Issue No. 2017/01-02

IEI - TLC - NEWS

IN-HOUSE NEWS LETTER OF

THE INSTITUTION OF ENGINEERS (INDIA)

TIRUCHIRAPPALLI LOCAL CENTRE

CHAIRMAN: Er. R. SELVARAJ, FIE HON. SECRETARY: Er. S. LAKSHMANAN, MIE

CHAIRMAN SPEAKS.....

Dear Engineers,

Warm & Best Greetings to all.

Very happy to meet all of you through our IEI-TLC E Newsletter.

It is a great pleasure for me to appreciate that the editorial team of IEI-Tiruchirappalli Local Centre in bringing out the second issue by taking lot of initiatives.

After the new team taken over, so far we have conducted & covered the following nine Engineering disciplines technical programmes. (I.e.) Agriculture Engineering, Aerospace Engineering, Computer Engineering, Civil Engineering, Electrical Engineering, Mechanical Engineering, Metallurgical & Materials Engg, Marine Engineering, Production Engineering.

We are yet to cover the following six Engineering disciplines (I.e.) Architectural Engineering, Chemical Engineering, Environmental Engineering, Electronics & Tele Comm. Engg, Mining Engineering, Textile Engineering which we are planning in the forthcoming months. I request all the members to attend the forthcoming technical programmes & get benefitted.

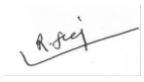
We are planning to convene a national level seminar in the 3rd quarter which shall be announced after getting the approval from HQ.

I request all our members to motivate new members to join our IEI to increase our strength. We are requesting, expediting & trying to motivate all the engineering colleges and polytechnics in our zone to establish student chapters

We solicit your support to make our local centre to be the best to disseminate the Engineering knowledge to this part of our country.

With Best Wishes.

With Warm Regards,



(R. SELVARAJ)

SECRETARY DESK.....

Dear Readers,

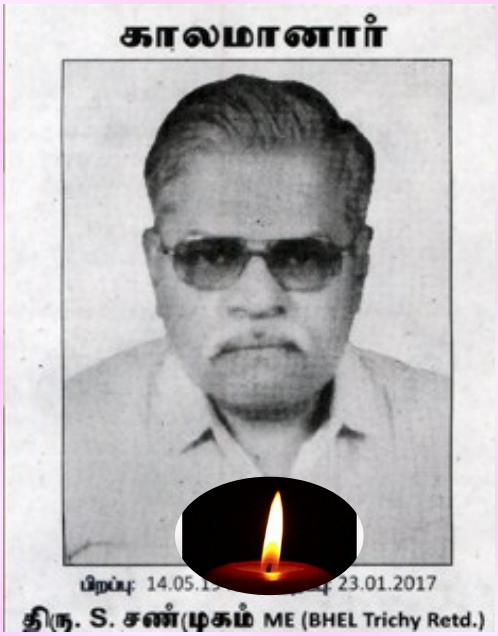
We are happy that our service of initiating this Engineering News Letter service to our Members makes us to feel happy. We are also being a small Brick in the construction of the Great Engineering Fraternity in general and made a significant milestone in the development of our Local Centre in particular.

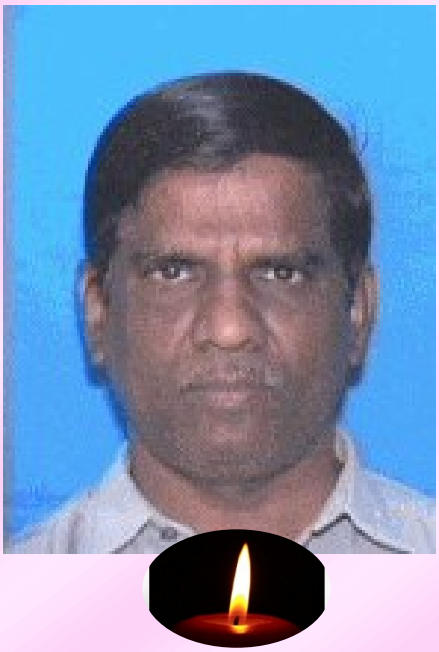
Your support in every aspect of further development of this newsletter will definitely makes this newsletter to shine brighter in the future. Your feedbacks are always welcome and we are expecting for that. Let us join hands together and make a better world.

With Best Wishes.

