

E-Yantrik

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Student Editors: *Suwendu Mishra*

Pintu Munda

Faculty Editor: *Swagatika Acharya*



Vision of the Department:

To become a centre of excellence, acclaimed globally as a source of knowledge in the field of Mechanical Engineering by producing the professionals of highest grade to excel in the field of Industry and Research, bearing the ability to face the challenges posed by latest technology and competition.

Mission of the Department:

- To impart quality education to the students and enhance their knowledge and skills to make them globally competitive Mechanical Engineers.
- To become a leader in the field of Mechanical Engineering by acquiring and disseminating knowledge, using the best methods of teaching.
- To develop linkages with Industrial and Research organizations, enterprises in India for industry-oriented projects to apply theoretical knowledge to practical problems.
- To develop entrepreneurship skill of the students to make them ready for self-employment.

PEO's of the Department

Program educational objectives of Undergraduate Mechanical Engineering Department are

- PEO-1 : Our graduates will succeed as a mechanical engineer or obtain an advance degree by applying basic principles of engineering and skills to solve complex engineering problems.
- PEO-2 : Our students will be able to carry out Multidisciplinary research using modern tools and adapt to current changes by inculcating habit of lifelong learning.
- PEO-3 : Our Students will be able to work in the field of clean energy for the welfare of the society as responsible citizens with good ethics.



From the HOD's Pen

Dear Readers,

Greetings from Department of Mechanical Engineering!

I am pleased to know that our students are successful in bringing their first issue of magazine E-YANTRIK for this academic year 2017-18. E-YANTRIK, the departmental magazine has the prime objective of providing aspiring engineers a wide platform to showcase their technical knowledge and to pen down innovative ideas. This magazine is intended to bring out the hidden literary talents in the students and teachers to inculcate strong technical skills among them. As a half yearly magazine of GIFT, it helps the students to interact and share their ideas with the industry leaders and their peers studying in the college. I congratulate and thank all the students and faculty coordinator who have made untiring efforts to bring out this magazine.

I thank everyone for their valuable contributions to the magazine and hope to receive similar enthusiasm through your precious insight in the fourth coming issues of E-YANTRIK.

Thanks & Regards,

Prof. Alok kumar Mohapatra

H. O. D, Mechanical

Gandhi Institute For

Technology, Bhubaneswar



From the Editor's Pen

Dear Readers,

Greetings from Department of Mechanical & Engineering!

It is my pleasure to congratulate the team that has taken the initiative for producing this E-YANTRIK magazine. It is great to find a considerable number of articles, technical quiz poems and abbreviation that certainly prove that our staff and students are adequately equipped and possess necessary skill sets to express their talent. Reading this E-YANTRIK magazine would definitely be an inspiration and motivation for all students and staff to contribute even more to the forthcoming issues.

I hope that everyone would continue to give their full efforts to keep the momentum and continue to enhance the standards of the magazine.

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Thanks & Regards,

Prof. Swagatika Acharya

Asst. Prof., Dept. of Mechanical

Editor, E-Yantrik

- **Article**

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2. *Experimental laser microgrooving*
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4. *Application of laser microdrilling in structural ceramics*
5. *Stratification by fuel injection and positive ignition*

- **Some Interesting Facts**

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COST BENEFITS OF USING RIGID-FLEX PCB VS. CABLES

Prof .Swagatika Acharya

When it comes to printed circuit boards (PCB) for your applications, you have a wide range of choices. Yet, many of these choices will be based on the cost factor to design and create the board, leading more business owners to take the traditional route and select rigid printed circuit boards over rigid-flex printed circuit boards. Another factor is familiarity. Manufacturers are accustomed to having traditional rigid circuit boards placed into their products and can be automatically prone to make this selection every time due to their better understanding of PCBs and cable assemblies. Also, it is often believed that rigid-flex printed circuit boards will be inherently more expensive due to the flexible materials that will be used. It is no secret that rigid-flex PCBs can be more expensive to fabricate. However, manufacturers may be missing out on some very important cost benefits. In fact, rigid-flex boards may offer cost savings that rigid circuit boards and cable assemblies cannot provide based on several different factors. In this article we will go over some of the cost-saving benefits that rigid-flex printed circuit boards have over rigid printed circuit boards and cable assemblies .When hearing the word "rigid-flex," many people assume it is a rigid board that has more flexibility than a regular rigid printed circuit board. That is not the case. Rigid-flex circuit boards are actually a combination of a rigid printed circuit board with a flexible printed circuit board attached. For some designs, there are multiple flexible circuit substrates attached to several rigid printed circuit boards. This design feature eliminates the need to add connectors and cable assemblies. A rigid-flex printed circuit board is unique as the rigid part of the circuitry can be placed directly into the application.

