, cac, and critical micelle concentration, cmc, values are less for gemini surfactants which indicate that the gemini surfactants interact strongly with HPMC as compared to conventional surfactant CTAB. The results also reveal that the gemini surfactant with shorter spacer interacts weakly as compared to the surfactant with longer spacer. The free energies associated with aggregation, $\ddot{A}G_{agg}$, micellization, $\ddot{A}G_{mic,}$ and transfer, $\ddot{A}G_{t}$ associated with the binding interaction between surfactant and polymer, have also been evaluated. The negative values of $\ddot{A}G_{t}$ confirm the feasibility of interaction between the surfactant and polymer. As the polymer concentration increases, the cac increases, however, not much, this shows weak interaction between the polymer and surfactant.

112. Amphibian Robot

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Key words: *Robotics, amphibian robots, remote controlled devices based on radio frequency*

Our robot “AMPHIBIAN ROBOT” is a versatile device which has been totally automatically controlled by a wireless system (in this case it is remote control) from a distant control area. Its mechanical structure is very flexible, robust and simple but its applications are far more superior, it’s a perfect machine because mechanical and electronic functions of this robot are almost equal. This is having the feature of amphibians that it can rollover surfaces as well as float on water surface. This is a kind of autonomous under water robot.

To make our robo functioning a signal is send to the rf receiver on the robo from any distance through radio frequency transmitter ,receiver on the robo receive the signals and by this signal it makes the direction of robo according to the signal received.

Our robo works efficiently in the areas where human's interventions are hazardous or impossible. For examples nuclear blast areas, chemical tunnels inspections, in inspecting monumental narrow areas, warfronts etc, where we cannot distract the monumental parts to make a way.

113. Computer Forensic Authentic Technology for Examination of Counterfeit Currency (Indian Bank Notes) Prepared by Scanning & Printing

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Key words: *Counterfeit, Genuine, Authentic technology, EnCase Version 5, Hard Disk, RBI Specifications.*

In the modern era of science and technology, the access to high quality and relatively inexpensive electronic devices like computers, multimedia devices, laser and electronic colour copiers, scanners, printers and digital image software has been increased. With the advent of these new technologies, counterfeiting is being carried out more efficiently and its detection has become difficult. In recent past it has been observed the cases of Counterfeiting of Indian currency of Rs 100/-, 500/-and 1000/- are mostly produced by counterfeiters with the help of computer, high quality scanners and printers. These cases seized by police, security features examined in the lab to ascertain the counterfeiting. The circulation of counterfeit currency is generally two types, one is being made with genuine currency paper and printing ink and another one is scanned genuine currency with high quality scanners, printers and digital image software. However, authors have successfully tried a new approach for the identification and preparation of counterfeit currency of Rs. 100/-,1000/-by using EnCase Version 5 software through Fast Bloc Write Blocker in Window XP Operating System, forensically imaged Hard Disk removed from counterfeiter's computer.

114. Space vector PWM for unbalance voltage disturbances Including Operation Over modulation Range

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Keywords: *Modulation index, Multilevel inverter, Over modulation, Space Vector pulse width modulation (SVPWM), FPGA*

Space vector modulation (SVM) is one of the most popular PWM techniques used in multilevel inverters. The calculation of reference vector location is very important for SVM technique to obtain exact switching times and to determine correct space vectors. Balanced/unbalanced voltage disturbance occurred in a three-phase system affects the switching times and output voltage of the multilevel inverter. In this study, effects of the disturbances such as line–line faults, balanced and unbalanced voltage sags/swells to SVM technique are investigated and a new technique derived from Clarke transformation is proposed. The effects of disturbances are minimized with this new method. This paper proposes a SVPWM based scheme to perform over modulation for a multilevel inverter, and its implementation. The position of the vector is identified using an integer parameter, called a triangle number. The switching sequences are mapped with respect to the triangle number. The on-times calculation's based on on-time calculation for two-level SVPWM. The on-time calculation equations do not change with the triangle. A simple method of calculating on-times in the over modulation range is used, hence, a solution to complex equations and lookup tables are not required. This leads to ease of implementation. There are no significant changes in computation with the increase in level. The proposed implementation is general in nature and can be applied to a variety of modulation schemes. The implementation is shown for a five-level and seven-level cascaded inverter. The proposed method implemented FPGA and tested the results.