With Warm Regards,

(S. Lakshmanan)





IEI - TLC

DEEPLY MOURNS THE DEMISE OF

ER. S. SHANMUGAM

PAST HON. SECRETARY OF THE CENTRE (2002-2004) &

SR. MEMBER OF THE INSTITUTE

WE CONVEY OUR CONDOLENCES TO THE BEREAVED FAMILY AND PRAY THE ALMIGHTY TO REST THE GREAT SOUL IN PEACE

IEI - TLC

DEEPLY MOURNS THE DEMISE OF

ER. R. SUBBURAJ

FORMER COMMITTEE MEMBER OF THE CENTRE

&

SR. MEMBER OF THE INSTITUTE

WE CONVEY OUR CONDOLENCES TO THE BEREAVED FAMILY AND PRAY THE ALMIGHTY TO REST THE GREAT SOUL IN PEACE

CONTENTS

NEWS FROM HQ

Certificate of Competency for Professional Engineers

Dear Sir,

Under the mandate of the Royal Charter, conferred on 13 Aug, 1935, The Institution of Engineers (India) grants Certificate of Competence to the engineers by way of Professional Engineer Certification known as P.Eng. (India).

Professional Engineer (PE) Certification enables engineering professionals to advance their career inspiration and in wide ranging ways. The Institution of Engineers (India) has a laid down process to certify Professional Engineers after assessing the competency of the engineers as per criteria of eligibility and as per the assessment process.

Considering the high standards required of competence for the engineering profession, PE Certification not only enhances an engineering professional's stature, but also makes them suitable to attain higher levels of authority and responsibility. The contribution to career advancement is among the most important benefits of PE certified professional.

It is envisaged that due to the growing requirement of competent engineers in the Country, in future, only a professional engineer may prepare, sign, seal and submit engineering plans and drawings to a public authority for approval, or to seal engineering work for public and private clients. With the growing economy and massive expansion of technological infrastructure, the market demand of PE certified engineers are expected to be much higher. Rising to the occasion, The Institution of Engineers (India) has taken up this important responsibility of certifying the competency of engineers by way of Professional Engineers (PE) Certification and in short will be called as P.Eng. (India). The Register for PE Certified Engineers shall be maintained by IEI at national/regional level for benefits of various stakeholders.

Also P.Eng. (India) Certification enables an engineer to become an independent consultant, a government engineer or an educator.

In view of above, it is requested that a wide circulation of the above may be made among the engineers at various levels associated with your Centre and also to disseminate the information amongst the industries and Engineering Colleges in and around your area to enable them to obtain P.Eng. (India) Certification which will help the organization enhancing its human resource potential and capacity building.

This is important to mention that no other Professional Body in the country is associated with The Institution of Engineers (India) in the matter of PE certification.

We look forward to your participation in this endeavour to significantly enhance the professional standards of Engineers.

The interested candidates may contact: PE Cell, Office of DDG, The Institution of Engineers (India), 8 Gokhale Road, Kolkata 700020. Ph: 033-40106237/40106232/40106275/40106300. Mob: 8961080218.

The complete details of PE Certification, certification process, the guidelines and the forms are available on IEI website (www.ieindia.org).

Thanking you and expecting a positive response from your end.

With warm regards.

Maj Gen S Bhattacharya, (Retd.)

Secretary & Director General

"OCEAN ENERGY" - 03rd January

Division: ***Marine Engineering***

The First lecture of the year 2017 was delivered by Mr. Deepak Kumar Nayak, Engineer, R&D, BHEL on 3rd anuary 2017 at the lecture hall in the premsies of the institute. In his lecture Er. Deepak kumar said,

"There are five dfferent potential forms of ocean energy viz. Ocean tidal wavepower, Ocean wave power, Ocean water current, Ocean thernal energy conversion and salinity gradient."

He also enlightened the audience about the two diferent forms of generation method. Further He said, "The tidal turbine farms which uses the kinetic energy of the moving tide to rotate the submersed tidal turbine smialr to the wind mills. The tidal barrages (dams) which is similar to a small hydro power station where head of water is created during the igh tide by filling the articiial dam, where as, during the low tide, when water level of the sea is low, the difference in water level is used for running the power generation."

Follwing are the few highlights from his lecture.

- **The global tidal power is close to 2500 GW.**
- **We can tap 20 GW initially with the constraints in extracting the energy.**
- **World's first global tidal power station is the 240 MW Rance Tidal Power Plant in France which was built between 1960 and 1966.**
- **Tidal potential at Gulf of Kutch id about 900 MW and Gulf of Combay is around 7000 MW.**
- **East coast also has lots of potential.**

Er. S. Lakshmanan conducted the proceedings, Er. S. Karuppasamy, past chairman felicitated the speaker and Er. Madhavan proposed the vote of thanks.