EXPERIMENTAL LASER MICROGROOVING

Mr.Amrit Mohapatra,4thyearMechanical

The recent technology has been advancing to infinite extent in search of newer materials and alloys with high hardness, strength, and less weight which are very difficult to be machined with the conventional machining processes for achieving the required accuracy and precision. Nowadays, there is a vast demand for the well finished products of alumina ceramic materials with high accuracy and complex integrated designs. Such features on a component can be achieved only through the advanced manufacturing process, especially by laser beam machining.

In case of micromachining, the feature size is less than 1 mm. Hence, lasers are increasingly employed for a precise micromachining because their beams can be focused accurately on microscopic areas, and attributed to a number of advantages which are normally applicable to whole range of the materials processing applications, like, non-contact processing, high productivity, eradication of the finishing operations, minimized cost of processing, and enhanced the quality of product, maximize material utilization, green manufacturing and minimize the heat affected zone. The above-cited advantages can only be obtained with appropriate selection of process parameters.

Researchers have employed various methods: multiple regression analysis (MRA) and artificial neural network (ANN) for mathematical modeling in order to predict the responses and Taguchi method, response surface method(RSM), genetic algorithm (GA), particle swarm optimization (PSO) for optimization the controlled process parameters during laser micromachining process that have been explored as productivity and reliable tool in advanced computing technology for high-quality frameworks .

Empirical models proposed for the technological response characteristic such as upper width deviation have R-Square value is set close to one and P-value less than 0.05, which ensures the greater statistical significance with the excellence of fit for the model. The normal probability plot ensures that the residuals distributed fairly near to a straight line showing the normality dispersion of errors as well as implying the sources associated with the model are significant. Response optimization employing PSO technique shows the optimal setting of machining variables in laser micro grooving, The suggested multiple approaches (experimental, statistical, and computational) are reliable methodologies for improving laser micro grooving process and can be used in model predictive control, real time process monitoring, and optimization in different machining processes.

ELECTRIC AUTOMOBILE

Mr. Sovan Nandi, 3rd year Mechanical

An Electric automobile (EA) is an automobile which uses an electric motor to power the vehicle with the electricity provided directly or through a battery. The electric motor gets its power from a controller and the controller is powered from an array of rechargeable batteries. Unlike conventional automobiles, the power supply is obtained from the battery-stored electricity rather than mechanical power from burning fuel. Practical electric road automobiles were invented around 1842, and in the early 1900s these automobiles had many advantages over their competitors. EVs were among the earliest automobiles, and before the pre-eminence of light, powerful internal combustion engines, electric automobiles held many vehicle land speed and distance records in the early. It is cleaner and much more efficient; however, it also has disadvantages. It is heavier, limited to the distance it can travel before recharge, and costs more. The future of the EV relies on its battery. If researchers can produce or find the “super battery”, the EV’s future is promising. As of today, each vehicle has its own characteristic that makes it better than the other. Only time and technological improvements will tell which vehicle will excel in the future. Fuel can be harnessed from any source of electricity, which is available in most homes and businesses. It reduces hydrocarbon and carbon monoxide, responsible for many environmental problems, by 98%. Also reduces pollution. It has the greatest degree of energy resilience.

Contains combined regenerative braking system that can convert movement energy into stored electricity. Charging done from power grid (household/charging station). A good charger monitors battery voltage, current flow and battery temperature to minimize charging time. 120/240 volts. A lead-acid battery is the most common and cheapest battery used by electric vehicle. The use of this battery is more recommended when weight is least concern. Nickel-zinc battery is more environmental friendly but has a short life cycle. Nickel-iron battery is heavy weight, high self-discharge rate, and high maintenance cost. Nickel-cadmium (Ni-Cd) battery is not suitable for high charge/discharge rate like in automobile application because of their memory effect.

