



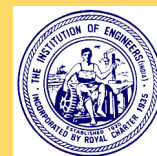
Issue No. 2018/0318

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 eleventh issue by taking lot of initiatives

From April 2017 up to March 2018, so far we have conducted & covered the following 15 engineering disciplines technical programmes. (I.e.)

Chemical Engineering, Computer Engineering, Electrical Engineering, Electronics & tele. comm. engg, Mechanical Engineering, Marine Engineering, Production Engineering and also about Goods & Services Act in General & Inter Disciplinary area. Architectural Engineering, Aerospace Engineering, Environmental Engineering, Metallurgical & Materials Engg, Textile Engineering and Mining Engineering

So far we have covered about 61 Technical programs from April 2017 up to February 2018.

We have conducted 50th Engineers Day at our Institution Premises with more than 250 members participation which was conducted in a Grand Manner.

We have conducted 33rd Electrical Convention, four one day seminars and one Energy Conservation Expo.

We have organised one industrial tour to M/s Saranya Mills, Namakkal, on 18th February 2018

We are motivating our Technicians & Senior Technicians to form study circles & promote our AMIE Studies. We extend all our support for the same.

I request all the members to attend the forth coming technical programs & get benefitted.

I request all our members to motivate new members to join our IEI to increase our strength.

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.

(R. SELVARAJ)



SECRETARY DESK.....



Dear Readers,

THOUGHT

We can say thought is in God's Space. Whatever we think is the base for our words and our actions

Those who think higher will achieve higher status in life. Famous Thirukkural says.

வெள்ளத் தனைய மலர்நீட்டம் மாந்தர்தம்

உள்ளத் தனையது உயர்வு

For any changes to be made in whatever we speak or our actions we have to change the thoughts accordingly and reinforce that thought. Another Thirukkural

எண்ணிய எண்ணியாங்கு எய்துப எண்ணியார்

திண்ணிய ராகப் பெறின்

For planning future, we have to think of what we want to achieve. Then only we can shape our future.

WORDS

Words belongs to society. Whatever we speak to other persons we are responsible. Words come from the thought or by habit. Our word should be such that

கேட்டார்ப் பிணிக்கும் தகையவாய்க் கேளாநும்

வேட்ப மொழிவதாம் சொல்

ACTION

Whatever we do is ours. Society values us based on our action only. Society also sees whether we follow our own words in action.

Thought, words and action should be in - line to achieve greater heights

With Best Wishes.

With Warm Regards,

(S. Lakshmanan)



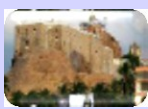
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“Failure is central to engineering. Every single calculation that an engineer makes is a failure calculation. Successful engineering is all about understanding how things break or fail”

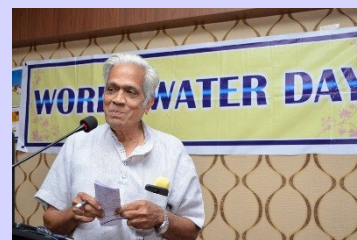
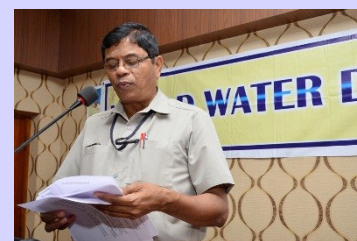
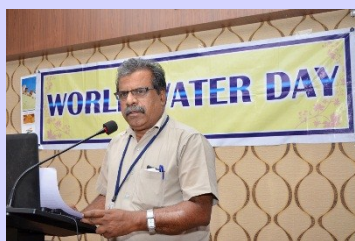
– Henry Petroski



WORLD WATER DAY 2018



The Tiruchirappalli Chapter of the Institution of Engineers (India) celebrated the World Water Day 2018 with a lecture by Er. P. Chidambaram, Senior Training Consultant, Irrigation Management Training Institute, Thuvakudi, Tiruchirappalli on the theme "Nature for Water". The celebrations were held on 22nd March 2018 at the APJ Abdul Kalam lecture hall of the institute. The excerpts of the lecture are furnished in the technical pages.



Earlier, Er. S. Lakshmanan, Secretary, IEI, TLC welcomed the gathering and conducted the proceedings. Er. N. Rajasekaran, committee member, IEI TLC read the message on the theme of this year. Presiding over the celebrations, Er. R. Selvaraj, Chairman, IEI TLC stressed the need to preserve water for the future of the planet. A memento was presented to the speaker by the chairman. Er. K. Ramadoss, Sr. member of the institute introduced the speaker and Er. D. Harsha offered his felicitations and briefed about the initiatives of BHEL for water conservation. Er. D. Senthil Kumar, member of IEI proposed the vote of thanks.



MEGA TECHNICAL PROJECT EXPO'18 ON "ENERGY CONSERVATION"

The Institution of Engineers (India) Tiruchirappalli Local Centre & Student's Chapter (621105/MCET/EE) in association with the Department of Electrical and Electronics Engineering, M. A. M College of Engineering and Technology, Siruganur, Tamilnadu Generation and Distribution Corporation (TANGEDCO) & Energy Efficiency Services Limited (EESL) organized **A Mega Technical Project Expo'18 on "Energy Conservation"** at 9:00 AM on 25th March 2018 at St. Joseph's College, Community Hall, Tiruchy.



Energy Conservation is the need of the hour. Now-a-days the fear of running out of all our energy resources is the new buzz which is going around. The main reason for this energy crisis is over consumption of energy resources. If this problem is overlooked now then our future generations will be deprived of the basic amenity like electricity. Can we imagine a day when we cannot even switch on the lights and fans due to lack of energy resources that generate electricity? Some steps have to be taken now to conserve the energy resources. The government and other

bodies are doing their part in order to save the future but unless and until each individual does not come forward and understand their responsibilities nothing much could be expected. We can conserve the energy by properly managing our electrical appliances such as lights, fans, air conditioners, heaters etc. If we follow a routine in which we make it a point to properly save and conserve electricity, we can definitely observe the changes which will be reflected in our electricity bills. By just improving on our day-to-day habits of using the electricity we can analyse that we have slashed our electricity bills by almost 50%. 01 unit of Energy saved equals 03 units of Energy generated.