115. Study of Linear Gap-coupled Circular Microstrip Antennas

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An analysis of resonant frequencies of linear gap-coupled circular microstrip antennas is presented in this paper. The central patch is loaded by a 50 ohm line and the adjacent patches are parasitic patches. The frequency characteristics of the input impedance of the three gap-coupled circular microstrip patch antennas with the gap-distance between the feed patch and parasitic patches is simulated. The effect of feed point location in the feed patch on the input impedance of proposed antenna is also studied and analyzed.

116. Wind Power Generation Control by Doubly Fed Induction Generator: A Novel Energy Model for Kerala State

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In the World, Wind power is the fastest growing energy sources. There are many thousands of wind turbines operating, with a total capacity 94,123 MW of which India account for 8000 MW with an annual growth of 27%. In recent years Wind energy technology has experienced important improvements due to increased penetration of wind power into electricity grid.

Wind energy conversion systems become a focal point in the research of renewable energy sources. Most of the existing large systems are built or planned to run at constant speed in synchronization with a utility grid. The transition from fixed speed to variable speed wind turbines has been a significant improvement in this technology. Doubly fed induction generator wind turbines are largely developed due to their variable speed feature. The response of wind turbine to grid disturbance is an important issue; especially since the rated power of the wind turbine is increases therefore it is important to study the effect of grid disturbances on the wind turbine.

Under the present research work a novel energy model has been developed for the development of Kerala State in long term planning of Energy Management and issues.

117. Design of a Low Cost Domestic Cold Storage Model without using Electrical and Mechanical power

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Keywords : *Cold storage, food preservation, electricity, mechanical power, rural areas.*

Cold storages form the most important element for proper storage of fruits and vegetables. As India is now looking forward for the storage of food grains for future, it has become necessary that cold storages are to be constructed in major producing as well as consuming centers to achieve this target. This work is taken up with an objective to design a low cost domestic cold storage without using electricity or mechanical power which is suitable for rural areas. The operating cost of the proposed model is low and it can be use for food preservation in rural areas without electricity supply.

118. Development of Heterogeneous Catalyst for Biodiesel Production- a review

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Keywords : *Heterogeneous catalysts, transesterification, biodiesel*

Development of new and effective catalysts (solid acid base to immobilized enzyme) is necessary for the production of biodiesel via transesterification. Heterogeneous catalysts

in this respect have gained importance for the transesterification reaction of vegetable oils to produce biodiesel. Unlike homogeneous catalysts, heterogeneous catalysts are environmentally benign and could be operated in continuous processes. Moreover they can be reused and regenerated. Because of these reasons the recent research in biodiesel has shifted to the development of new types of catalysts which are heterogeneous in nature. In this paper, we have summarized the recent advanced in the various types of heterogeneous solid catalysts and the specific research outcomes of transesterification by employing them.

119. Blending Effect of Terminalia belerica biodiesel with basic properties of mineral diesel

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Keywords: *Biodiesel, fatty acid profile, oxidation stability, EN14214*

Terminalia (Terminalia belerica Robx.) is a tree available in northeastern region of India. Terminalia belerica is one of such oilseed which yield about 43% of oil by weight of its kernel. The fatty acid profile shows that about 39.5% oil is saturated and 60.5% is unsaturated. Alkaline transesterification was the most suitable process to convert the oil into fatty acid methyl ester. All the properties of fatty acid methyl ester were tested and found that almost all the properties conform to the existing standards. Fiver blends viz 5%, 10%, 20%, 30%, and 40% were prepared with mineral diesel obtained from Numaligarh refinery and the properties were being evaluated. According to EN14214, the oxidation stability of pure biodiesel sample should be 6 hrs. Oxidation stability of terminalia biodiesel along with the different blends was also studied. The study reveals that the problem of oxidation stability can be minimized in blending with mineral diesel.

120. Durability Studies of High Strength Metakaolin Concrete

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Cement concrete is most widely used material for various constructions and even in severe environmental conditions. To meet the stringent and demanding specifications such as limitations on water cement ratio for structures, admixtures have assumed a major importance in the construction activity in recent years. Though, admixtures date back to 1930, there seems to be then on and presently many researches are making an attempt to understand these materials. However, from the past literature, it can be noted that the information available on the behavior of high strength concrete using Metakaolin as mineral admixture is very limited, particularly regarding the durability aspects. As a part of my research work an attempt is made to study the strength and durability of Metakaolin blended high strength concrete when it is exposed to acid attack.