"SECURITY IN CLOUD" - 10th January 2017

Division: ***Computer Engineering***

In the lecture organised on 10th January 2017 by the Centre in association with the Computer Society of India", Tiruchirappalli Chapter, Er. K. Vignesh, Asst. professor, of MAM College of Engineering spoke on the topic "Security in Cloud".

His lecture highlighted the security challenges and risks as well as various types of security measures viz. Software as a Service Security, Security Governance, Risk Management, Security Monitoring, Data Security, Application Security and Virtual Machine Security.

Er. R. Selvaraj, Chairman, IE (TLC) presided over the function. Er. D Setnhil Kumar, Hon. Treasurer, CSI< Tiruchy chapter welcomed the gathering. Er. S. Lakshmanan, Hon. Secretary, IE (TLC) conducted the proceedings. Er. S. Ramadas & Er. Chandrasekaran presented mementos to the speaker. Er. G Arumugam proposed the vote of thanks.

"ENERGY EFFICIENCY IN WELDING - EQUIPMENT, PROCESSES, PRACTICES AND ENVIRONMENTAL IMPACTS" - 17th Januarv 2017

Division: ***Production Engineering***

Er. V R Samuel delivered a lecture on "Energy Efficiency in Welding - Equipment, Processes, Practices and Environmental Impacts" on 17th January 2017. The joint lecture programme was jointly organised in association with IWS, IIM, IIW & ISNT.

Er. R. Selvaraj, Chairman, IE (TLC) and Hon. Secretary (IIW) presided over the function. Er. D Varatharajulu past Hon. Secretary welcomed the gathering. Er. S. Lakshmanan, Hon. Secretary, IE (TLC) conducted the proceedings. Er. N Parameswaran, Hon. Secretary, IIM Tiruchy chapter and Er. N. Subramanian, EC Member (ISNT) presented mementos to the speaker. Er. N Rajasekaran, Former National Secretary of IWS & Vice Chairman (IIM, Tiruchy chapter) proposed the vote of thanks.

Note: The entire presentation of Er. V R Samuel has been published in the Technical Pages of the newsletter.

"SYNTHESIS OF Al-MoO_3 COMPOSITES THROUGH OPTIMIZED POWDER METALLURGY PARAMETERS" - 24th January 2017

Division: ***Metallurgical & Material Science Engineering***

On 24th January 2017, the IIM Tiruchy chapter, IIW Tiruchy branch and IIIE, Tiruchy chapter have joined hands with IEI TLC to organise the lecture on "Synthesis of Al-MoO_3 composites through Optimized powder metallurgy parameters" at the institute premises.

Dr. M Ravichandran, professor & Director of Centre for Research of Chenduran College of Engg. & Technology shared his research work and enlightened the audience on powder metallurgy of Al

MoO_3 composites. It is worth to mention here that he is the recipient of Young Engineer Award from IE.

During his lecture he said, "Aluminum matrix composite with 10 wt% of MoO_3 particulate reinforcement was synthesized through powder metallurgy technique. The cold upsetting studies of the composites were investigated based on Taguchi L9 orthogonal array experimental design to evaluate the significance of compaction pressure, sintering temperature, and sintering time on strength coefficient. The combination of 350 MPa pressure, 600 °C temperature, and 90 minutes sintering time was identified as the optimum blend for maximum strength coefficient using the main effect plot. From the analysis of variance, compaction pressure and sintering temperature were identified as highly contributing parameters on strength coefficient. Further, a confirmation test was also conducted with the optimum parameter for validation of the Taguchi results. X-ray diffraction and scanning electron microscopy were used to confirm the presence of MoO_3 and its uniform distribution over the aluminum matrix."

Er. S. Ramachandran, Er. M Loganathan and Er. Anvar Ali honoured the speaker and Mr. K E R Chari, EC member of IIM Tiruchy proposed the vote of thanks. Er. G Arumugam welcomed the gathering.

"TECHNOLOGICAL DISRUPTIVE IDEAS IN FARMING – OPPORTUNITIES FOR ENGINEERS" - 31st January 17

Division: Agricultural Engineering

Er. P. Gomathi Nayagam, Consultant Agricultural Engineer / Approved Valuer, Chartered Engineer and Committee Member of IE (I) TNSC delivered the lecture at the institution premises on 31st Jan 2017.