The Mega Technical Project Expo'18 was inaugurated by Er. S. Prakasam, Executive Engineer, TANGEDCO, Srirangam. He explained how to conserve energy and methods to build solar roof for houses and government grants information (TEDA), ways to setup solar water pump for agriculture and government subsidy (NABARD), electrical safety, methods of saving Electricity, Methods of buying and using electrical goods, uninterrupted power supply (Solar UPS), Electric vehicles and power generation using renewable energy systems at home. His speech was very inspiring and he motivated the students and encouraged them to expertise in renewable energy systems.

Renewable energy is a critical part of reducing global carbon emissions. Renewable energy systems have been heavily encouraged by policy measures and financial support, with the explicit aim of driving costs down through early deployment. Today, hydro, wind and solar are the three main pillars for renewable energy sources. In the MEGA TECHNICAL PROJECT EXPO' 18, students of Electrical and Electronics Engineering department, MAMCET, Tiruchy had setup 25 stalls on various Energy Conservation projects like Solar, Thermal and Wind. To name a few projects of students demonstrated on the technical expo are as follows: Energy Conservation in Park, Solar Smart City, Energy Conservation at home, Wireless electricity Radio Frequency Transmission, Solar tracking using IoT, Building automation using IoT, Automatic control of residential lighting system and Smart prepaid energy meter. Few companies like EESL, Indar Electricals, Electric Bikes and a solar company had also put up stalls to demonstrate the general public on Energy consumption with their Solar based home products, Emergency lamps, etc.



“HIGHLIGHTS OF ENERGY AUDITING IN ELECTRIC AND THERMAL UTILITIES (HEALTH)”

In association with the Department of Mechanical Engineering of E. G. S PILLAY Engineering College (Autonomous), the local centre has conducted a one day programme on “**HIGHLIGHTS OF ENERGY AUDITING IN ELECTRIC AND THERMAL UTILITIES (HEALTH)**” on 14th March 2018 at the college premises.

In the one day event, the following resource persons delivered lectures.

Dr. S. Sambath, Assistant Executive Engineer, TNEB, Mannargudi

Dr. S. Chokalingam, Associate Professor – Mechanical, ESPEC, Nagapattinam

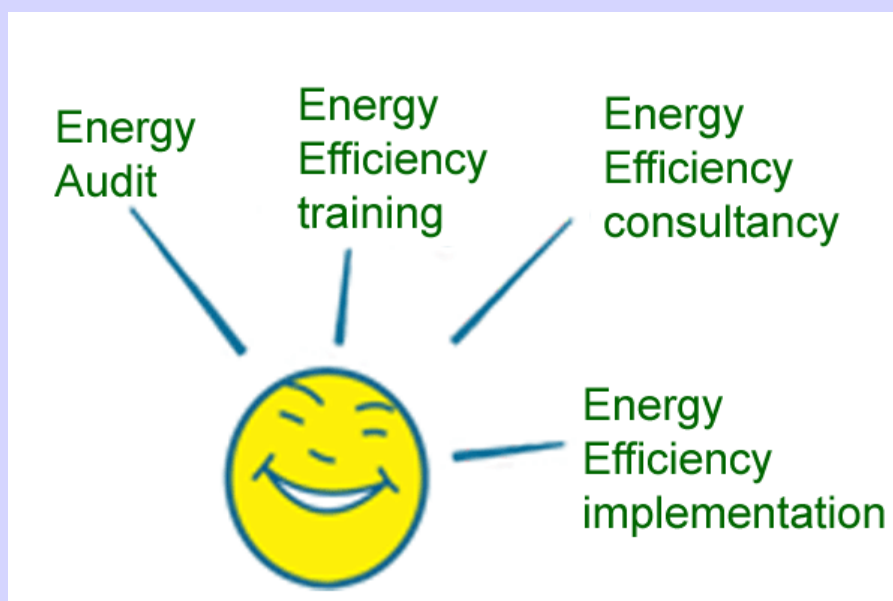
Prof. R. Rangarajan, Associate Professor – Mechanical, ESPEC, Nagapattinam

Dr. N. Sendhil Kumar Asst. Professor & Head - Mechanical, NIT - Puducherry (Approved Energy Auditor)



The invited talks by the speakers have enlightened the audience on various aspects of energy audit in thermal; electric power utilities and energy audit process in industries and also used to gain knowledge in electricity act ; energy auditing instruments like lux meter; anemometer; thermal imaging camera; power quality analysis to measure light; temperature; humidity; velocity and electrical parameter, etc.

Earlier, the programme was inaugurated by Er. R. Selvaraj, Chairman of IEI, TLC and Er. S Lakshmanan, Hon. Secretary of IEI TLC offered his felicitations. In his address, Mr. Selvaraj highlighted the benefits of energy conservation and briefed the audience about ISO 50001, the Energy Management System, which is resulting in direct savings to the organisations. He also briefed about Smart devices which led to energy savings.





Er. R Selvaraj, Chairman, IEI TLC inaugurated the event. Head of the Department of ICE and association in charge Dr. M. Shanmugavalli, and

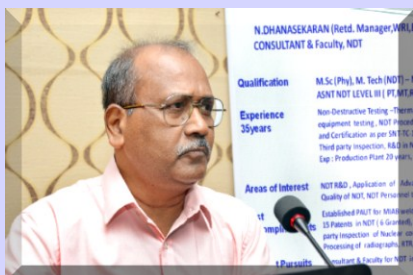
- Students from various colleges and students from our college has attended the workshop.
- Mr. Anish Kumar and Mr. Rajasekar from Optithoughts trained the students throughout the workshop.
- Introduction to the LabView and interfacing it to the myRIO was taught in the first session
- After that lunch was provided to the students and the second session is about how to interface the Internet of Things (IoT) with the LabVIEW using myRIO.
- The trainers explained about how LabVIEW is useful in industries and its importance.
- Finally the workshop was ended by issuing certificates to the students who participated in the workshop
- Students said that the workshop was quiet informative and useful one.





