K.L.N. College of Engineering

Pottapalayam – 630612.(11 km From Madurai City)
Tamil Nadu, India.

MECASO/MECH/VOLUME 1/ISSUE 1

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DEPARTMENT OF MECHANICAL ENGINEERING

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VISION

To become a Centre of excellence for Education and Research in Mechanical Engineering.

MISSION

- Attaining academic excellence through effective teaching learning process and state of the art infrastructure.
- Providing research culture through academic and applied research.
- Inculcating social consciousness and ethical values through co-curricular and extra-curricular activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO I	Graduates will have successful career in Mechanical Engineering and service industries.
PEO II	Graduates will contribute towards technological development through academic research and industrial practices.
PEO III	Graduates will practice their profession with good communication, leadership, ethics and social responsibility.
PEO IV	Graduates will adapt to evolving technologies through lifelong learning.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Mechanical Engineering Graduates will be able to:

PSO 1	Derive technical knowledge and skills in the design, develop, analyze and manufacture of mechanical systems with sustainable energy, by the use of modern tools and techniques and applying research based knowledge.
PSO 2	Acquire technical competency to face continuous technological changes in the field of mechanical engineering and provide creative, innovative and sustainable solutions to complex engineering problems.
PSO 3	Attain academic and professional skills for successful career and to serve the society needs in local and global environment.

MECASO

MECHANICAL ENGINEERING NEWSLETTER

Principal Message

It is a matter of great pride and satisfaction for KLN COLLEGE OF ENGINEERING to bring out the News Letter 'MECASO' Released from the Department of Mechanical Engineering. The College has made tremendous progress in all areas- academic, non-academics, capacity building relevant to staff and students. The College has achieved another milestone in getting NBA (National Board of Accreditation).I am confident that this issue of Department News Letter will send a positive signal to the staff, students and the person & scholars who are interested in the Technical education and Technology based activities. A News Letter is like a mirror which reflects the clear picture of all sorts of activities undertaken by a department and develops writing skills among students in particular and teaching faculty in general. I congratulate the Editorial Board of this News Letter who have played wonderful role in accomplishing the task in record time. I express my deep sense of gratitude to Dr.M.R.Thansekhar, HOD/MECH under whose guidance this Technical work has been undertaken and completed within the stipulated time. Also my heartfelt congratulations to staff members and students for their fruitful effort. With Best Wishes,

Principal

Dr. A.V. RAMPRASAD

Message from the Head of the Department

I am excited to report that our department continues to grow in response to the societal need for engineers. Mechanical engineering is one of the largest enrolled departments in the college.

Over the last few years, we have made significant improvements in our educational programs. To meet industry demands and student requests, we recently conducted many programs, in which students could enroll and enhance their knowledge. Such programs help our graduates to become better engineers. Many of these initiatives are only possible with the generous contributions of alumni, faculty and staff. Thank you all for your wonderful support.

HOD/MECH

Dr. M.R. Thansekhar

News letter editorial board

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Introduction to Taguchi Method

By Sikkandhar Basha (111020) III year A Section

Every experimenter has to plan and conduct experiments to obtain enough and relevant data so that he can infer the science behind the observed phenomenon. He can do so by,

Trial-and-error approach:

Performing a series of experiments gives some understanding. This requires making measurements after every experiment so that analysis of observed data will allow him to decide what to do next - "Which parameters should be varied and by how much". Many a times such series does not progress much as negative results may discourage or will not allow a selection of parameters which ought to be changed in the next experiment. Therefore, such experimentation usually ends well before the number of experiments reach a double digit! The data is insufficient to draw any significant conclusions and the main problem (of understanding the science) still remains unsolved.

1. **Design of experiments**:

A well planned set of experiments, in which all parameters of interest are varied over a specified range, is a much better approach to obtain systematic data. Mathematically speaking, such a complete set of experiments ought to give desired results. Usually the number of experiments and resources (materials and time) required are prohibitively large. Often the experimenter decides to perform a subset of the complete set of experiments to save on time and money! However, it does not easily lend itself to understanding of science behind the phenomenon. The analysis is not very easy (though it may be easy for the mathematician/statistician) and thus effects of various parameters on the observed data are not readily apparent. In many cases, particularly those in which some optimization is required, the method does not point to the BEST settings of parameters. A classic example which illustrates the drawback of design of experiments is found in the planning of a world cup event, say football. While all matches are well arranged with respect to the different teams and different venues on different dates and yet the planning does not care about the result of any match (win or lose)!!!! Obviously, such a strategy is not desirable for conducting scientific experiments (except for co-ordinating various institutions, committees, people, equipment, materials etc.).