In the well-attended programme, the speaker said, "For the Past 7 years has seen an unprecedented growth in technology, which has moved from playing a supportive role in business to "running the business itself". In the VUCA world (volatile, uncertainty, complex, Ambiguous world) of today people are not ready to think of innovation in Farming for fear of failure, fear of nature, lack of data, lack of "T experts", in the field of farming……

Disruptive technological efforts are happening in Delivery, organic retail outlet, Organic products etc. and people are thinking farm to fork etc. Organic products, organic shops etc. is not scalable, people are starting with small scale. They have to aim for minimum target within short period of launch of business. And there are tremendous opportunities in Lab to land, as our yield levels are very low, the average farmer is ignorant of his land, soil, water , do not have proper tools, farmer is not master of his chosen crops, and he is not properly using his resources ……."

He also highlighted about various models like E- National Agriculture Market, FPO, FPO plus Private equity, etc. He concluded that one has to work on pentagon of success theory, where one has to work on all five sides equally.

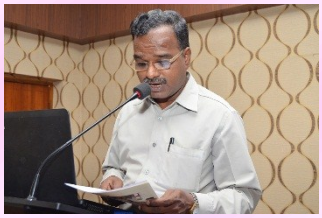
Earlier Er. D Senthilkumar introduced the speaker. Er. R Selvaraj, Chairman and Er. S. Ramadas, Sr. Member of the institute, honoured the speaker. Er. N Rajasekaran, proposed the vote of thanks and Mr. S Lakshmanan Hon. Secretary conducted the proceedings.

"BIO MATERIALS" – 07th February 2017

Division: Metallurgical & Material Science Engineering

Dr. N Ramesh Babu, Asst. professor, NIT, Tiruchy delivered the talk on "Bio Materials" in the lecture programme organised by the Centre in association with IIM TIRUCHY chapter & IIW Tiruchy branch on 7th February 2017.

Er. A. Anand, welcomed the gathering. Mr. S Samidas, past chairman and Mr. S. Ramachandran, Sr. member presented mementos to the speaker. Mr. N Rajasekaran, Committee member proposed the vote of thanks. Mr. S. Lakshmanan, Hon. Secretary conducted the proceedings.



In his lecture Dr. Ramesh Babu said, "Biomaterials can be derived either from nature or synthesized in the laboratory using a variety of chemical approaches utilizing metallic components, polymers, ceramics or composite materials. They are often used and/or adapted for a medical application, and thus comprises whole or part of a living structure or biomedical device which performs, augments, or replaces a natural function. Such functions may be relatively passive, like being used for a heart valve, or may be bioactive with a more interactive functionality such as hydroxy-apatite coated hip implants. Biomaterials are also used every day in dental applications, surgery, and drug delivery. For example, a construct with impregnated pharmaceutical products can be placed into the body, which permits the prolonged release of a drug over an extended period of time. A biomaterial may also be an autograft, allograft or xenograft used as a transplant material."

Earlier, the Members observed one minute silence as mark of respect to the departed soul of Mr. S Shanmugam, our past secretary.

"INFORMATION SYSTEM & THE ENTROPY" – 14th February 2017

Division: Computer Engineering

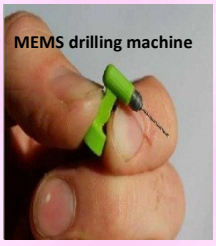
Er. Parigyan Singh, System, Engineer, BHEL Tiruchy delivered the talk on "Information System & the Entropy" on 14th February 2017 in the lecture programme organised in association with CSI, Tiruchy chapter.

The topic covered the core philosophy and fundamental concept of entropy. The role of entropy in information system. Importance of entropy theory in Data compression & Efficiency of compression algorithm. The topic also covered the philosophical aspect of entropy in day to day life.

Earlier Er. D. Senthil kumar, Hon. Treasurer, CSI, Tiruchy chapter welcomed the gathering. Er. M. Chockalingam & Er. S. Samidas presented mementos to the speaker. Er. G Arumugam proposed the vote of thanks. Er. S Lakshmanan conducted the proceedings.

"MEMS BASED POCKET FACTORY" - 21st February 2017

Division: Mechanical Engineering



Dr. TTM. Kannan, Associate Professor, Department of Mechanical Engineering, Indra Ganesan College of Engineering, Tiruchy delivered the talk on "MEMS based pocket factories" a contemporary topic for the audience. In his lecture he highlighted that Pocket factory is a small dimensioned factory which is suitable for batch production with maintained by clean environment. Main objectives of pocket factory is greater saving of energy, space, time, materials and all resources, Pocket factory is a future manufacturing system which is fabricated by Micro Electro Mechanical System devices. Pocket factory consists of Micro Lathe, Micro drilling, Micro milling and Micro grinding with clean environment for micro machining process. MEMS is an integration of Mechanical MEMS based pocket factory has potential to revolutionize both industrial and consumer products with micro

manufacturing technologies. Pocket factory can bring the remarkable improvement to manufacturing sustainability such as Environment, Economic and Social.

