

E-Yantrik

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1st :Issue

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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,

Dr. Nabnit Panigrahi

H. O. D, Mechanical

Gandhi Institute For

Technology, Bhubaneswar



From the Editor's Pen

Dear Readers,

Greetings from Department of Mechanical & Engineering!

I am happy to note that the magazine E-YANTRIK brought out in our college is of good quality and taste. Hearty congratulations to the editorial team. It is a matter of great pleasure for me to go through the wonderful contributions made by the students. This E-YANTRIK is intended to bring out the hidden literary talents in the students and the teachers and to inculcate leadership skills among them. The outside world will come to know about the caliber of the students and the faculty through this magazine.

I extend my thanks to all the contributors for their articles, poems, quotation and Technical quiz for E-YANTRIK

Thanks & Regards,

Prof. Rajeswari Chaini,

Asst. Prof., Dept. of Mechanical

Editor, E-Yantrik

- **Article**

- *A case study on al/al o ultrafine Composites fabricated using pm route*
- *Cost benefits of using rigid-flex pcb vs. Rigid pcb and cables*
- *Battery certifications: mandatory optional, & the unknown*
- *Flexible heaters: selecting the right mounting method for your application*
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A CASE STUDY ON AL/AL₂O₃ ULTRAFINE COMPOSITES FABRICATED USING PM ROUTE

Prof. Aravind Tripathy

Composites with light metals as the matrix and ceramic particles as the reinforcements are being acknowledged widely during the past decade for their superior mechanical properties, the most successful among them has been, Al/Al₂O₃ composite i.e. Alumina (Al₂O₃) particulate reinforced in Aluminium (Al) matrix. Al/Al₂O₃ ultrafine composites samples with 10%, 20%, 30% and 40% Al₂O₃ as reinforcement were fabricated using uni-axial hot press under 10–5 mbar vacuum pressure at 400 °C sintering temperature and 3-ton load for 2-h experimental condition. Effect of Al₂O₃ volume fraction on microstructural and mechanical properties of the composite was studied through optical microscopy. Phase analysis and microstructure investigations revealed, microstructure of the consolidated material consists of Al as a matrix phase and Al₂O₃ phases with size below 1 μm homogeneously dispersed in a continuous matrix. This ultra-fine composite is intended to be a good substitute ‘low weight high strength material’ with better wear resistance properties at elevated temperatures for automobile braking applications as well as for various other industrial applications which may include robots, high speed machineries and automobiles.

Keywords

Ultra-fine composites Powder metallurgy Hot pressing Mechanical properties This is a preview of subscription content, log in to check access.

COST BENEFITS OF USING RIGID-FLEX PCB VS. RIGID PCB AND CABLES

Mr. Samarjit Samal , 4th year, Mechanical

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. Then, the flexible section can be bent and even folded to fit around components to make another direct connection. This aspect ensures a reliable connection to parts for higher performance.

Some of the most common products that incorporate rigid-flex PCBs in their design include laptop computers, smart phones, and wearable devices due to the bending capabilities of rigid-flex. A good example of this

would be a desktop computer compared to a laptop. Most people have seen the inside of a desktop computer with the cover removed. It's filled with various circuit boards, connected by ribbon cables and cables

assemblies. If you take apart your laptop, particularly the back cover on the hinge that separates the screen from the keypad, you would reveal the rigid-flex circuitry.

While understanding the cost benefits can help manufacturers understand the typical savings they may obtain from rigid-flex circuits, the final total cost will always be dependent on the final assembly in the end application. It will also be dependent on the number of rigid-flex printed circuit boards required. When it comes to production, there will be more cost savings when there are longer production runs creating hundreds of units.

BATTERY CERTIFICATIONS: MANDATORY, OPTIONAL, & THE UNKNOWN

Mr. Siba prasad Barik, 3rd year, Mechanical

When developing a new battery pack, a common question asked by customers is: "What certifications will I need?" This question has many variables that need to be factored in from the customer level to determine what will be required. Each project is unique. There is no generic, one-size-fits-all answer. New special battery chemistries have strained older naming conventions. Rechargeable NiCd (Nickel Cadmium) and NiMH (Nickel Metal Hydride) typically output 1.25 V per cell. Some devices may not operate properly with these cells, given the 16% reduction in voltage, but most modern ones handle them well. Conversely, lithium-ion rechargeable batteries output 3.7 V per cell, 23% higher than a pair of alkaline cells (3 V), which they are often designed to replace. Non-rechargeable lithium-chemistry batteries, which provide exceptionally high energy density, produce about 1.5 V per cell and are thus similar to alkaline batteries.