NDE METHODS

Division: **Production Engineering**



Er. N Dhanasekaran, ASNT NDT Level III, NDT consultant enlightened the members of the Institute on the NDE methods. The lecture programme was organised by the centre on 06th March 2018.

The Dentist explained the need and methods to prevent tooth decay and other dental problems. He also highlighted the rectifications available today, in the modern science. The lecture was well received by all the participants.

Er. S. Lakshmanan, Hon. Secretary, IE (TLC) welcomed the gathering and introduced the speaker. Er. R. Selvaraj, Chairman, IE (TLC) presided over the function and presented the memento to the speaker. Er. K. Ramadoss, Sr. member of IEI proposed the vote of thanks.



RLA & INSITU METALLOGRAPHY

Division: **Metallurgical & Materials Engineering**



Er. D Devanand, Dy. Manager, Plant Lab, BHEL delivered a lecture on “RLA & Insitu metallography” at the institution premises on 08th March 2018.

In his lecture he covered the importance, methods and national / international code requirements on metallurgical evaluation of creep serviced components of power plants for residual life assessment and life extension.



He also said, “Crept components after completing their designed life are examined for their “Fitness for the Purpose” or “Life Extension Programme”

as per the code requirements. Revised IBR–November 1998 made in-situ metallography – Replication as a mandatory requirement during periodic inspection in life extension programme (Temperature > 400°C)”.





Er. A Leelavinothan, Member, IEI TLC welcomed the gathering and introduced the speaker. Er. R. Selvaraj, Chairman, IE (TLC) presided over the function and presented the memento to the speaker. Er. A. Santhakumari offered her felicitations. Er. N Rajasekaran, Committee Member, IEI TLC proposed the vote of thanks. Er. S. Lakshmanan, Hon. Secretary, IE (TLC) conducted the proceedings.



GRAPHICS & ANIMATION

Division: *Computer Engineering*



Graphics and animation was the theme of the lecture by **Er. M Ramesh Babu, Sr. Faculty, Ozone Technologies & Solutions**. The programme was organised in association with the Computer Society of India, Tiruchirappalli Chapter on 13th March 2018 at the institute premises.

In his lecture he said, by using photoshop 3.0 we can correct and enhance the photos, create collages by adding multiple images, add text, graphics and artistic effects, organize photos and exhibit photos via slideshow, greeting card, postcards, calendars, etc. He also briefed about the shortcut tools and the work area in 3.0. He also said that the Photoshop Elements Quick Fix dialog box gathers several image correction tools in one spot viz. Straighten, Crop, Tonality, Colours and Sharpness. He also briefed about standard edit, background manipulation, healing brush, panorama, types of resolution, layers formation & editing, animation, etc.



Er. T Senthil kumar, Former Treasurer CSI, Tiruchy chapter, welcomed the gathering and introduced the speaker. Er. R. Selvaraj, Chairman, IE (TLC) presided over the function and presented the memento to the speaker. Er. K. Ramadoss, Sr Member of IEI offered his felicitations. Er M Chockalingam, Member, IEI TLC proposed the vote of thanks. Er. S. Lakshmanan, Hon. Secretary, IE (TLC) conducted the proceedings.

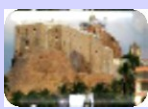


LASERS IN MATERIALS PROCESSING

Division: *Metallurgical & Materials Engineering*



On 16th March 2018, **Dr. B Shanmugarajan, Sr. Manager, WRI**, delivered a lecture on “Lasers in Materials Processing” at the Institution premises. The salient points of the lecture are detailed under technical pages. Er. S. Dharmalingam, Past Chairman, IEI, TLC welcomed the gathering and introduced the speaker. Er. R. Selvaraj, Chairman, IE (TLC) presided over the function and presented the memento to the speaker.



Er. G. Balakrishnan, Committee Member, IEI TLC proposed the vote of thanks. Er. S. Lakshmanan, Hon. Secretary, IE (TLC) conducted the proceedings.



MANAGEMENT IN THIRUKKURAL

Division: *National Language Promotion Committee*



Er. N Rajasekaran, Dy. GM, BHEL & Committee member of the centre, delivered a lecture on “Thirukkuralil Melaanmai (Mangement in Thirukkural” at the Institution premises on 20th March 2018.

During the talk, he presented and explained the Couplets (kurals) which are relevant to various aspects of management. IN his lecture he covered relevant couplets on Management,

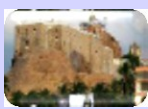
POSDCORB. Forecasting, strategy, SWOT, Planning, Execution, Motivation, Leadership, ROI & Investment, Finance, Recruitment, HRM, ERM, Communication, Competition, Knowledge Management, marketing, vigilance, customer relationship management, business excellence, crisis

management and CSR. In the programme conducted in Tamil, the speaker explained about the meaning of the couplets and their analogy with the managerial thoughts. In total, he mentioned about 85 Kurals in his lecture which are having the concepts of modern management.



Dr. S. Dharmalingam, Past Chairman, IEI, TLC welcomed the gathering and introduced the speaker. Er. R. Selvaraj, Chairman, IE (TLC) presided over the function and presented the memento to the speaker. Er. K Ramadoss, Sr. Member of IEI offered hid felicitations. Er. G. Balakrishnan, Committee Member, IEI TLC proposed the vote of thanks. Er. S. Lakshmanan, Hon. Secretary, IE (TLC) conducted the proceedings.





IOT APPLICATIONS IN AGRICULTURE

Division: *Agricultural Engineering*



Mr. J. ARUN PANDIAN, Assistant Professor, Computer Science and Engineering, M.A.M. College of Engineering and Technology delivered a lecture on “IoT Applications in Agriculture” at the Institution premises on 27th March 2018. The programme was organised in association with the Computer Society of India, Tiruchirappalli Chapter.

In his talk he said, “IoT agricultural applications are making it possible for ranchers and farmers to collect meaningful data. Large landowners and small farmers must understand the potential of IoT market for agriculture by installing smart technologies to increase competitiveness and sustainability in their productions. The demand for growing population can be successfully met if the ranchers as well as small farmers implement agricultural IoT solutions in a successful manner.” For more details refer technical pages.