Earlier Er. G Arumugam welcomed the gathering. Er. M. Chockalingam & Er. S. Samidas presented mementos to the speaker. Er. Selvarajan proposed the vote of thanks. Er. S Lakshmanan conducted the proceedings.

"RAPID MANUFACTURING" – 28th February 2017

Division: ***Production Engineering***

Dr. S Vinod, Asst. Professor of NIT, Tiruchy delivered the talk on "Rapid Manufacturing" at the institution premises on 28th February 2017. The lecture focused on deliberation of fundamentals and advancements of Rapid Manufacturing and Product development.

He started the lecture with various phases of product development such as concept design, detail design, engineering analysis & optimization, prototyping and manufacturing. A comparative analysis of sequential and concurrent engineering is presented coupled with tools/techniques of product development such as brainstorming, Pugh concept selection charts, TRIZ etc. also covered. Comparison of Additive and subtractive manufacturing processes were highlighted with the process overview on Additive Manufacturing. Principles and process details of three major Additive Manufacturing processes such as Stereo lithography (SLA), Selective Laser Sintering (SLS), Fused Deposition Modelling (FDM) were presented highlighting the applications and drawbacks. Insights on 3D Printers and potential applications were deliberated. Two application case studies on Rapid Manufacturing were discussed addressing various phases as well tools/techniques.

Environmental impact analysis and Life Cycle Assessment for additive manufacturing were also discussed. Scope of research centers involved in additive manufacturing as well research avenues on Rapid Manufacturing were part of the lecture. The lecture concluded with the prospects of Rapid Manufacturing and 3D printing in enabling manufacturing process innovation.

Earlier Er. A. Anand welcomed the gathering. Er. S Dharmalingam & Er. S. Samidas, Past Chairmen presented mementos to the speaker. Er. G Arumugam proposed the vote of thanks. Er. S Lakshmanan conducted the proceedings.

The Laurels & Accolades

- ✓ Er. A. Santhakumari, SDGM, WRI, BHEL received the BEST WOMEN EXECUTIVE AWARD 2016 of PSUs by SCOPE.

- ✓ **Er. A. Santhakumari, SDGM, WRI, BHEL has been conferred as 'Eminent Women Engineer Award 2017' by IEI, Hosur Local Centre**
- ✓ **The following members were enrolled / upgraded as Fellow of IE.**
    - **Dr. Natatrajan Kumaresan**
    - **Er. R. Annadurai**
    - **Er. A. Santhakumari**
    - **Er. N. Rajasekaran**
    - **Er. E. Rajasekaran**
- ✓ **The following members were enrolled / upgraded as Member of IE.**
    - **Er. MG Geena**
    - **Er. G Mahadevan**
    - **Er. M. Sukumar**
    - **Er. M. Elangovan**
    - **Dr. M. Chandrasekar**
    - **Dr. (Ms). N Sozhamadevi**
    - **Er. D Suresh**
    - **Er. R Sowmyalakshmi**
    - **Dr. H. Habeebbullahsait**
    - **Er. P Ramadevi**
    - **Er. B Nagarajan**
    - **Er. R jayarani**
    - **Er. R Gandhi Raj**
    - **Er. S Durairaj**
    - **Er. P Vijayarajan**
    - **Dr. G Balakrishnan**
    - **Er. M. Tamilselvan**
    - **Dr. M. Balasingh Moses**
    - **Er. S. Karthikeyan**
    - **Er. S Shanmuga Priya**
    - **Er. R Ravindran**
    - **Er. M Abdul Hak**
    - **Er. A Kamal Raj**
    - **Er. S Pauline**
    - **Dr. S. Ramesh Kumar**
- ✓ **The following members were enrolled / upgraded as Associate Member of IE.**
    - **Er. M. Angelo Prem**
    - **Er. M Maharaj**
    - **Er. M. Palanisamy**
    - **Er. R. Dharniee**
    - **Er. R Nisha**
    - **Er. M Aarthi**
    - **Er. N. Viswanathan**
    - **Er. P Selvan**
    - **Er. S Arunvinthan**
    - **Er. R Jayaraj**
    - **Er. R Hariharan**
    - **Er. R Shivakumar**
    - **Er. S A Mohamed Fashith**
    - **Er. S B M Priya**
    - **Er. K R Kaarthika**
    - **Er. V Uma**
    - **Er. V Sriramulu**
    - **Er. D Raja**
    - **Er. M Priya**
    - **Er. O Premavathi**

FOR KIND INFORMATION OF MEMBERS

Electrical Engineering Division Board of IEI, in the recent meeting held at Aurangabad has approved the proposal OUR LOCAL CENTRE to host the 33rd National Convention of Electrical Engineers 2017. The Convention will be held in November 2017 at Tiruchirappalli. Additional details will be shared in the next Newsletter.

