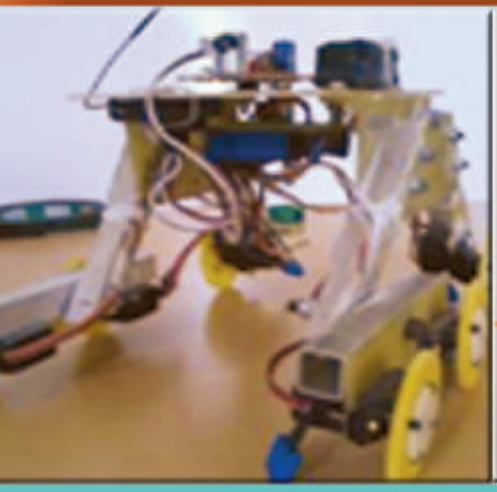
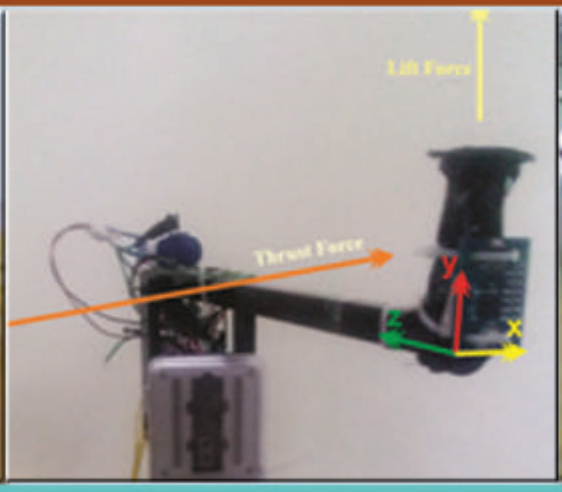
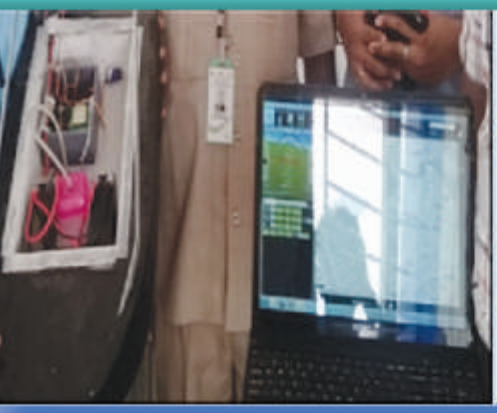
Compendium on R&D Projects under Grant-in-Aid Scheme

Volume 3

September 2014







The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020
A Scientific and Industrial Research Organisation
recognised by Department of Scientific and Industrial Research
ISO 9001:2008 Certified

The Institution of Engineers (India)

(Established in 1920. Incorporated by Royal Charter in 1935)
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Phone: +91 33 22238311/14/15/16, Fax: +91 33 22238345
Website: www.ieindia.org

The Institution of Engineers (India) or IEI is the largest multidisciplinary professional body that encompasses 15 engineering disciplines and gives engineers a global platform from which to share professional interest. IEI has membership strength of nearly 0.7 million. IEI functions among professional engineers, academicians and research workers. It provides a vast array of technical, professional and supporting services to the Government, Industries, Academia and the Engineering fraternity, operating from over 100 Centres located across the country.

IEI conducts Section A and B Examinations in different Engineering disciplines, the successful completion of which is recognized as equivalent to Degree in appropriate field of Engineering of recognized Universities of India by the Ministry of Human Resources Development, Govt. of India. Every year as many as 90000 candidates appear for these exams. for details, please see: **www.ieindia.org**

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- Entitlement to have 'Chartered Engineer' certificate on payment of requisite fee
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- Participation in continuing education programme at the Engineering Staff College of India (ESCI), Hyderabad and at State and Local Centres
- Participation in the numerous seminars, symposia, conventions, workshops, lectures, conferences, congresses and other events held at national, regional and local levels.
- Participation in international conferences.
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- Entitlement to reserve and stay in retiring rooms available at the Headquarters and at Centres at concessional rates
- For Eligibility Criteria, Membership Fees, Application Forms, etc. please visit www.ieindia.org

IEI R&D Grant-in-Aid

In order to promote Research and Development by students of undergraduate and post-graduate levels and Research Scholars of Engineering Institutes, IEI provides grant to selected projects in every year. For Guidelines and Format of Application please visit: www.ieindia.org

IEI Prizes & Awards

IEI Industry Excellence Award - to recognize industry leaders for their innovation, excellence in engineering operations and thereby, to lead their industry in competitive manner

IEI Young Engineers Award - to recognize outstanding achievements/contributions made by young engineers in engineering research, excellence in engineering technology development, technology transfer, etc. Any engineer citizen of India not older than 35 years of age is eligible for the Award.