Metakaolin is a thermally structured, ultra fine pozzolana, which replaces industrial by-products such as silica fume, fly ash etc. This paper presents experimental investigations carried out to evaluate the strength and the durability in terms of chemical resistance for super plasticized concrete of M50 grade containing high reactivity metakaolin by partial replacement of cement. Water to cementitious material ratio used is 0.33. The optimized dosage of super plasticizer is noticed as 1.0% by weight of binding material. In this Investigation, an attempt is made with acids like H_2SO_4 and HCL. Acid attack is studies for a period of 30, 60, and 90 days. The results show that the percentage weight loss strength is reduced and in the case of metakaolin concrete when compared to normal concrete. Also the percentage weight loss and loss in compressive strength is minimal when the concrete is exposed to HCL attack.

121. An Efficient Reversible Logic Based Design of Low Power and High Speed Digital FIR Filter

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Keywords: *Fredkin gate, online testing, reversible logic, Toffoli gate, Feynman gate, NG, CTSG.*

Reversible logic is emerging as a promising computing paradigm having its applications in low power VLSI design. Most gates used in digital design are not reversible. For example the AND, OR and E-XOR gates do not perform reversible operations. Of the commonly used gates, only the NOT gate is reversible. A set of reversible gates are needed to design reversible circuits. Several such gates have been proposed over the past decades. Among them are the proposed by Feynman, Toffoli, and Fredkin[4] Gates, a new 4-input and 4 - output(4*4) reversible gate named 'NG' (New Gate) is proposed which is suitable for reversible logic circuits. NG can also work singly as a reversible full adder with a bare minimum of two garbage outputs. NG is shown better than the recently proposed R1 gate in terms of computation complexity. The proposed reversible gate is combined with the existing 4*4 Feynman gate to design online testable reversible adders, multipliers, D flip flop and digital FIR filters .The FIR filter design using testable reversible circuits proposed are shown to be better than the conventional designs with 10% reduced delay and 37% improvement in power.

122. Acrylamide Formation in Food during Thermal Processing

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The neurotoxic and carcinogenic compound, acrylamide found in heat processed food is mainly formed from an amino acid, asparagines and a reducing sugar through Maillard

reactions. Higher temperature, low moisture conditions and frying time play a major role in its formation. Fried potato products, French fries, ready to eat breakfast cereals, baked foods and roasted coffee contribute most to acrylamide exposure. There are many harmful effects of acrylamide. It cause damage to nervous system in human and animals and is considered a reproductive toxin with mutagenic and carcinogenic properties in experimental mammalian in vitro and in vivo system..The acrylamide formation can be reduced by various methods as By addition of acids, lowering the pH, in the presence of cation, microwave heating.

123. Finite Element Analysis of Deformation Behavior of an Articular Cartilage Due to Creep and Stress Relaxation

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Keywords: *Articular Cartilage, Finite element Analysis, Creep and Stress relaxation*

Articular cartilage is a viscoelastic, soft, semitransparent tissue with an opalescent bluish tint, overlying the articulating bony surfaces in diarthrodial joints. It consists of collagen fibrils and proteoglycan (PG) aggregate molecules as well as an interstitial fluid. The primary mechanical function of articular cartilage is to transmit loads across diarthrodial joints while maintaining low friction and wear. It functions as the bearing material of synovial joints providing very low friction and wear.

The elastic properties like Young's modulus and visco elastic properties such as Stress relaxation modulus and creep compliance of an articular cartilage play a key role in

determining its ability to bear and transmit the loads. Mechanical testing methods such as shear, tension and compression tests can be used for characterization of Cartilage, but the indentation testing is commonly used to deduce material properties like Young's modulus and Poisson's ratio. In the present paper, the deformation behavior of an Articular Cartilage due to creep and stress relaxation have been analyzed by Finite Element Method. The results have been compared with experimental and analytical results and validated.