MARCH 2017			
Date	**Division**	**Topic**	**Speaker**
07-03-2017	Aerospace Engineering	An Over view of Aircraft- Engine Operations	Er G Arumugam, *AE, BHEL*
14-03-2017	Computer Engineering	Wireless Sensor Networks	Er K Muthuramalingam, *Asst. Prof. BDU*
21-03-2017		World Water Day 2017 on the Theme "Wastewater"	Dr R Ilangovan, *ME, PhD., former Chief Engineer, PWD*
28-03-2017	Mechanical Engineering	Quality Circle – A systematic approach to develop a Total Quality Person	Er C Balaji, *Sr. Engr., BHEL*
APRIL 2017			
Date	**Division**	**Topic**	**Speaker**
04-04-2017	Electronics & Commn. Engg.	Control of Induction Generators	Dr S Senthil Kumar, *Asst. Prof., NITT*
11-04-2017	General & Inter-Disciplinary	General Sales Tax	Er. T V Sundaram, *Sr. Manager, BHEL*
18-04-2017	Production Engineering	Familiarization of 16 Different NDE Methods	Er T Gurunathan, *Addl. GM, BHEL*
25-04-2017	Mechanical Engineering	Experimental Investigation and Optimization of Milling Parameters for Machining Aluminum Silicon Carbide Composite using Design of Experiment Approach	Dr M. Ganesan , *Assistant Professor, Saranathan College of Engineering*

For Details Please see Engagement Column of Leading Newspapers of Tiruchirappalli

16th MAY 2017

World Telecommunication and Information Society Day (WTISD 2017)

TECHNICAL PAGES

Energy Efficiency in Welding

(Equipment, Processes, Practices and Environmental Impacts)

Ratchanniya Samuel V, *Dy. General Manager, Maintenance & Services, BHEL, Tiruchy*

INTRODUCTION

Welding equipment, no exception, are a major power consumer machines in industries. Welding annually consumes at least $15 million worth of electricity in the United States and about $99 million worldwide. About 600 arc welding machines are installed in BHEL, Tiruchy and 600,000 machines in India (estimated) – 500 Gown (Units) a year. Every conventional welding machine consumes 800 Units/per year. Today's manufacturing environments need an energy-efficient, reliable welding program that not only produces quality welds using multiple processes but also saves on operating and electricity costs. Using energy efficient welding equipment, efficient welding processes and intellect practices shall fetch benefits such as energy conservation, material savings, cycle-time reduction, conservation of resources and protection of environment.

ENERGY EFFICIENCY IN WELDING EQUIPMENT

Evolution of Arc Welding Machines & Efficiency

- Engine Driven Generator Sets : 20 to 30%
- Motor Generator Sets – Field Control : 30 to 40%
- Transformer Rectifier Machines - Moving Core/Coil : 35 to 45%
- AC Transformers - Moving Core/Coil : 40 to 50%
- Thyristor Machines – Reactor Control : 50 to 60%
- Transistor / BJT Machines – Invertor / Multi process : 50 to 60%
- MOSFET Machines – Invertor / Multi process : 60 to 70%
- IGBT controlled Machines – Invertor / Multi process : 75 to 80%
- SiC Device Based Machines : Energy Efficient : 78 to 90%

Older welding power sources lack the energy-saving capabilities of newer technology. Therefore equipment older than 5 years are to be revisited. Latest welding power sources offer many benefits like Multi-process, increased weld quality, increased metal deposition, increased energy efficiency and better reliability. Depending on the technology used, efficiency of welding equipment varies from 30% to 90%. Based on the application and end use an appropriate welding machine may be chosen that provide multiple advantages.

Means of achieving Energy Efficiency-Considerations

- Selection of welding machine – site or shop?
- Engine driven or Motor driven?
- Engine with Carburetor or Electronic Fuel Injection (EFI)?
- DC Generator – Commutator or Rectifier Diode?
- Transformer and Rectifier – Moving Core/Coil?
- Energy Efficient Transformer?
- Current/Voltage variation by SCR or Tap changing?
- Rectifier / Controller – Transistor or MOSFET?
- Inverter with IGBT or SiC Device?