Dr. S. Dharmalingam, Past Chairman, IEI, TLC welcomed the gathering and introduced the speaker. Er. R. Selvaraj, Chairman, IE (TLC) presided over the function and Er. K. Nagarajan, General Manager, Civil, BHEL presented the memento to the speaker. Er. G. Balakrishnan, Committee Member, IEI TLC proposed the vote of thanks. Er. S. Lakshmanan, Hon. Secretary, IE (TLC) conducted the proceedings.



EXPERIENCES IN COLD WIRE ADDITION IN LINE PIPE WELDING

Division: *Mechanical Engineering*



Er. M. Ramakrishnan, former Sr. Manager of WRI, BHEL has shared his experiences in cold wire addition in line pipe welding with the participants of the lecture programme held on 30th March 2018 at the institute premises.

During the lecture he said, “Cold wire addition provides an increase in deposition rate without an accompanying increase in heat input.

It also provides a finer heat affected zone grain structure and narrow heat affected zone compare to conventional submerged arc welding. Cold wire addition has produced quality welds with lower heat input per gram of deposited weld with substantial reduction in arcing time. NDT testing including, ultrasonic and radiographic inspections have been carried out. Fracture toughness of the wide groove weld made using tandem submerged arc welding was determined and compared





with that of the narrow gap welds. Also microstructure of the welds was studied. Destructive testing includes all weld tensile test, transverse tensile test, Charpy V-notch impacts, side, root, face bends and hardness surveys, metallurgical characterization was carried out and compared with the conventional welds. The results of all these tests ensured the quality of the weld made by cold wire addition technique”.



He also said, the cold wire addition technique has been successfully established for line pipe welding. During the occasion, Er. G Arumugam, Member, IEI, TLC welcomed the gathering and introduced the



speaker. Er. N Rajasekaran, Committee Member, IE (TLC) presided over the function and presented the memento to the speaker. Er. K Arivanandan, Sr. Member of IEI offered his felicitations. Er. Anand, Member, IEI TLC proposed the vote of thanks. Er. S. Lakshmanan, Hon. Secretary, IE (TLC) conducted the proceedings



NPTEL- National Programme on Technology Enhanced Learning is offering 270+ online courses under the SWAYAM Programme of the Ministry of Human Resources Development during July-October 2018 and Members of IEI can join these courses free of cost from the Login area of IEI Web portal.



TECHNICAL PAGES

INTRODUCTION TO NDT

N. DHANASEKARAN M. Sc (Phy), M. Tech (NDT)

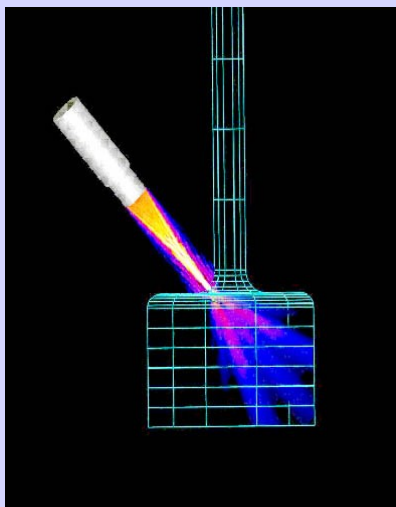
ASNT NDT LEVEL III (PT, MT, RT, UT)

CONSULTANT & FACULTY

ndsndt@gmail.com

INTRODUCTION

By definition non-destructive testing is the testing of materials, for surface or internal flaws or metallurgical condition, without interfering in any way with the integrity of the material or its suitability for service. The technique can be applied on a sampling basis for individual investigation or may be used for 100% checking of material in a production quality control system. Being a high technology concept, evolution of the equipment has made it robust enough for application in any industrial environment at



any stage of manufacture - from steelmaking to site inspection of components already in service. A certain degree of skill is required to apply the techniques properly in order to obtain the maximum amount of information concerning the product, with consequent feed back to the production facility. Non-destructive Testing is not just a method for rejecting substandard material; it is also an assurance that the "good" is good. The technique uses a variety of principles; there is no single method around which a black box may be built to satisfy all requirements in all circumstances. Brief description of the methods most commonly used in industry, together with details of typical applications, functions and advantages and the future trend follows:

NDT TECHNIQUES

NDT techniques fall into two categories:

1. Techniques which only detect and size defects/damage present on the surface of a component;
2. Techniques which can detect and size defects/damage embodied within a component.

Correct selection and application of an NDT technique can provide confidence that a component or piece of plant does not contain defects of the type which the technique was capable of detecting. The types of defect / flaw and degradation that can be detected using NDT are, Planar defects, Laminations, Voids and inclusions, Wall thinning, Corrosion pits, Structural deformities, etc.

Visual Inspection, Liquid penetrant testing, Magnetic particle testing, Ultrasonic testing, Radiography testing are popular NDT test methods.



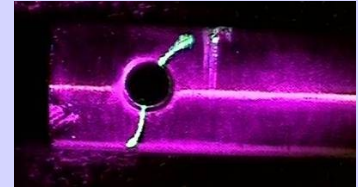
VISUAL INSPECTION

It is able to detect surface damage and distortion. However, access to the surface is required and the capability relies on the illumination and the eyesight of the inspector. Tools include fiberscopes, borescopes, magnifying glasses and mirrors.



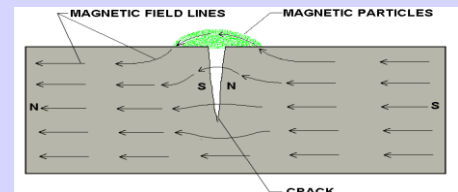
DYE PENETRANT INSPECTION

Liquid penetrant inspection is a method that is used to reveal surface breaking flaws by bleed out of a colored or fluorescent dye from the flaw.

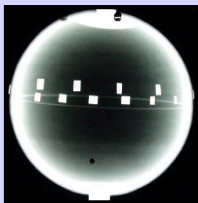


MAGNETIC PARTICLE INSPECTION

Defects on the inspection surface interrupt the lines of magnetic flux. Magnetic particles sprayed onto the surface are attracted to these defects identifying their position. This NDT method only detects abrupt changes in the magnetic field.