APPLICATION OF LASER MICRODRILLING IN STRUCTURAL CERAMICS

Mr. Subrat Kumar Patra 3rdyear Mechanical

Structural ceramics play an important role in several applications due to their excellent properties like high hardness, high strength, good thermal resistance and chemical stability. However, it is difficult to machine due to the brittle and hard nature of ceramics. Traditional processing ways of ceramics are not only time-consuming but also laborious. Under such circumstances, various nontraditional machining methods have been adopted in processing ceramics, including ultrasonic machining (USM), electrical-discharge machining (EDM), laser beam machining(LBM) and laser assisted machining (LAM). As one of the advances machining methods, LBM is considered a desired machining technique on account of non-conduct processing, low production costs, flexibility and its ability to process variable parameters with high accuracy.

LBM has been applied in many aspects of industry and life. Pulsed lasers have been used in drilling of structural ceramics. The circularity, taper angle of hole and heat affected zone (HAZ), cracks at surface and wall near hole are often used to characterize the quality of hole. To obtain the desired hole, laser drilling generally involves a great many of controllable parameters such as pulse width, energy density, repetition frequency and focal plane position. For optimization purposes, modelling and simulation is indispensable, such as experimental methods ,analytical methods and artificial intelligence methods.

Somebody can review on laser drilling of structural ceramics with millisecond (ms), nanosecond (ns), pico second (ps)and femto second (fs) lasers in order to predict the significant factors and effects on the quality characteristics.

LBM has been demonstrated as a practical tool for the high-quality drilling holes in ceramics. The quality of laser drilling is affected by variety of parameters, such as laser power, number of pulses, pulse width, repetition rate, type and pressure of assisted gas. Desired quality characteristics of hole are minimum values of taper, HAZ, recast layer, micro-cracks and maximum values of circularity. The optimal processing quality can be obtained with the discovery of the influence of each factor on the material processing. Auxiliary method assisted LBM is a promising technology.

STRATIFICATION BY FUEL INJECTION AND POSITIVE IGNITION

Biswajeet Behera, 2nd year mechanical

Many types of IC Engines, two types, namely diesel and petrol engines, are well established. Each one of them has certain limitations. The full load power characteristics of petrol engine are very good, but the degree of air utilization is also high. Diesel engines have part load characteristics but have poor air utilization. Comparatively, the emission characteristics for the diesel and petrol engines are poor due to the high peak temperatures. In the actual operation, basing on the stoichiometric fuel–air mixture ignition the fuel efficiencies are very much lowered in both the engines. From the observation, we see that the engine runs at part load and max power conditions. Therefore, an engine is to be developed, which can combine the advantages of diesel and petrol engine and also avoid the many of their disadvantages. In that course of action stratified charge engine is one, which is midway of the heterogeneous CI engine and homogeneous SI engine. Here an overview of stratified charge engine working and its combustion by fuel injection with positive ignition method is presented.

The main objective of stratified engine feeds the rich mixture through a separate inlet valve to generate a swirl in the combustion chamber. By this, weak mixture enters the cylinder in general and then the vortex comprising alternate layers of rich and lean mixtures are formed. As the rich mixture is directed on to the spark plug points which ignite and burns the mixture throughout the cylinder. This stratified engine concentrates on the mixture near the spark plug whose AF ratio is $<14:1$ and the remaining mixture in the cylinder which is a lean mixture whose AF ratio is $\geq 50:1$. As like the direct ignition system in the diesel, here it uses the same process to run at high compressions. However, to gain the ability of quick mixing and clean burning to avoid the poor combustion it relies on gasoline-like Otto cycle which is found in the diesel.

Empirical models proposed for the technological response characteristic such as upper width deviation have R-Square value is set close to one and P-value less than 0.05, which ensures the greater statistical significance with the excellence of fit for the model. The normal probability plot ensures that the residuals distributed fairly near to a straight line showing the normality dispersion of errors as well as implying the sources associated with the model are significant. Response optimization employing PSO technique shows the optimal setting of machining variables in laser micro grooving, The suggested multiple approaches (experimental, statistical, and computational) are reliable methodologies for improving laser micro grooving process and can be used in model predictive control, real time process monitoring, and optimization in different machining processes.