Inverter welding machines that uses IGBT renders energy efficiency up to 85% whereas SiC based IGBT of latest technology provides efficiency up to 90%. Inverter welding machines are much superior to Diode, Thyristor (SCR), Transistor (BJT) or MOSFET based welding machines in terms of energy efficiency, multi-process, size, weight, operating cost, power factor, idle power losses, etc. For site applications, oil engines with Electronic Fuel Injection (EFI) and Diode based rectifier instead of Commutator in DC Generator are much efficient as compared to conventional machines.

Resistance welding machines are very widely used in sectors such as automobile, sheet metal, railway coach industries, etc. Spot Welding for thin sheet lap joining in car bodies, Projection welding for welding of machined components, Seam Welding for lap joining of thin sheets in automobile shops, Butt welding for welding of wires and flats (power saw blades), Flash Butt Welding for car rims, rails

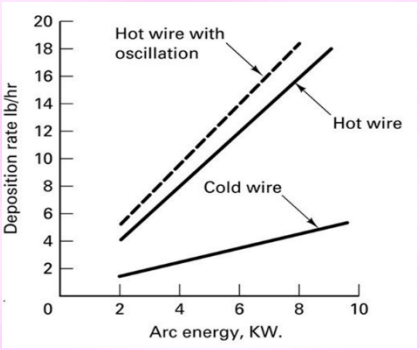
(Railway tracks) and Induction Pressure Welding for boiler tubes & ERW (GI) pipes are popularly used in manufacturing sectors. Certain Special welding Processes like Micro spot welding for micro-electronic power devices, Wire seam welding for food containers / beverage packs, Spiral Fin Welding for heat exchanger components and Foil Butt Seam Welding for building Railway coaches and sheet metal products are also used in industries.

Conventional resistance welding machines with AC Transformer operate with 60 to 70% Conversion efficiency, 3 phase DC Rectifier Machines provides 65 to 75% efficiency due to lower secondary circuit impedance and Inverter Machines render 75 to 80% efficiency due to lower circuit impedance & improved conversion technology in addition to improved weld quality. Intelligent Welding Controllers are available that saves energy and improves quality in resistance welding. Few billions of kWh electrical energy could be conserved annually in car industries alone worldwide.

ENERGY EFFICIENT WELDING PROCESSES

Any attempt made for Energy Efficiency results in improved process efficiency, improved productivity, reduced heat input, controlled distortion in end product, cycle time reduction in manufacturing cycle, improved quality, cost reduction and the process become environmental friendly.

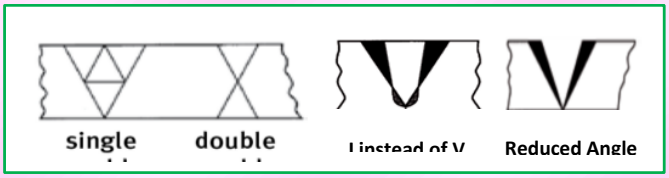
Energy Efficient Welding Processes
- GMAW over SMAW
- FLUX and CORED (FCAW) process
- TWIN Arc Welding in Automated processes
- HOT Wire TIG processes
- COLD Wire Addition is SAW process
- Metal POWDER addition in AUTO welding
- TANDEM ARC welding in SAW
- LASER Augmented TIG welding



Many developments in welding processes have taken place worldwide to fetch the above mentioned benefits. Some of the Energy Efficient Welding Processes are GMAW (in place of SMAW), Flux and Cored Arc Welding (FCAW) process, TWIN arc welding in automated processes, HOT wire TIG processes, COLD wire addition is SAW process, Metal powder addition in AUTO welding, Tandem arc welding in SAW, LASER Augmented TIG welding, and TIP TIG are a few to mention. Implementation of these processes fetches benefit of increased productivity, cost reduction, improved quality in addition to good amount of energy conservation.

IMPROVING PROCESS EFFICIENCY BY BETTER PRACTICES

Better weld procedures and practices we follow in industries can help a lot to save energy by improving process efficiency. Reduction in weld size for optimised weld quality is a simple method. Fillet welds with a small increase in fillet leg length has a dramatic increase in the volume welded. The weld volume is proportional to the square of the leg length, that is, doubling the weld length increases the weld volume four times, tripling increases the volume nine times.