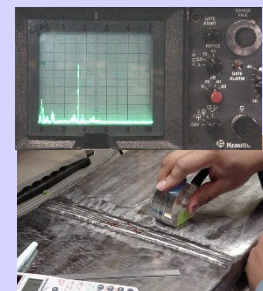
RADIOGRAPHY



Radiography is the detection of material loss by the variation in applied radiation, gamma or x-ray, passing through a component and impinging on a film. As it is sensitive to material loss, radiography is better suited to the detection of volumetric defects such as slag or porosity.

ULTRASONIC TESTING

Ultrasonic testing is the use of high frequency sound waves in a similar manner to sonar or radar: sound pulses are reflected from interfaces or discontinuities. In thickness checking the reflections from the wall surfaces are measured. In defect detection reflections from cracks, voids and inclusions are detected and assessed.



CONCLUSION

Extremely beneficial for evaluating product and material quality, researching and troubleshooting, the biggest advantage NDT methods offer is, they do not affect the object that is being tested in even a slight manner. The range and sophistication of non-destructive testing techniques now available is capable of finding defects far smaller than those which need to be eliminated from a structure if it is to perform its function satisfactorily. NDT is to be utilised by the industry for high productivity. Effective utilisation of various NDT methods suitable for their products will lead to high quality and customer satisfaction. It may be highly appreciated to get help from capable NDT personnel to get the best benefit from NDT for the safety of the world.



LASERS IN MATERIALS PROCESSING

Dr. B SHANMUGARAJAN

Sr. Manager, WRI, BHEL, Tiruchy – 620 014

INTRODUCTION

Laser is a beam of electromagnetic radiation with wavelengths ranging from ultra violet to infrared and has the following unique properties

- Highly directional – can travel long distances without spreading
- Coherent – constant phase relationship between the adjacent waves
- It is monochromatic

The nature of the beam enables it to readily heat, melt and vaporize any material. Hence, laser, as a single source can be used for variety of applications starting from simple heating to melting to vaporization. The operation can be performed by varying the intensity and interaction time combinations. The talk has covered various aspects of this combination and its usefulness for the application.

LASER SURFACE TREATMENT

The surface treatment is an operation performed to alter the microstructure/chemistry of the surface. Different laser surface treatment processes can be carried out using the laser.

a. Laser Hardening

The process can be performed only on materials which are amenable. Laser hardening is the process in which laser is used to heat the surface and take it to a temperature above upper critical range. The self-quenching due to rapid cooling will induce hard microstructures in the surface thereby enhancing the surface properties

b. Laser Cladding

Laser cladding is a process in which the chemistry of the surface is altered by melting and depositing a different grade of material on the surface using lasers. A variety of consumables can be used and deposited. Laser cladding finds its applications in aerospace, power, oil field, etc.

LASER ADDITIVE MANUFACTURING

It is a variant of laser cladding process. Laser Additive Manufacturing (LAM) can be performed by blown powder method, which is similar to laser cladding where in powders are melted and deposited in a sequence but the particle size of the powders will be finer. The second method is powder bed deposition, in which the lasers are used for selectively melting the powder in a programmed fashion to build a component. This method is also Direct Metal Laser Sintering.



LASER WELDING

Laser welding is a non-contact fusion welding process that produces coalescence of materials with the heat from a laser beam focused on the weld joint. Depending on the power of the laser source and the penetration requirement laser welding process can be classified into two major types viz.

a) Conduction mode

A process in which the surface is heated above the melting point but below the vaporization temperature. The melt pool is formed by the conduction of heat from the surface to the sub surface and the amount of the molten pool formed is limited by conduction hence, called conduction limited welding. The process is used for joining thin sheets or for sealing welds where the penetration requirements are minimal.

b) Keyhole mode

A process in which the welding is accomplished by the formation of keyhole – hot ionized metal vapour surrounded by thin film of liquid metal. The power/power density required for keyhole mode of welding will be of the order of 10^6 W/cm^2 . The keyhole will be moved along the joint wherein the molten metal ahead of the hole flow along the sides and solidifying at the rear end of the keyhole to form the joint. This mode of welding is used for deeper penetration welding.

Benefits of laser welding

Laser welding offers many advantages as listed below

1. Low and precise heat input
 - a. Narrow HAZ;
 - b. Low distortion
2. High welding speed and simple joint design
3. Easily amenable for automation
4. Due to the non-contact nature, can be used to weld in inaccessible location otherwise
5. Effective shielding of molten pool

Limitations of laser welding

Laser welding due to the nature of the power source has some limitations as listed below

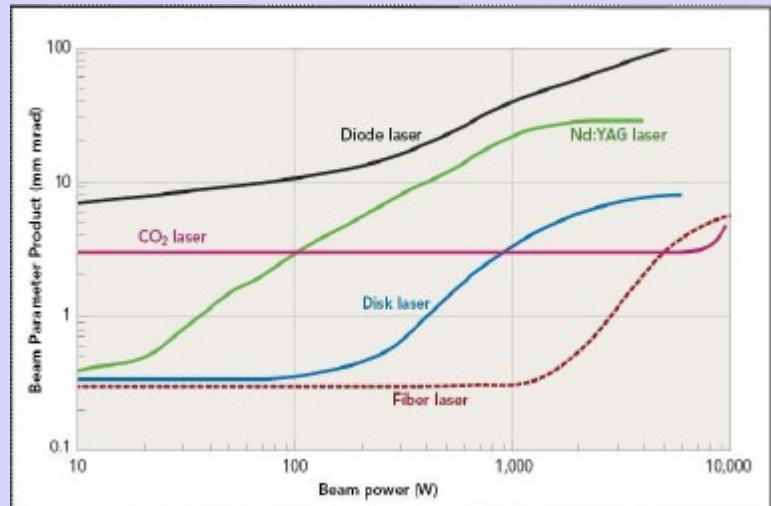
1. The laser welding equipment is capital intensive. Hence, the selection of such a process should be justified by the unique advantages lasers can offer compared to conventional welding.
2. Stringent joint fit up.
3. Can cause weld embrittlement in hardenable steels
4. Porosities in the welds while welding materials with volatile elements like zinc, etc.
5. Stringent eye safety precautions are to be adopted which can increase the cost.