All India Student Design Awards by National Design and Research Forum

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The SAIL Awards - for the best paper, broadly pertain to the Iron and Steel Industry, invited and received by the Institution on the subjects announced each year through the Institution publications

The Coal India (J G Kumaramangalam Memorial) Award - for the best paper, broadly pertains to the mining industry, invited and received by the Institution on the subject announced each year through the Institution publications.

Apart from the above, best papers published in IEI Journals are awarded every year during the Indian Engineering Congress.

Message from the President

The funding for R&D projects in India has so far been predominantly dependant on government and industrial ventures. Most of these avenues are meant for professionals with profound R&D exposure. Consequently, many promising R&D ventures in our country have met abrupt end because of lack of a supportive and inclusive financial system that provides the necessary risk capital to spur such innovations and enterprises.

The Institution of Engineers (India) have identified the voids plaguing the promotion of R&D and evolved a policy of funding research initiatives from engineering students community in the form of Grant-in-Aid scheme in the year 2001. The modest enterprise has now manifested into a full-fledged program which has percolated to the student community around the country. The proclaimed beneficiary figure for the financial year 2013-14 itself is over 100. The funding scheme has been primarily designed to address the need of the undergraduate research community whose avenues of receiving financial support is limited.

To proliferate the visibility and acceptability of the R&D Grant-in-Aid program, IEI has embarked upon setting up of IEI Research Innovation Group (IERIG) which is a novel initiative involving various engineering colleges across the country. This group is proposed to work in tandem with patronage from IEI with the common cause of furtherance of R&D culture within the country.

The Institution of Engineers (India) empowered by the Royal Charter is all set to redefine the nature of basic and applied engineering research, developing new research paradigms that better address compelling social priorities and recognizing the importance of diverse approaches - albeit characterized by quality and rigour - to serve the highly diverse technology needs of our society.

Ashok Kumar Basa, *FIE*
President, IEI

Message from Chairman
Committee for Advancement of Technology and Engineering

Over the last few years the Institution has envisaged the need for a paradigm shift in its role- from a technology financer to that of a technology perpetrator. In tune with the spirit of recognition as a Scientific & Industrial Research Organization by the Ministry of Science and Technology, GoI, the Institution has taken several admirable steps towards furtherance of Science and Technology across the nation. Institution has rightly identified the challenge to ensure a sustainable pipeline of talented pool of budding engineers committed towards the advancement of S&T. R&D Grant-in-Aid initiative which has emerged as a flagship program of IEI has been designed with the objective of nourishing the root. This effort has put Institution on a more visible platform in the national R&D funding scenario.

India has been ranked as the world's sixth most 'innovative' country, according to GE's Annual Global Innovation Barometer. Research is imperative for widening India's production potential and professional bodies like IEI must have taken the onus on them for dissemination and creation of public awareness on the issue.

The fact that as many as 20 Institutions have acquired Institutional Membership during FY 2013-14 alone is a testament to the enhanced visibility of IEI. Despite the promising scenario we need to catch up and put our best foot forward so that R&D initiatives of the Institution get its rightful place.

Dr K Venkatasubbaiah, FIE
Chairman, CATE

Message from Chairman
Research & Development Committee

We are all aware of the fact that many promising R&D ventures in our country have failed to thrive because of lack of a supportive and inclusive financial system that provides the necessary risk capital to spur such innovations and enterprises.

The Institution of Engineers (India) empowered by the Royal Charter has been trying to fit into the aforementioned role with the aim 'to encourage inventions and investigate and make known their nature and merits'. R&D Grant-in-aid program of the Institution, which started in 2001 in a modest way, has now become Institution's identity.

The highlights of the R&D program of IEI may be attributed as (1) comprehensive yet user-friendly application process (2) rapid finalization and intimation to applicants (3) quick disbursement of one-time grants (4) dedicated support system to applicants which have culminated in wider acceptability and overwhelming recognition for the scheme. We are pleased to mention that several research works carried out from these R&D funding have been published in the IEI-Springer Journals which speaks volume about the success of the initiative.

Further, we have organized Campus Reach-out Programs at various corners of the country with the objective of wider dissemination of the R&D initiatives of the Institution. Lately, the Council of the Institution has also felt the need to develop Patent Facilitation Centres at identified locations to recognize and encourage original and novel research contributions and is expected to add thrust to the Institution's R&D efforts.