2. Taguchi Method:

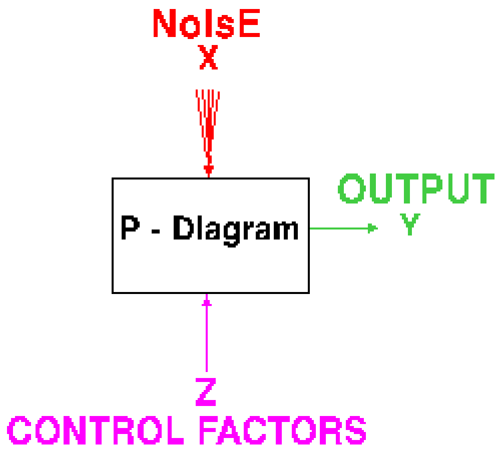
Dr. Taguchi of Nippon Telephones and Telegraph Company, Japan has developed a method based on " ORTHOGONAL ARRAY " experiments, which gives much reduced variance for the experiment with " optimum settings " of control parameters. Thus the combination of Design of Experiments with optimization of control parameters to obtain BEST results is achieved in the Taguchi Method. "Orthogonal Arrays" (OA) provide a set of well balanced (minimum) experiments and Dr. Taguchi's Signal-to-Noise ratios (S/N), which are log functions of desired output, serve as objective functions for optimization, help in data analysis and prediction of optimum results.

Taguchi Method treats optimization problems in two categories,

Static Problems :

Generally, a process to be optimized involves several control factors which directly decide the target or desired value of the output. The optimization then involves determining the best control factor levels so that the output is at the target value. Such a problem is called as a "STATIC PROBLEM".

This is best explained using a P-Diagram which is shown below ("P" stands for Process or Product). Noise is shown to be present in the process but it does not have any effect on the output! This is the primary aim of the Taguchi experiments. To minimize variations in output even though noise is present in the process. The process is then said to have become ROBUST.

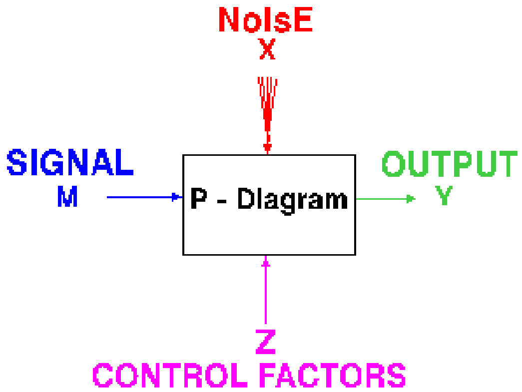


P - Diagram for STATIC problems

B. Dynamic Problems:

If the product to be optimized has a signal input that directly decides the output, the optimization involves determining the best control factor levels so that the "input signal / output" ratio is closest to the desired relationship. Such a problem is called as a "DYNAMIC PROBLEM".

This is best explained by a P-Diagram which is shown below. Again, the primary aim of the Taguchi experiment is to minimize variations in output even though noise is present in the process which is achieved by getting improved linearity in the input/output relationship.



P - Diagram for DYNAMIC problems

Composite Manufacturing Processes

By Jeyachandran G (121028) II year C Section

Composite Manufacturing Processes

- Particulate Methods: Sintering
- Fiber reinforced: Several
- Structural: Usually Hand lay-up and atmospheric curing or vacuum curing
- **Open Mold Processes**
- Only one mold (male or female) is needed and may be made of any material such as wood, reinforced plastic or , for longer runs, sheet metal or electroformed nickel. The final part is usually very smooth.
- **Shaping**. Steps that may be taken for high quality

1. Mold release agent (silicone, polyvinyl alcohol, fluorocarbon, or sometimes, plastic film) is first applied.
2. Unreinforced surface layer (gel coat) may be deposited for best surface quality