LASERS FOR WELDING

Conventionally, CO₂ lasers and lamp pumped Nd : YAG lasers were dominating the welding market. In olden days only CO₂ lasers were available at high powers (>20 kW) and acceptable beam quality for deep penetration applications like cutting and welding. CO₂ laser at far infrared wavelength (10.6 μm) had some inherent disadvantages like it cannot be transported through fibre optic cables, difficult to



weld reflective materials like aluminium, etc. Nd : YAG lasers could overcome these limitations due to the near infrared ($1.064\ \mu\text{m}$) wavelength. However, the power availability was very limited. With the advent of high power Nd : YAG lasers ($> 4\ \text{kW}$) and more robust lasers like disc and fibre lasers, the use of fibre coupled lasers for welding applications has increased and hence laser welding could reach many horizons. The comparison of different lasers available with respect to beam quality is shown in figure.



As can be seen from the figure CO₂ laser, disc laser and fibre lasers have good beam qualities at higher power levels and hence more suitable for welding application.

Variants of Laser Welding

There are many variants available like laser-GMAW hybrid welding process, laser brazing, etc.

CONCLUSION

Lasers can perform wide range of operations and selection of proper laser source will help in efficient metal processing.



IOT APPLICATION IN AGRICULTURE

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INTRODUCTION

The Internet of Things (IoT) has the capability to transform the world we live in; more-efficient industries, connected cars, and smarter cities are all components of the IoT equation. However, the application of technology like IoT in agriculture could have the greatest impact.

The global population is set to touch 9.6 billion by 2050. So, to feed this much population, the farming industry must embrace IoT. Against the challenges such as extreme weather conditions and rising climate change, and environmental impact resulting from intensive farming practices, the demand for more food has to be met.

Smart farming based on IoT technologies will enable growers and farmers to reduce waste and enhance productivity ranging from the quantity of fertilizer utilized to the number of journeys the farm vehicles have made.

SMART FARMING

Smart farming is a capital-intensive and hi-tech system of growing food cleanly and sustainable for the masses. It is the application of modern ICT (Information and Communication Technologies) into agriculture.

In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system. The farmers can monitor the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach.

The applications of IoT-based smart farming not only target conventional, large farming operations, but could also be new levers to uplift other growing or common trends in agricultural like organic farming, family farming (complex or small spaces, particular cattle and/or cultures, preservation of particular or high quality varieties etc.), and enhance highly transparent farming.

In terms of environmental issues, IoT-based smart farming can provide great benefits including more efficient water usage, or optimization of inputs and treatments. Now, let's discuss the major applications of IoT-based smart farming that are revolutionizing agriculture.

APPLICATIONS OF IOT IN AGRICULTURE

1. Precision Farming: Also known as precision agriculture, precision farming can be thought of as anything that makes the farming practice more controlled and accurate when it comes to raising livestock and growing of crops. In this approach of farm management, a key component is the use of IT and various items like sensors, control systems, robotics, autonomous vehicles, automated hardware, variable rate technology, and so on.



The adoption of access to high-speed internet, mobile devices, and reliable, low-cost satellites (for imagery and positioning) by the manufacturer are few key technologies characterizing the precision agriculture trend.

Precision agriculture is one of the most famous applications of IoT in the agricultural sector and numerous organizations are leveraging this technique around the world. CropMetrics is a precision agriculture organization focused on ultra-modern agronomic solutions while specializing in the management of precision irrigation.

The products and services of CropMetrics include VRI optimization, soil moisture probes, virtual optimizer PRO, and so on. VRI (Variable Rate Irrigation) optimization maximizes profitability on irrigated crop fields with topography or soil variability, improve yields, and increases water use efficiency.

The soil moisture probe technology provides complete in-season local agronomy support, and recommendations to optimize water use efficiency. The virtual optimizer PRO combines various technologies for water management into one central, cloud based, and powerful location designed for consultants and growers to take advantage of the benefits in precision irrigation via a simplified interface.

2. Agricultural Drones: Technology has changed over time and agricultural drones are a very good example of this. Today, agriculture is one of the major industries to incorporate drones. Drones are being used in agriculture in order to enhance various agricultural practices. The ways ground-based and aerial based drones are being used in agriculture are crop health assessment, irrigation, crop monitoring, crop spraying, planting, and soil and field analysis.

The major benefits of using drones include crop health imaging, integrated GIS mapping, ease of use, saves time, and the potential to increase yields. With strategy and planning based on real-time data collection and processing, the drone technology will give a high-tech makeover to the agriculture industry.

PrecisionHawk is an organization that uses drones for gathering valuable data via a series of sensors that are used for imaging, mapping, and surveying of agricultural land. These drones perform in-flight monitoring and observations. The farmers enter the details of what field to survey, and select an altitude or ground resolution.

From the drone data, we can draw insights regarding plant health indices, plant counting and yield prediction, plant height measurement, canopy cover mapping, field water ponding mapping, scouting reports, stockpile measuring, chlorophyll measurement, nitrogen content in wheat, drainage mapping, weed pressure mapping, and so on.

The drone collects multispectral, thermal, and visual imagery during the flight and then lands in the same location it took off.

3. Livestock Monitoring: Large farm owners can utilize wireless IoT applications to collect data regarding the location, well-being, and health of their cattle. This information helps them in identifying animals that are sick so they can be separated from the herd, thereby preventing the spread of disease. It also lowers labor costs as ranchers can locate their cattle with the help of IoT based sensors.



JMB North America is an organization that offers cow monitoring solutions to cattle producers. One of the solutions helps the cattle owners observe cows that are pregnant and about to give birth. From the heifer, a sensor powered by battery is expelled when its water breaks. This sends an information to the herd manager or the rancher. In the time that is spent with heifers that are giving birth, the sensor enables farmers to be more focused.