Dr K Gopalakrishnan, FIE
Chairman, R&D Committee

The Institution of Engineers (India)

Volume 3, September 2014

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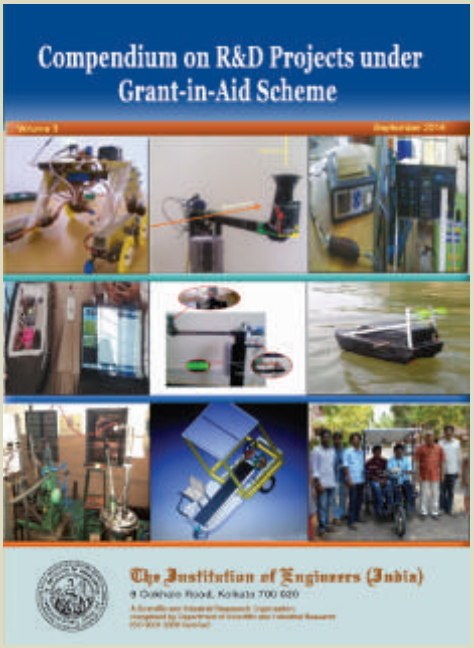

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The Institution of Engineers (India) has tied up with M/s. Springer (India) Pvt Ltd, a reputed publishing house to increase the visibility, greater acceptability, impact factor and improved citation index of the Institution Journals. The tie up will add greater value to the published research work and result in quantum jump in the circulation of the Journals to a wide spectrum of learned community.

The details of scheduled publications by M/s. Springer and the subscription rates are given herein under

Series of Journals of IEI	Number of issues per year	Month of publication	† Institutional subscription, INR	Institutional subscription, US$	†† Individual subscription (Non-member, IEI), INR	Individual subscription (Non-member, IEI), US$	††† Individual subscription (Member, IEI), INR	Individual subscription (Member, IEI), US$
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Please note that January 2012 being the scheduled month of publication for the first issue of Journal by M/s. Springer, the publication schedule during the transition period has been modified. Members of the Institution or other subscribers who have already subscribed for the Journals will be refunded their payments, after necessary adjustments as per official rules.

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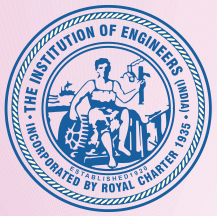

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Compendium on R&D Projects under Grant-in-Aid Scheme Vol. 2, September 2013

1. Prediction of Product Sale on Discount Basis on Historical Statistics
2. Enhancement of Torsional Resistance of R. C. Beams using Fibre Reinforced Polymer Composites
3. Characterization of Copper/Carbon Nanotube Nanocomposites Fabricated by Hot Pressing
4. Comparative Studies Involving CAD, CAE and RP Techniques for Accelerated Development of Bio-engineering and Aeronautical Systems
5. Degradation of Rhodimine 6G at Pilot Scale Capacity using Hybrid Techniques based on Cavitation
6. To Facilitate Cell Phone Usage for the Elderly and Disabled
7. Corporate Portal Management System
8. Design and Modeling of Wheat Reaping Machine
9. Save Inhabitants from the Attack of Wild Animal and to Deterrent Animals away from Railway Track
10. Design and Development of Blimp for Aerial Surveillance
11. Preparation of Vegetable Oil based Plasticizers
12. Integration of Fused Deposition Modeling and 3D Scanning Technology for Development of Centrifugal Pump
13. Optimisation of Surface Roughness in End Milling Operation using Experimental Design
14. RP on Telemetry System of Gas Turbine Engine
15. Novel Indicative Methods for Melanoma Detection using Mobile Imaging Techniques
16. Fabrication of Low Cost Dye-Sensitized Solar Cell Based on Natural Dyes
17. Development of RC Mini Air Vehicle for Video Surveillance and Atmospheric Modelling
18. Green Synthesis of Silver Nano-Particles for Solar Cells Efficiency Improvement
19. Development of Obstacle Aware Routing Tool for 3D Integrated Circuits
20. Bidirectionally Coupled Network and Road Traffic Simulation for Improved IVC Analysis
21. Design and Development of Hydroforming Setup
22. Design, Modelling and Implementation of A Field Deployable Single Pem Fuel Cell based Power Cells based Power Cells for Low Power Telecom Applications
23. Automatic Drip Irrigation System
24. Development and Evaluation of Animal Operated Farm Yard Manure Applicator
25. Transmission Line Inspection and Maintenance Robot
26. Automatic Estimation of Lung's Air Volume and Visualize Variations Throughout CT Images
27. Identification of Ayurvedic Medicinal Plants Using Image Processing Techniques
28. Rocker Bogie Mobility System