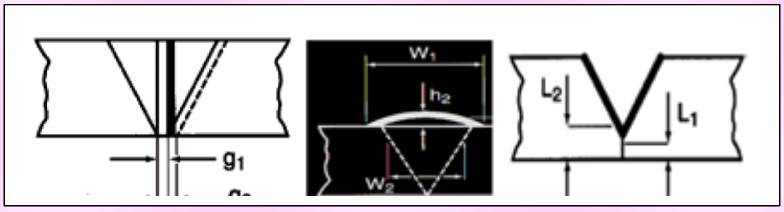


Optimising included angle in Butt Joints: reducing the included angle of V-type weld preparations reduces the weld volume (shaded area). Sufficient access to the side walls of the weld preparation is to be ensured while checking contract specifications. Double V edge preparation instead of Single V preparation for the same parent metal thickness, normally halves the total weld volume. If the weld is

back-gouged, weld volumes are normally reduced when the parent material is 20 mm or thicker. This joint preparation result in lesser heat input in addition to cycle time reduction in production shop.

U or J shaped weld preparations on thicker parent metals drastically reduce weld volumes. The machinery costs are offset by the savings through reduced welding volumes (shaded area).

Optimize root face, root gap and welding cap in butt joints. A small change to the root face size (L1 to L2), welding cap (W1 to W2) and root gap (G1 to G2) can decrease the total weld size dramatically.



Other tips include: Quality control will save time, money, electricity and consumables, while keeping quality high. Minimise the welding you need to do. Extrusions or prefabricated parts can eliminate the need for welding in some parts of the product. Keep up to date with your suppliers about the extrusions or prefabrications / sub-assemblies that are relevant to the product. Have a weld map for repetitive work. Having a set plan for welding reduces errors and time spent correcting faulty work.

Saving material by design: Strongall (a patterned technology) method, developed by French boat builder Meta, employs a self-supporting structure - no ribs and rib bands - reliant on thick aluminium plates. It reduces construction time by up to 25%, including decks and fittings.

Equipment maintenance is equally important to improve machine up time. Other factors: Electric Welding Processes are much efficient. Use only correct rating of welding equipment. Use as much electricity as you need. Using a welding machine that is too large wastes electricity and consumables. Consider upgrading old equipment. Newer equipment may have much better power factors and lead to significant energy savings. Check with supplier about the most energy-efficient models.

ENVIRONMENTAL IMPACTS OF WELDING

Like any other manufacturing methods, welding is a process for which inputs are Weld wire, Electrical energy, Flux, Gas, etc. while the out puts are welded product, heat - radiated, conducted & convicted, arc that produces light radiation, gases (toxic), spatter and slag. Since weldment is the only useful product, efforts to minimize other out puts greatly enhances process efficiency in addition to reduction of environment pollution.

- Each kWh produces 0.24 kg (0.524 lbs) of carbon dioxide, this convert to 2,15,102 MT (474,220,000 lbs) less carbon dioxide release to the air.
- Modern welding machines can considerably reduce carbon emission

Welding fumes are a complex mixture of metal vapour, metallic oxides, silicates and fluorides. Since these fumes are toxic gases in nature, it should be properly extracted from the weld zone. Weld slag is solid waste produced by certain welding processes, proper care is to be taken for safe disposal of this waste. Old process like Fusion Welding Process is one of the most inefficient method that produce large amount of slag in addition to pollution of the entire shop with dust and high noise due to pneumatic chip removal.

Finally energy conservation in welding not only saves energy but also greatly helps in conservation of the environment. Each kWh of electricity generation using fossil energy produces 0.24 kg (0.524 lbs) of

carbon dioxide that directly responsible for global warming. Several millions of Metric Tons of CO_2 production could be reduced by minimizing fumes produced by welding various processes.

CONCLUSION

Energy efficient welding machines helps to conserve energy with added advantages such as multi process, versatility, low operating power, high power factor, smaller size, less weight, etc. Efficient welding processes discussed above enhance productivity through increased metal deposition rate, improved quality and so on. Intellect welding practices shall fetch benefits such as energy conservation, material savings, cycle-time reduction, etc. Together, all the above aspects help industries for conservation of resources and protection of environment.

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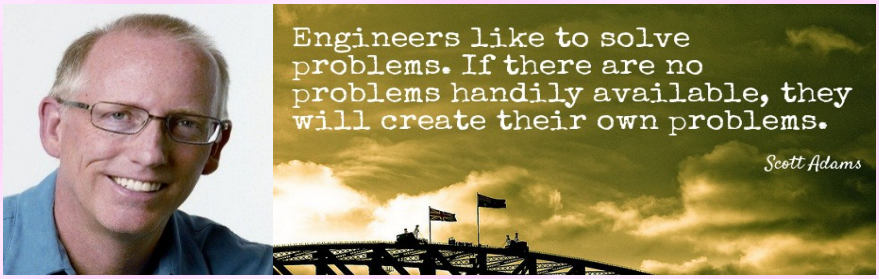

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