124. Intelligent Buildings- Concept & Reality

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Keywords: *Heat transfer, Conduction, Convection, Radiation, Management Systems*

Intelligent buildings are dwellings data which are a product of late 20th century. Intelligent buildings provide a productive cost environment through the optimization of four basic elements viz. systems, structures, services and management. Intelligent buildings facilitate change during the life time of the structure. These provide a responsive, effective and supportive environment within which the organization can achieve its objectives. Generally the buildings are designed to employ and coordinate process controls/ communications to the best advantage in order to make the best utilization of resources and facilities available. In this paper the various attributes of intelligent buildings along with building management systems are discussed. Some examples of prominent intelligent buildings constructed are also highlighted.

125. Development of a PLC based Process control system for Jute Industry

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In Jute Industries and other related fields, it is often required to control the speed of the processing machineries like, drawing spinning, weaving, etc. especially for processing of value added and blending products. Moreover it is also required to run the machines sequentially in a time delay mode, also known as soft start mode.

Such a complete control system has been developed and is being used in the pilot plant of NIRJAFT, where the computer control arrangements has been provided to control the complete process of the system by changing the system parameters through suitable programming.

In the physical centre of the load points there is PLC installed from where control terminals has been provided to the respective vector drive units which in turn drives the prime mover of the processing machines.

The system runs in two modes, viz. stand alone mode and programming mode. In standalone mode the machines run at their pre-defined speeds separately. In programming mode, the speed of each machine and their delay timings can be set as follows:

$N_1 \times T_1 + N_2 \times T_2 + N_3 \times T_{3.....} + N_{10} \times T_{10}$ where N_1, N_2, N_3 etc are the desirable speeds in R.P.M. of the machine for the time period T_1, T_2, T_3 minutes respectively.

Arrangements have also been made to provide the inter machines delay time like:

$M_1 \times R_1 + D_1 + M_2 \times R_2 + D_2 + M_3 \times R_3 + D_3 + ...+ M_{10} \times R_{10}$ where, M_1, M_2, M_3 etc are the machine gross run times and D_1, D_2, D_3 etc. are the inter machine delay times.

Though this system has been especially developed for the production of different value added products and blended products of jute with coir and other natural or manmade fibres, it can also be used in other industries with minor changes in system parameters.

It is observed that:

- It reduces the down time of the machines commonly caused due to change of pulleys and other gadgets.
- It reduces the power consumption of the system as the non active machines will remain off for the defined time spans.
- With the use of this system it is possible to produce better quality of final products through the automatic required speed control of the machines.
- It will benefit the industries by reducing techno-managerial cost and will provide cost effective solution.
- Less wear and tear of the system.

126. The Space Elevator – India's Next Leap to Space

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Keywords : *Space Elevators, Tether, Geo Stationary Orbit, carbon nanotubes, Climber, Laser beaming*

The present method to access space is with the help of rockets which use chemical propellants. The efficiency of expendable rockets is low and 94% of the mass of the rocket is the infrastructure to carry the payload. This 94% of the rocket is also not available for the next launch.

The concept of tethers and space elevators may provide a much more efficient way to reach space. Development work towards realisation of Space elevator has progressed well around the world.

Space elevator consists of a cable from an anchor in the ground to a counter weight located beyond geostationary orbit (GEO) ie., 35,786 km. A climber will move up on a

tether between Earth and Space. The space elevator would be utilized as a transportation and utility system for moving people, payloads, power, and gases between the surface of the Earth and space. The cost of launching to GEO would be reduced to less than US $ 250 / kg from the present US $ 40,000 / kg.

A tall building on earth would be the anchor, from which a tether made of Carbon nanotube composite fabric would extend to about 50, 000 km. A climber, which is powered using laser beaming of energy, can travel over this tether. The payloads can be transported using these climbers to the Geostationary orbit. Development in the area of material like carbon nanotube tethers, climber, and technologies like power beaming for the climber etc have been extensively researched around the world.

This paper is a brief review of the developmental status in this area and aims at acting as a stimulant for Indian space agency, Industries and Universities to make a start towards realisation of materials and technology for the tethers and space elevator.

127. ANUSAT : 18 months of on Orbit Performance and Operation

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Keywords: *Microsatellite, Small Satellite, University Satellite*

This paper discusses, very briefly, the design and operational aspects of ANUSAT. This is the first microsatellite from an Indian University, and is designed, built and operated by the students and faculty of Anna university, Chennai. Over the last one and half years of “on orbit operation”, the performance of mechanical, power, onboard RF, control, telemetry, telecommand and ground systems have all been as per design and predictions. A brief outline of the system design, the “on orbit” performance along with the shortcomings, and the future possibilities opened up by the ANUSAT microsatellite mission are provided in this paper.