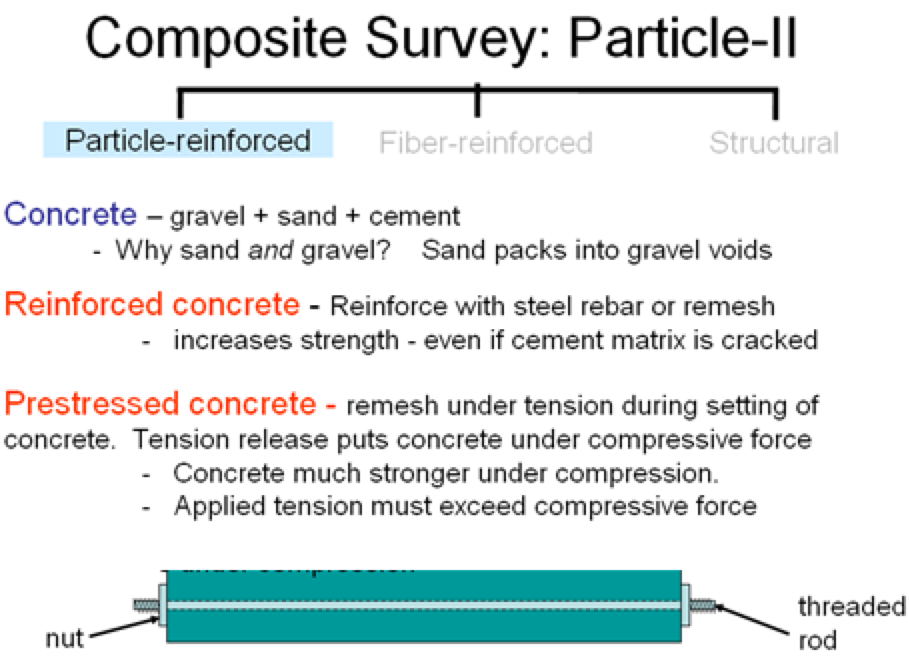
Hand Lay-Up: The resin and fiber (or pieces cut from prepreg) are placed manually, air is expelled with squeegees and if necessary, multiple layers are built up.

- Hardening is at room temperature but may be improved by heating.
- Void volume is typically 1%.
- Foam cores may be incorporated (and left in the part) for greater shape complexity. Thus essentially all shapes can be produced.
- Process is slow (deposition rate around 1 kg/h) and labor-intensive
- Quality is highly dependent on operator skill.
- Extensively used for products such as airframe components, boats, truck bodies, tanks, swimming pools, and ducts.

Filament Winding Characteristics

- Because of the tension, reentrant shapes cannot be produced.
- CNC winding machines with several degrees of freedom (sometimes 7) are frequently employed.
- The filament (or tape, tow, or band) is either precoated with the polymer or is drawn through a polymer bath so that it picks up polymer on its way to the winder.
- Void volume can be higher (3%)

- The cost is about half that of tape laying
- Productivity is high (50 kg/h).
- Applications include: fabrication of composite pipes, tanks, and pressure vessels. Carbon fiber reinforced rocket motor cases used for Space Shuttle and other rockets are made this way.



Tribology

By Annalakshmi K (121038) II year C Section

Tribology is the science of interacting surfaces in relative motion. It includes the study and application of the principles of friction, lubrication and wear. Tribology is a branch of mechanical engineering and materials science

The tribological interactions of a solid surface's exposed face with interfacing materials and environment may result in loss of material from the surface. The process leading to loss of material is known as "wear". Major types of wear include abrasion, friction (adhesion and cohesion), erosion, and corrosion. Wear can be minimized by modifying the surface properties of solids by one or more "surface engineering" processes (also called surface finishing) or by use of lubricants (for frictional or adhesive wear).

Estimated direct and consequential annual loss to industries in USA, due to wear is approximately 1-2% of GDP. (Heinz, 1987). Engineered surfaces extend the working life of both original and recycled and resurfaced equipment, thus saving large sums of money and leading to conservation of material, energy and the environment.

New areas of tribology

Since 1990s, new areas of tribology have emerged, including the nanotribology, biotribology, and green tribology. These interdisciplinary areas study the friction, wear and lubrication at the nanoscale (including the Atomic force microscopy and micro/nanoelectromechanical systems, MEMS/NEMS), in biomedical applications (e.g., human joint prosthetics, dental materials), and ecological aspects of friction, lubrication and wear (tribology of clean energy sources, green lubricants, biomimetic tribology).