Chemistry selection will have some bearing on certifications. For example, all lithium-based products are required by law to perform the DOT UN38.3 transportation certification to manage shipping of the battery. The testing will be performed by a certification agency to verify the battery construction is safe and passes all

the required shipping standards. There are global options for these certification agencies that can be managed by your battery assembler.

Other chemistries such as nickel metal hydride, nickel cadmium, alkaline, and lead acid are not required to have the UN38.3 cert. These chemistries can be shipped globally without restrictions.

Where you intend to market your product should also be considered. There are multiple global certifications for various countries, some of which need to have the testing and certifications completed in those specific origins. If your product is intended to be marketed as a consumer product, you most likely will want UL certification as the minimum.

Another frequently asked question is regarding certifications required when shipping a lithium battery installed in the intended device. This is all relative on how you intend to manage the battery after receiving from your supplier. If the battery is intended to be installed in the device and shipped under the classification of “battery in device,” the regulations are not as stringent and more around the basic packaging and labeling required.

Every product is unique. Some require multiple certifications, while others don’t require any. It is always beneficial to understand the markets intended at the onset of the project, and your battery assembler should be able to provide guidance on what you will require with assistance from the regulatory agencies that would perform the testing and formal certifications.

FLEXIBLE HEATERS: SELECTING THE RIGHT MOUNTING METHOD FOR YOUR APPLICATION

Mr. Hitesh swain , 2nd year, Mechanical

Industries around the world will experience cold interior operations or outdoor environmental temperatures that can impact the performance of equipment. For example, foodservice operations that have to keep finished meals at a set low temperature before serving to airplanes flying in winter weather, the equipment components and products must be maintained at a certain temperature to prevent equipment malfunctions, device failure or spoiled products.

Epec Engineered Technologies has extensive design and application engineering experience in manufacturing precision-grade flexible heaters. These highly-customized heaters are engineered to meet your specific

requirements. These heaters are thin, bendable, and can be designed using the most complex shapes, geometries, and curves to fit almost any type of application. Flexible heaters have excellent heat transfer properties has the ability to be directly bonded to areas needing heat, provide quick optimum temperatures, uniform heat distribution, and high-watt densities without sacrificing efficiency or dependability.

There are three main types of mounting methods that manufacturers use for their flexible heaters: pressure sensitive adhesive (PSA), factory vulcanized mounting, silicone RTV bonding. Some mounting methods are dependent on the level of heat generated, while others must provide heat transfer capabilities.

Pressure sensitive adhesive involves having a flex heater with an adhesive surface that is pre-attached. The protective backing is peeled away as the flexible heater is then placed onto the component. It may have a single side of adhesive or a double-sided coating. PSA mountings for flex heaters are more suitable for clean surfaces that are smooth or for slightly curved surfaces. It is the most economical and fast mounting method available.

Factory vulcanized mountings involve taking the flexible heater and mounting it to the component using a vacuum oven. The flexible heater becomes adhered to the component as it is a suitable method for metal surfaces such as stainless steel, anodized aluminum, or black anodized aluminum. This mounting method provides a permanent bond due to the flex heater, such as silicone rubber type, filling into microstructure of the metal material. Most often the component mounting will be performed in-house before the finished product is sent to the company for further component installation into equipment. Factory vulcanized methods are appropriate when you want the best heat transfer capabilities as the flexible heater itself is fastened to the component without anything obstructing the contact point.

Silicone RTV involves adhering the flexible heater to the surface of the component by using a silicone adhesive that is both room temperature and ambient humidity cured. It consists of a one-part adhesive (or a two-part adhesive consisting of a resin and a catalyst that is mixed together) and is applied to the silicone rubber heater. Then the heater is positioned onto the part as a small roller runs across the heater to remove air pockets while securely adhering the heater. Silicone RTV is suitable for components that are in field

applications where high temperatures will be produced during operations. It can be used for heaters that will provide up to 5 W/in² and temperatures of 500°F (260°C).