SOME INTRESTING FACTS

Biswaranjan Tarai,4th yr Mechanical

- 1. Scientists estimate there are between 200 - 400 billion stars in our galaxy while there are an estimated 1 trillion trees on Earth! Like the stars, trees live a long time and are truly important for life.*
- 2. After carefully studying hominin fossils found in Kenya, Ethiopia and Chad, German scientists have concluded that 4 distinct human species coexisted at the same time about 3 million years ago.*
- 3. Hard to believe, but true. Sharks kill an average of 5 people per year while cows kill an average of 22 people per year. In fact, humans are more deadly to sharks than they are to humans. Humans kill about 100 million sharks per year*
- 4. You can fit all of the planets in the Milky way between the Earth and Moon with a little space left over.*
- 5. Lobsters don't die of old age.*
- 6. There was a time when there was no bacteria that would decompose a tree.*
- 7. Remember this the next time you buy a lovely pineapple and then let it go to waste. If planted from a sucker, a pineapple will take about 18 months to bloom, but if you plant the top of the pineapple, it will take 2 to 2 1/2 years to produce a bloom.*
- 8. Pluto hasn't made a full orbit around the sun since it was discovered in 1930*

Technical Quiz

Mr. Sandeep Mohanty, 4th Year MECH

- Q 1. What is the formula for Gibb's phase rule.
(a) $f=c+p-2$ (b) $f=c-p+2$ (c) $p=c+f-2$ (d) $p=c-f+2$
- Q 2. Luder bands generally appears in
(a) 12° to tensile axis (b) 65° to tensile axis (c) 75° to tensile axis (d) 45° to tensile axis
- Q 3. Yield Strength of a metal mainly depends on
(a) Grain size (b) Dislocation (c) Both "a" and "b" (d) single crystal
- Q 4. Energy Stored during elastic deformation is known as
(a) Stiffness (b) toughness (c) resilience (d) ductileness
- Q 5. Rate of Diffusion is higher for a crystal having
(a) Fine grain (b) Coarse grain (c) higher packing factor (d) None of these
- Q 6. Volume defect can be
(a) Schottky defect (b) Twin defect (c) Stacking defect (d) none of these
- Q 7. Ideal crystal have _____
(a) Line defect (b) point defect (c) electronic defect (d) No defect
- Q 8. Point defect is an example of
(a) 1D defect (b) 2D defect (c) 3D defect (d) Zero Defect
- Q 9. _____ is a BCC structure
(a) Gold (b) Copper (c) Aluminum (d) Iron
- Q 10. Bravaislattics consist of
(a) 16 Basic unit cell in 36 system of crystal
(b) 7 Basic unit cell in 14 system of crystal
(c) 14 Basic unit cell in 7 system of crystal
(d) 17 Basic unit cell in 7 system of crystal

Answers

1. A
2. D
3. C
4. C
5. A
6. C
7. D
8. D
9. D
10. C

ABBREVIATION

AA - Aluminum Association
AC - Asphalt Concrete
AG - Agricultural Pipe Drain
BLK - Block Work
BSP - British Standard Pipe
CFW - Continuous Fillet Weld
FSBW - Full Strength Butt Weld
FTP - Fibre Termination Panel (fibre optical cable)
FW - Fillet Weld
HR - Hot Rolled
HV - Vickers Hardness
LGX - Line Group Cross (Connector, fibre optical cable)
LPG - Liquid Petroleum Gas
MS - Mild Steel
PL - Plate
SS or S/S - Stainless Steel
TC - Tungsten Carbide
TUN - Tundish
UA - Unequal Angle (steel)
UB - Universal Beam (steel)
UC - Universal Column (steel)
WB - Welded Beam (steel)
WC - Welded Column (steel)
Z - Zulu (Greenwich Mean Time) or Z-shaped steel purlin

GREAT QUOTES

Swagat Singh, 4th yr Mechanical

1. *"The greatest part of a writer's time is spent in reading, in order to write. A man will turn over half a library to make a book."*

- Samuel Johnson

2. *"Writing a novel is like driving a car at night. You can only see as far as your headlights, but you can make the whole trip that way."*

- E. L. Doctorow

3. *"To produce a mighty book, you must choose a mighty theme."*

- Herman Melville

4. *"Tell the readers a story! Because without a story, you are merely using words to prove you can string them together in logical sentences."*

- Anne McCaffrey

5. *"Description begins in the writer's imagination but should finish in the reader's."*

- Stephen HawKing

6. *"No tears in the writer, no tears in the reader. No surprise in the writer, no surprise in the reader."*

- Robert Frost

7. *"If you want to be a writer, you must do two things above all others: read a lot and write a lot."*

- Stephen King

The End