Applications

The study of tribology is commonly applied in bearing design but extends to almost all other aspects of modern technology, even to such unlikely areas as hair conditioners and cosmetics such as lipstick, powders and lipgloss.

Any product where one material, slides or rubs over another is affected by complex tribological interactions, whether lubricated like hip implants and other artificial prostheses, or unlubricated as in high temperature sliding wear in which conventional lubricants cannot be used but in which the formation of compacted oxide layer glazes have been observed to protect against wear.

Tribology plays an important role in manufacturing. In metal-forming operations, friction increases tool wear and the power is required to work a piece. This results in increased costs due to more frequent tool replacement, loss of tolerance as tool dimensions shift, and greater forces required to shape a piece. The use of lubricants which minimize direct surface contact reduces tool wear and power requirements

What is Nanotechnology?

By SrikrishnanSenthilnathan (121303) II year B Section

A basic definition: Nanotechnology is the engineering of functional systems at the molecular scale. This covers both current work and concepts that are more advanced.

In its original sense, 'nanotechnology' refers to the projected ability to construct items *from the bottom up*, using techniques and tools being developed today to make complete, high performance products.

The Meaning of Nanotechnology

When K. Eric Drexler (right) popularized the word 'nanotechnology' in the 1980's, he was talking about building machines on the scale of molecules, a few nanometers wide—motors, robot arms, and even whole computers, far smaller than a cell. Drexler spent the next ten years describing and analyzing these incredible devices, and responding to accusations of science fiction. Meanwhile, mundane technology was developing the ability to build simple structures on a molecular scale. As nanotechnology became an accepted concept, the meaning of the word shifted to encompass the simpler kinds of nanometer-scale technology. The U.S. National Nanotechnology Initiative was created to fund this kind of nanotech: their definition includes "anything smaller than 100 nanometers with novel properties".

Much of the work being done today that carries the name 'nanotechnology', which is not nanotechnology in the original meaning of the word. Nanotechnology, in its traditional sense, means building things from the bottom up, with atomic precision. This theoretical capability was envisioned as early as 1959 by the renowned physicist Richard Feynman.

I want to build a billion tiny factories, models of each other, which are manufacturing simultaneously. . .The principles of physics, as far as I can see, do not speak against the possibility of maneuvering things atom by atom. It is not an attempt to violate any laws; it is something, in principle, that can be done; but in practice, it has not been done because we are too big. — Richard Feynman, Nobel Prize winner in physics

Based on Feynman's vision of miniature factories using nanomachines to build complex products, advanced nanotechnology (sometimes referred to as molecular manufacturing) will make use of positionally-controlled mechanochemistry guided by molecular machine systems. Formulating a roadmap for development of this kind of nanotechnology is now an objective of a broadly based technology roadmap project, led by Battelle (the manager of several U.S. National Laboratories) and the Foresight Nanotech Institute.

Shortly after this envisioned molecular machinery is created, it will result in a manufacturing revolution, probably causing severe disruption. It also has serious economic, social, environmental, and military implications.

Organized Events

Guest Lecture

S. No	Date	Topic of Lecture	Name of Industry / Scholar	Year	No. of Students
1.	23.6.14 to 27.6.14	Placement training	Skill Enhancement programme– Aptitude Skills Preliminary Level	Ethnus Consultancy Pvt.Ltd., Bangalore	142
2.	23.6.14 to 27.6.14	Placement training	Skill Enhancement programme– Verbal Skills and Soft skills	Six Phrase, Coimbatore	138
3.	30.6.14 to 3.7.14	Placement training	Skill Enhancement programme– Aptitude Skills – Advanced Level	Focus Academy of Career Enhancement, Coimbatore.	92

PROGRAM OUTCOMES (POs)

Mechanical Engineering Graduates will be able to

1.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to solution of complex engineering problems.
2.	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.	Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.
12.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

K.L.N. COLLEGE OF ENGINEERING

VISION

To become a Premier Institute of National Repute by Providing Quality Education, Successful Graduation, Potential Employability and Advanced Research & Development through Academic Excellence.

MISSION

To Develop and Make Students Competent Professional in the Dynamic Environment in the field of Engineering, Technology and Management by emphasizing Research, Social Concern and Ethical Values through Quality Education System.

Principal President Secretary & Correspondent