Engineering Technologies offers both design and manufacturing services under the same roof. So, we can engineer and build the flex heater project without sending certain parts off to other contract manufacturers. Instead, we ensure that superior quality design and reliable manufacturing services are used throughout the entire project. To learn more about our flex heating solutions, contact our technicians today.

AN OVERVIEW OF THE FLAMMABILITY REQUIREMENTS FOR CUSTOM CABLES

Mr. Amit Kumar , 2nd year, Mechanical

Though electrical fires are broadly defined as “any fire that involves some type of electrical failure or malfunction”, the actual events themselves can be much more specific than that, particularly when you consider why they are often caused. According to one recent study, one of the leading direct causes of electrical fires around the country is faulty wiring. This is especially true in environments such as a home that is more than 20 years old, as it may not actually have the wiring capacity necessary to safely handle the increased numbers of electrical items that we use more and more in our daily lives. When you consider an environment like a business, which itself can have dozens or even hundreds of computers, office equipment, server and network items, and even HVAC systems, it's easy to see why this problem is such a severe (and unfortunately, common) one.

CL2 & CL3: NEC (National Electric Code) has an established standard defined in Article 725 for low voltage applications, less than 150 volts. This rating provides fire resilience and protection from electrical shock. CL2 & CL3 cables are also designed to support specific pull forces and 90-degree bends. Many low power/high frequency cables such as high-resolution video and coaxial cables carry the CL2 and CL3 designation.

Plenum: These types of cables are designed for installation in areas with forced air ventilation, air handling, and cooling systems. Since the high air flow environment can cause fire to rapidly spread, a cable jacket with fire retardant jacket is critical to prevent fire propagation. Since these cables may be collocated around air handling systems, there is also a need to minimize the amount of smoke produced if the cable jacket does combust. Specialized jacket materials can be employed for low-smoke characteristics. Other common types of flammability ratings include OFNR (Optical Fiber Nonconductive Riser), which is given to fiber optic cables that are designed to be used in vertical runs within buildings. OFNP (Optical Fiber Nonconductive Plenum) is the same but is designed for horizontal runs while

also exhibits low smoke characteristics, similar to a plenum rating. CM (similar to CL2 and CL3), CMR (similar to CL2 and CL3 but for a riser applications) and CMP (similar to CL2 and CL3 but for a plenum applications) are ratings also given to network cables, they are roughly equivalent to Article 725 cables but are designed for much lower power ratings, such as Ethernet cables.

SOME FUNNY FACTS

Debasis Pani ,4th year Mechanical

- 1. The snowboard was invented by an engineer?
with some engineering twists and turns along the way, the snowboard has become a marvel of geometry, chemistry, and biomechanics. Since the snowboard allows deft turns, ski manufacturers have quickly adopted some of the snowboard innovations, enabling skiers to turn with less effort.*
- 2. Engineers design running shoes for protection, performance, and comfort?
Engineers understand how much force travels from the ground through the shoe to the foot. Through the work of engineering, weight is distributed throughout the whole foot -- heel to toe.*
- 3. A civil engineer created the slippery part of the water slide?
A civil engineer designed a pumping system to circulate just the right amount of water to the flume. Without the right flow of water, there is no ride. Additionally, civil engineers have designed the slide to withstand the weight of people, the water, and even the force of the wind blowing on it.*
- 4. The launch and return of spacecraft, from the Apollo to the Shuttle, is a monumental engineering triumph?
The space program has greatly expanded the world's knowledge base. The technological advancement by engineers in energy, communications, materials, structures, and computers, have made space travel possible.*

5. *Engineers make interactive television possible?*

Engineers are involved in all aspects of interactive TV technology, from designing new cables, to creating new film emulsions, to engineering better sound quality. This technology allows viewers to select any program, film, or game from more than 500 channels.