128. DFIG Wind Energy System (WES) and Photovoltaic (PV) Solar Farm as FACTS Device for Voltage Regulation

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Index Terms— *Distributed generation, Photovoltaic, Solar farm, voltage-source inverters (VSI), Doubly-fed induction generator, Voltage regulation*

This paper presents the concept of utilizing photovoltaic(PV) solar farm (SF) as flexible ac transmission system controller, for voltage regulation at the point of common coupling during night time when the SF is not producing any active power. The proposed control will enhance connections of WES to the remote grids.MATLAB/Simulink based simulation results are presented for validation of the system.

129. Design of Ant Colony Based MEB Trees

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Keywords: *Minimum Energy Broadcast (MEB), Ant Colony Optimization (ACO), Omicron ACO (OA), Broadcast Incremental Power (BIP), Max-Min Ant System (MMAS).*

Wireless networks have attracted significant attention due to their potential applications in numerous domains. A wireless network consists of numerous devices that are equipped with processing, storage memory and wireless communication capabilities, and are linked via short-range ad hoc radio connections. The energy consumption is optimized by exploiting the broadcast nature of radio transmission. It requires no pre installed infrastructure. Supported by multi-hop transmissions in which intermediate nodes relay packets between the communicating nodes, it is required for all broadcast communication. The use of batteries

limits the power of each node. Energy efficiency thus is an important design consideration for these networks.The broadcast communication method is an important mechanism to communicate information in all-wireless networks. A broadcast mechanism is required bay many routing protocols in order to update their states and simultaneously maintaining the routes between the concerned nodes. Minimum Energy Broadcast trees are aimed at minimizing the consumption of power to the connected nodes in a network in data communication. This paper is focused at designing a Minimum Energy Broadcast tree rooted at the source node. This is achieved by applying Omicron Ant Colony Optimization algorithm. A broadcast spanning tree is constructed which is rooted at the source node and spans all nodes in a way such that the sum of transmission powers at non-leaf nodes is minimized, for every new broadcast session. A comparison is made between the proposed model and the already existing MMAS model. Power consumption is an area where the conjectured model provides better results.

130 Energy Harvesting Issues For Sustainable Wireless Sensor Networks Used For Structural Health Monitoring

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Keywords: *Piezo Electric Energy Harvestors, Conversion Electronics, Power Management, Transducer Efficiency, Wireless Sensing Nodes, Low Power Applications*

There have been increasing research focuses in recent years on powering the wireless sensor networks. Wireless sensor networks have considerable potential in areas ranging from building monitoring to environment control. Design and developments of wireless sensing nodes compatible with energy harvesting systems are of significance in the present scenario of structural health monitoring of deteriorating infrastructure and hence the protection of them. Advances in low power Very Large Scale Integration (VLSI) design along with the low duty cycles of wireless sensors have reduced power requirements in

terms of tens to hundreds of microwatts. Such low power dissipation opens up the possibility of powering the sensor nodes by energy harvesting solutions and extending the lifetime indefinitely. The collection/conversion electronics, energy storage, and energy delivery functions of the solution are all significant to the performance and longevity of the application. The paper talks about the issues prevalent in this area along with recent developments and discusses the trend including possible future developments.

131. Strong Motion Earthquakes And Sustainability Of Urban Infrastructure

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Keywords: *Sustainability, Ground Motion, Near Source Effects, Earthquake Spectrum, Intensity Of Earthquake, Urban Infrastructure*

The recent scenario of increased seismic activity around the world can justify the creation of sustainable built environment around us. Earthquakes continue to result in vast loss of life and damage to property especially in populated urban areas like the happenings in cities of Japan, China, Haiti etc. Urban infrastructure constitutes bridges, water retaining structures and other life line facilities which are vital organs of the many interlinked systems during natural hazards. Quantitative evaluation of ground motion severity is required for sustainable infra structure development towards seismic safety. The seismic performance of a structure may be significantly affected by the energy or duration of ground motion in addition to the response spectral characteristics of the ground motion. A study has been conducted on an ensemble of near fault earthquakes and the significant parameters like energy content, significant duration, etc. have been calculated. Analytical investigation on a typical infrastructural facility has been carried out to assess the performance of the system.