4. Smart Greenhouses: Greenhouse farming is a methodology that helps in enhancing the yield of vegetables, fruits, crops etc. Greenhouses control the environmental parameters through manual intervention or a proportional control mechanism. As manual intervention results in production loss, energy loss, and labour cost, these methods are less effective. A smart greenhouse can be designed with the help of IoT; this design intelligently monitors as well as controls the climate, eliminating the need for manual intervention.

For controlling the environment in a smart greenhouse, different sensors that measure the environmental parameters according to the plant requirement are used. We can create a cloud server for remotely accessing the system when it is connected using IoT.

This eliminates the need for constant manual monitoring. Inside the greenhouse, the cloud server also enables data processing and applies a control action. This design provides cost-effective and optimal solutions to the farmers with minimal manual intervention.

Illuminum Greenhouses is a drip installation and Agri-Tech greenhouse organization and uses new modern technologies for providing services. It builds modern and affordable greenhouses by using solar powered IoT sensors. With these sensors, the greenhouse state and water consumption can be monitored via SMS alerts to the farmer with an online portal. Automatic Irrigation is carried out in these greenhouses.

The IoT sensors in the greenhouse provide information on the light levels, pressure, humidity, and temperature. These sensors can control the actuators automatically to open a window, turn on lights, control a heater, turn on a mister or turn on a fan, all controlled through a WiFi signal.

CONCLUSION

Thus, the IoT agricultural applications are making it possible for ranchers and farmers to collect meaningful data. Large landowners and small farmers must understand the potential of IoT market for agriculture by installing smart technologies to increase competitiveness and sustainability in their productions. The demand for growing population can be successfully met if the ranchers as well as small farmers implement agricultural IoT solutions in a successful manner.



“NATURE FOR WATER”

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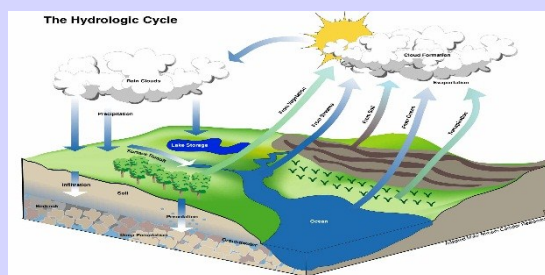
INTRODUCTION

Water is a basic necessity for the survival of human as well as for animals and plants. It is needed for the agricultural produce which sustains life on the earth. Water is used for various other purposes as for production of Hydro power, Navigation. Industrial, Fishing and Recreation etc., If water is properly harnessed, stored and utilized, it can prove a boon and immense value to the mankind. In case if it is not properly controlled, it may become a curse and cause of misery and destruction to the humanity.

With advancement of civilization, the importance of water has increased greatly. Modern medical science and sanitary has increased the life span of man also changed their life style. The standards of personal cleanness require more water than used in the past. Further the ever increasing population requires more food, which requires more land for agriculture and more water for irrigation and for other purposes. The increasing urban population needs more water supply and sewerage etc., Industrial development needs more water for different process in the industry and power generation. The emphasis of water resources engineering shifts more or less continuously.

HYDROLOGICAL CYCLE

Water occurs by nature in the form of rain. Rain water takes its shape and color according to the topography of the earth slope and soil characteristics. Rain water is available in the form of rivers, man-made reservoirs, dams, tanks, fields , ground water and plants consumption etc., Due to sun shine, the water will evaporate from the surface water and transpiration takes place through the leaves and stems of the plants and form as cloud and rain cloud again it convert as rain.



World Water Available

1		Ocean	:	96.5%
2		Polar ice	:	1.70%
3		Balance ice	:	0.025%
4		Ground Water		
	4.1	Potable Ground Water	:	0.76%
	4.2	Salt water	:	0.93%
5		Soil Moisture	:	0.0012%
6		Tanks		
	6.1	Potable Water	:	0.007%
	6.2	Salt Water	:	0.006%
7		Grass	:	0.0008%
8		Rivers	:	0.0002%
9		Water in Bio sphere	:	0.0001%
10		Water in space	:	0.001%



The Indian situation - I

- Fresh water (rain and snow) availability - 4,000 BCM Most of which returns to the seas via rivers.
- Surface and ground water availability - 1,869 BCM. Of this, 40 % is not available.

Groundwater Consumption:	Surface water Consumption:
• 92% - Agricultural • 5% - Industrial • 3% - Domestic.	• 89% - Agricultural • 2% - Industrial • 9% - Domestic.

- Ground water is the major sources of water in our Country with 85 % of the Population dependent on it.
- Ground water table decline- 33 centimetres per year

WATER IS SCARCE – SAVE AND CONSERVE

INDIAN SCENARIO

- Indian territory: 328 million hectare
- 2.4% of total earth's land area
- 7% of world's population
- 4% of world's water resources

POPULATION	18 % of the world
LAND AREA	2 % of the world
WATER RESOURCE	4 % of the world

Topography – Monsoons - River Wealth

		BCM
Annual Precipitation		4000
Average Annual Potential in River Systems Estimated		1869
Utilisable		
	Surface	690
	Ground	432
	1132	1122

Demand estimated for - 2025 AD.		
Water Supply & Domestic	73	
Irrigation	910	
Energy	15	
Industry	23	
Ecology & Others	72	
Total	1093	1093



- ### Tamil Nadu Scenario:

SURFACE WATER

- Ground Water Potential : 790 TMC (Current utilization 78 %)**

TOTAL WATER POTENTIAL

- **Surface + Ground Water : 1643 TMC**
- **Population as on 2010 census : 7.21 crores**

Water Potential per Capita per Annum for

- **Tamil Nadu** : 645 cu. m
- **India** : 1530 cu. m

The dwindling of forest area due to felling of trees by unscrupulous persons' has influenced the average rainfall, resulting less and less annual rainfall. Due to less rainfall, average water per capita has reduced considerably. Another reason is increasing population year by year.