Technical Quiz

1. When the velocity ratio is high and space is limited, one should use

- a. Spur gears
- b. Bevel gears
- c. Worm gears
- d. Helical gears

2. An automobile gearbox has

- a. Simple gear train
- b. Compound gear train
- c. Epicyclic gear train
- d. None of the above

3. The main function of an automobile gearbox is

- a. To reduce speed
- b. To increase speed
- c. To provide variable speeds
- d. To increase power

4. A flywheel is used

- a. To limit the fluctuation of speed during each cycle
- b. To control the mean speed of the engine
- c. To maintain a constant speed
- d. To come into action when the speed varies

5. The maximum fluctuation of speed of flywheel is

- a. Difference between maximum and minimum speed during the cycle

- b. Difference between maximum and mean speeds during the cycle
- c. Difference between mean and minimum speeds during the cycle
- d. Mean of maximum and minimum speeds during the cycle

6. Which of the following is an open pair?

- a. Journal bearing
- b. Ball and Socket joint
- c. Leave screw and nut
- d. None of the above

7. The Kutzbach criterion for determining the number of degrees of freedom (n) is (where l = number of links, j = number of joints and h = number of higher pairs)

- a. $n = 3(l-1)-2j-h$
- b. $n = 2(l-1)-2j-h$
- c. $n = 3(l-1)-3j-h$
- d. $n = 2(l-1)-3j-h$

8. A fixed gear having 200 teeth is in mesh with another gear having 50 teeth. The two gears are connected by an arm. The number of turns made by the smaller gear for one revolution of arm about the centre of bigger gear is

- a. 2
- b. 4
- c. 3
- d. None of the above

9. When brakes are applied on a moving vehicle; the kinetic energy is converted to

- a. Mechanical energy
- b. Heat energy
- c. Electrical energy
- d. Potential energy

10. The following is not a drum brake

- a. External contracting brake
- b. Internal expanding brake
- c. Disc brake
- d. All of the above

NEW SMARTPHONES

1. Samsung Galaxy S20/S20 Plus/S20 Ultra



Samsung's S20 series are powered by a Qualcomm Snapdragon 865, AMOLED 120Hz refresh rate displays ranging from 6.2 to 6.9 inches, 12GB RAM (with 16GB option), 128GB to 512GB storage options with a microSD for even more capacity, three rear cameras (the Ultra has unique camera specifications), IP68 rating, WiFi 6, and Bluetooth 5. Battery capacity ranges from 4,000 to 5,000mAh. The S20 does not support high band (mmWave) faster 5G networks so make sure you pick the device that will fit your network needs.

LG V60 ThinQ 5G

The LG V60 ThinQ 5G is composed of two pieces of Gorilla Glass 5 with a metal frame and is certified for shock resistance to MIL-STD 810G. LG's new phone has a 6.8-inch OLED panel, Qualcomm Snapdragon 865,

8GB of RAM, 128GB of internal storage with a microSD card, and 5G. A Dual Screen cover is included for the \$900 price and gives you a large platform for serious productivity.



3. ONEPLUS 8/8PRO



This latest OnePlus flagship offers extremely responsive performance with its 90Hz and 120Hz displays, fast UFS 3.0 internal storage, generous RAM, and the latest Qualcomm Snapdragon 865 processor.

The phones are lovely with Interstellar Glow, Glacial Green, and other color options available. There are a couple of different RAM and internal storage options for each phone. With the size and battery capacity differences between the OnePlus 8 and 8 Pro, we also find some differences in cameras, display refresh rate, and wireless charging functionality.

GREAT QUOTE

Biswaranjan tarai, 4th year, mechanical

- ❖ *"Start writing, no matter what. The water does not flow until the faucet is turned on."
- Louis L'Amour*

- ❖ *"Get it down. Take chances. It may be bad, but it's the only way you can do anything really good."
- William Faulkner*

- ❖ *"The first draft is just you telling yourself the story."
- Terry Pratchett*

- ❖ *"You don't start out writing good stuff. You start out writing crap and thinking it's good stuff, and then gradually you get better at it."
- Octavia E. Butler*

- ❖ *"Start before you're ready."
- Steven Pressfield*

❖ *"You can always edit a bad page. You can't edit a blank page"*

- Jodi Picoult

The End