A Study on the Feasibility of using Processed Waste Engine Oil as an Alternate Fuel for a DI Diesel Engine

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OBJECTIVE

An experimental investigation on the performance, emission and combustion characteristics of a single cylinder diesel engine is carried out at a constant speed of 1500 rpm to study the feasibility of using processed waste engine oil (WEO) as fuel in compression ignition engine. The experiments were carried out at different load conditions from no load to 110% load, while injection pressure was varied from 220 to 300 bar in steps of 20 bar and injection timing was varied from 23° to 28° before top dead centre (bTDC) in steps of 2.5°. The process used to purify the WEO was thin film evaporation. The characteristics of the engine with processed WEO were compared with that obtained with diesel fuel at standard operating point. The standard operating point of the engine is 220 bar injection pressure and 23° bTDC. For the WEO fuel the optimum operating point for the engine is 300 bar injection pressure and 25.5° bTDC injection timing. With WEO fuel there is a considerable reduction in NO emission, and a minimum NO emission of 237 ppm at full load was obtained. BTE obtained using with WOE was comparable with that obtained with diesel fuel.

Photographic view of engine setup

ACHIEVEMENTS

In this study the feasibility of using processed WEO as fuel was studied. For this the performance, emission and combustion characteristics of the engine was studied using diesel and the fuel from WEO. To obtain the optimum operating point for the engine with WEO fuel, the injection parameters were changed and the characteristics studied. With WEO fuel the performance of the engine is comparable to that of diesel. In case of emission, NO values improved with the use of WEO but CO and UHC increased. But a few of the physical characteristics to be met by the fuel is way beyond the limit, like viscosity. But if we consider all the other parameters we can say that processed WEO can be used as fuel in diesel engine. For the WEO fuel the optimum operating point was found to be 300 bar (injection pressure) and 25.5°bTDC (injection timing).

Photographic view of AVL digas 444 gas analyser and AVL 437 smoke meter

BSFC decreases considerably with load for all fuels. For the WEO fuel the minimum value of BSFC was 0.343 kg/kWh (at 25.5° injection timing and 300 bar injection pressure) for full load condition. At standard operating condition the use of WEO fuel resulted in a 4% increase in BSFC, when compared to that of diesel. BTE obtained with WEO fuel at all conditions was always lesser than that obtained with diesel at standard point. Maximum BTE at full load was obtained with 25.5° bTDC injection timing. For WEO maximum BTE obtained was 26.5%. With WEO fuel minimum BSEC occurred at 25.5° bTDC for full load conditions. BSEC obtained with diesel fuel was 14.23 MJ/kWh. Minimum BSEC obtained with WEO fuel is 14.6 MJ/kWh.

The CO_2 emissions increased with increasing load for both fuels. CO_2 emission of diesel fuel is higher than that of WEO fuel. By advancing the fuel injection CO_2 emission decreased. CO_2 emission increased with increasing injection pressure. The CO emissions also increased with increasing load as expected. With WEO fuel, minimum value of CO emission was 0.23% vol, obtained with 280 bar injection pressure and 25.5° bTDC injection timing. The NO emissions were lower for WEO fuel when compared with that for diesel. Advancing the fuel injection resulted in increase in NO emissions. At full load minimum value for NO emission was 237 ppm and it was obtained with 280 bar injection pressure and 23° bTDC injection timing. UHC in the exhaust emission increased at all operating points with WEO fuel when compared with that with diesel fuel. Smoke opacity increased for the engine emission when WEO fuel was used due to the high sulphur content in the fuel. Minimum smoke opacity obtained at full load with WEO fuel is 51% (injection pressure of 280 bar and injection timing 25.5° bTDC).

Use of WEO resulted in an increase in maximum cylinder pressure. With WEO fuel, maximum cylinder pressure was obtained with 28° bTDC injection timing and 240 bar injection pressure. Maximum pressure increased as the injection timing was advanced. Peak pressure for WEO fuel was obtained at 6° after TDC. With WEO fuel maximum HRR value of 40.9 J/deg is obtained at 300 bar injection pressure and 23° bTDC injection timing and it occurs at 6° after TDC, but for diesel maximum HRR occurs at 3° bTDC.