Sl. No	Years	Per annum per capita availability of water (cu. m)
1	1951	6602
2	1971	4349
3	1981	2829
4	2000	2384

IRRIGATION WATER MANAGEMENT

Process by which agriculture production is increased for each unit or drop of water supplied. We are supplying the water to the plant by artificial means i.e. Irrigation. Supplying the water to the plant at right time, right place and right quantity is the water management. Water is the one input for achieve this; many inputs are there to achieve this goal. Some of the inputs are,

- Selection of high yielding variety of seeds
- Soil characteristics
- Pesticide management
- Applying natural manure / Fertilizers
- Working out crop water requirement
- Scheduling of irrigation
- Maintenance of the distribution system, ,supply channel etc.,
- Regulation of water by maintain sluices and shutters
- Minimizing water loss due to seepage and percolation
- Adopting scientific method like geo synthetic applications for dams and canals to reduce the seepage losses
- Avoiding evaporation loss
- Choosing the suitable Irrigation methods for crops considering the soil characteristics
- Adopting drip and sprinkler irrigation methods
- Participatory irrigation by involving the Farmers
- Community nursery
- Farm women and Farmers training in irrigation management

IMPROVING IRRIGATION WATER PRODUCTIVITY

- Increasing irrigation efficiency
 - Water saving technologies and management
 - Introduction of water efficient crops (e.g. shift rice to other crops. Cereals, black gram, dry crops etc.,)
- Use of non-conventional water resources :
 - Treated waste water
 - De-Salinized water

DRAINAGE AND FLOOD CONTROL

Water harvesting: Collection of water in structures ranging from small furrows to dams.

Allow Farmers to conserve rainwater and direct it to crop for increased food security in drought prone areas.

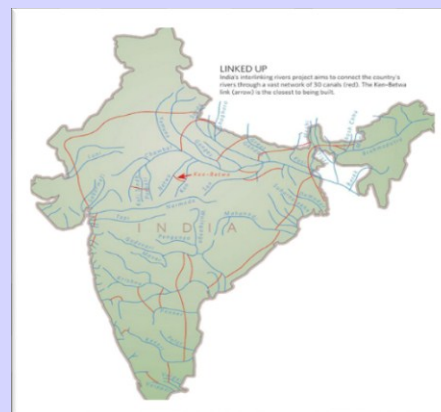


SOLUTION

National River Linking Project

Interlinking of Mahanadhi–Vaippar

1. Mahanadi (manibhadra)–Godavari-(Dowlaiswaram)
2. Godavari (Inchampalli)–Krishna-Nagarjunasagar)
3. Godavari (Inchampalli)–Krishna (Pulichintala)
4. Godavari (Polavaram)–Krishna (Vijayawada)
5. Krishna (Almatti)–Pennar
6. Krishna (Srisaillam)–Pennar
7. Krishna (Nagarjunasagar)–Pennar (Somasila)
8. Pennar (Somasila)–Palar–Cauvery (Grand Anicut)
9. Cauvery (Kattalai)–Vaigai–Gundar
10. Ken–Betwa*
11. Parbati–Kalisindh–Chambal*
12. Par–Tapi–Narmada*
13. Damanganga–Pinjal*
14. Bedti–Varda
15. Netravati–Hemavati
16. Pamba–Achankovil–Vaippar*



Peninsular Rivers Component

The scheme is divided into four major parts:

Interlinking of Mahanadi–Godavari–Krishna– Pennar–Cauvery rivers and building storages at potential sites in these basins.

- Involves interlinking of the major river systems where surpluses from the Mahanadi and the Godavari are intended to be transferred to Krishna, Pennar, and Cauvery rivers to cater to the needs of the deficit areas in the south.

Interlinking of west-flowing rivers, north of Bombay and south of Tapi

- This scheme envisages construction of as much optimal storage as possible on these streams and interlinking these storage facilities to make available appreciable quantum of water for transfer to areas where additional water is needed. The scheme also provides for taking water supply canal to the metropolitan areas of Mumbai.

Interlinking of Ken–Chambal

- The scheme provides for a water grid for Madhya Pradesh, Rajasthan, and Uttar Pradesh and an interlinking canal backed by as many storage facilities as possible.

Diversion of other west flowing rivers

- The high rainfall on the western side of the Western Ghats runs down into numerous streams which discharge into the Arabian Sea. The construction of an interlinking canal system backed by adequate storages could be planned to meet all requirements of Kerala as also for transfer of some water towards east to drought affected areas.



PARTICIPATORY IRRIGATION MANAGEMENT

Participatory Irrigation Management (PIM) refers to a Management approach that embraces the involvement of the people who directly use the irrigation water.

In an irrigation system the Farmers work cooperatively to maintain and operate the canal system. A management system comes into being divide water, make repairs and settle all disputes among the Farmers.



Farming Water user Association (WUA):

- Framing the rules
- Selecting the President, Secretary, Treasurer and other Committee Members
- Farming different Committees :
 - For operating the Canal as per Schedule of Irrigation.
 - Maintenance
 - Finance
 - Getting loans from different Institutions

WOMEN IN WATER RESOURCES MANAGEMENT

- Improved access to water for household use and food production (fruit and vegetables)
- Improve household food security and health
- Ensure women participation in water users groups
- Training of women in effective water use and income generating activities



Training the Farmers

- Involving Farm-Women
 - Evolving duties and responsibility of each committee
 - Contacting the Government Officials
(Viz: Public Works Department, Agriculture, Agriculture engineering, Co-operative Societies and Banks)

The success of any Irrigation Technology needs people:

- ✓ Who design & built it
- ✓ Who live it
- ✓ Sleep it
- ✓ Dream it
- ✓ Believe it
- ✓ And built great future plans for it.

CONCLUSION

- Existing irrigation system to be modernized for better functional efficiency



- Micro irrigation through drips and sprinklers can be encouraged
- Recycling of waste water
- Harnessing the rain water
- Awareness to save water in all the fields
- Interlinking of National Rivers
- Interdisciplinary approach of departments (Public works department, Agriculture department, Agriculture Engineering Department, Agriculture Universities and Research Institutions, Banks and cooperative Societies)
- Participatory irrigation management with cooperation of bureaucracy and beneficiary.
- Farming Water Users' Associations

TRAINING TO THE FARMERS AND FARMWOMEN IN BETTER IRRIGATION WATER MANAGEMENT AND AGRICULTURAL PRACTICES IS THE NEED OF THE HOUR

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