132. Continuously Variable Transmission

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India is an agricultural country with a large population and technology has a major role to play in its agricultural practices, from seed production to harvesting using mechanized harvesters. All these machines are mechanically powered using fuel, primarily by internal combustion engines. The speed and torque variations are effected using conventional gear trains, frequently causing the internal combustion engines to deviate from the optimal working conditions thus decreasing their fuel efficiency and increasing the specific fuel consumption. To increase the engine efficiency and to achieve infinitely variable transmission, Pulley Type Continuously Variable Transmission can be incorporated in the tractors and harvesters, eliminating the need for gears and gear boxes in the power train of the equipments, causing any desired speed change steplessly. A simple arrangement of two variable diameter pulleys connected by one angular contact Vari-speed Elastomer belt can be attached to the drive shaft, the pulleys being actuated by stepper motors and/or clutch based hydraulic control systems. This changeover would cause major savings in fuel and economy by running the engine at its efficient speed and driving at any desired speed by step-less variations. This technology also has the potential for being introduced in heavy duty machine tools, where frequent change in the spindle speed is required, eliminating the need for gearboxes. They can also be incorporated in scooters and cars, thus improving the fuel efficiency, drive comfort through jerk-less operation, in the cities and even in the mountainous regions.

98th Indian Science Congress

January 3-7, 2011, Chennai

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LIST OF

PAST SECTIONAL PRESIDENTS

PAST SECTIONAL PRESIDENTS

Engineering Sciences

G. S. Mukherjee	(2010)
N. B. Basu	(2009)
Gurdip Singh	(2008)
Sujit Kumar Mitra	(2007)
V.K.Mathur	(2006)
Tara Singh Kamal	(2005)
P.K.Raychaudhuri	(2004)
S.K.Tandon	(2003)
Suresh Chandra Bhatia	(2002)
Jaswant Singh	(2001)
S.T.Deshmukh	(2000)
P.B.Sharma	(1999)
V.K.Aatre	(1998)
O.P.N.Calla	(1997)
V.M.Trehan	(1996)
V.M.Trehan	(1995)
Vijaya Agarwal	(1994)
Ramadhar Jha	(1993)
J.H.Agarwal	(1992)
P.K.Patwardhan	(1991)
M.P.Chowdiah	(1990)
H.B.Lal	(1989)
P.K.Jena	(1988)
S.C.Chakravarty	(1987)
Manindramohan Chakrabarty	(1986)
S.S.Garg	(1985)
Bisweswar Maitra	(1984)
S.C.Lahiri	(1983)
T.R.Anantharaman	(1982)
M.K.Das Gupta	(1981)
S.S.Saluja	(1980)
S.Deb	(1979)
R.B.Chakravarty	(1978)
J.N.Bhar	(1977)

Engineering & Metallurgy

D.C.Tapadar	(1976)
Harsh Vardhan	(1975)
Jivan Datt	(1974)
G.R.Toshniwal	(1973)
S.N.Ghosh	(1972)

J.K.Choudhury (1971)

S.V.Chandrashekhar Aiya (1970)

Hem Chandra Guha (!969)

K.K.Majumdar (1968)

A.K.Sen Gupta (!966)

S.S.Banerjee (1965-1964)

R.G.Mukherji (1963)

V. Cadambe (1962)

H.N.Das Gupta (1961)

N.N.Sen (1960)

M.Datta (1959)

C.S.Ghosh (1958)

G.P.Chatterjee (1957)

B.N.Dey (1956)

B.B.Bhowmik (1955)

H.N.Srivastava (1954)

S.K.Sircar (1953)

J.N.Basu (1952)

M.S.Thacker (1951)

D.R.Malhotra (1950)

M.Sengupta (1949)

N.Sen (1948)

H.P.Bhaumik (1947)

P.H.Kutar (1946)

Karunamay Ray (1945)

J.J.Ghandy (1944)

N.V.Modak (1943)

B.B.Bhowmik (1942)

Engineering

C.C.Inglis (1941)

PROCEEDINGS

OF THE

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INDIAN SCIENCE CONGRESS

CHENNAI, 2011

PART II

SECTION OF ENGINEERING SCIENCES

President **: Dr.Vipin K.Tyagi**

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