Further, research work is needed to identify better processes to yield WEO fuel that will be more similar to diesel in their properties. Research is needed to understand the changes needed to the inlet port of the engine to obtain better characteristics with WEO fuel. Research is needed to find additives for WEO fuel which will improve its performance. Further study can be done on the engine characteristics with WEO fuel, by using electronic fuel injection system and also with the addition of exhaust gas recirculation system.

Legacy of IEI

Smt Indira Gandhi, Prime Minister of India, during the Golden Jubilee Celebrations of The Institution of Engineers (India) at Kolkata in 1970

Design & Analysis of Train Position Detector and Accident Prevention Module with Auto Control an Regenerative Brakes

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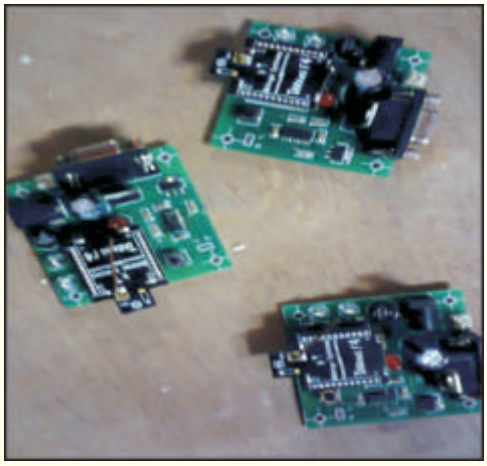
OBJECTIVE

- To minimize to control the train accidents by preventing running one train on to other
- To know the exact position of two trains running on same track
- Automated regenerative breaking if they come seriously close
- The accidents due to human errors

ACHIEVEMENTS

- Communication between the position and train has been established
- Communication to train module and system has been established
- User interface to see train position has been developed
- Successful in sending the train name, location and alert signals to computer, same are displayed in user interface
- Able to detect the position
- Successful in halting the trains in all danger scenarios
- Able to glow a small LED while halting



Zigbee modules used in project

User interface showing train positions and alert signal

The ideal engineer is a composite ... He is not a scientist, he is not a mathematician, he is not a sociologist or a writer; but he may use the knowledge and techniques of any or all of these disciplines in solving engineering problems.

N. W. Dougherty

Eco Friendly Road Pavements using Fly Ash and Steel Slag (Design and Implementation)

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Full view of the concrete pavement

OBJECTIVE

The main objective of the project is to find out alternative materials for road pavements to meet the demands of bitumen for the upcoming years. Addition of alternate materials which reduces cement content results in the less emission of carbon dioxide. To make the eco friendly roads with high performance and cost effective in this investigation, an attempt has been made to determine the feasibility of industrial waste products such as steel slag and fly ash use in base layer of concrete road pavements.

ACHIEVEMENTS

- ✓ The physical and chemical properties of fly ash, steel slag were experimented as per Codal recommendations and studies have been carried out.
- ✓ The optimum replacement level of steel slag for fine aggregate is found to be 40% combined with 30% fly ash. Flexural strength of concrete pavement with 40% steel slag and 30% fly ash was determined experimentally for M40 grade concrete, which was found to be greater than the required as per IRC 58.
- ✓ Design of thickness for concrete road pavement has been made as per IRC 58. The concrete pavement has been modeled and analyzed with IRC Class B loading in staad.pro software for optimum replacement level of steel slag and fly ash in concrete. The concrete pavement with optimum replacement of fly ash and steel slag behaves in a similar manner of normal concrete pavement.
- ✓ The cost analysis of normal concrete pavement and concrete pavement using fly ash for cement and steel slag for fine aggregate has been made with the current price in the market.
- ✓ The evaluated cost has been compared normal concrete pavement was compared with concrete pavement using fly ash and steel slag and discussed. The result of concrete pavement using fly ash and steel slag was found to be economical when compared with normal concrete pavement.

- ✓ The cost saving was found to be 15%, hence it shows that the utilization of industrial waste products such as fly ash and steel slag in concrete pavements were cost effective, eco friendly and energy efficient.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

1. EXPERIMENTAL INVESTIGATION ON EFFECT OF FLY ASH AND STEEL SLAG IN CONCRETE PAVEMENTS
N. SUMI & R. MALATHY
Department of Civil Engineering, Sona College of Technology, Salem, Tamil Nadu, India
International Journal of Research in Engineering & Technology (IJRET)
Volume 1, Issue 2, July 2013, 117-124
© Impact Journals

2. Study on Effect of Fly ash and Steel Slag Replacement in Concrete Road Pavement
N.Sumi & Dr. R. Malathy,
National Conference on Recent Advancements in Geotechnical Engineering, April 26, 2013, Coimbatore.

Notification for R&D Grant-in-aid

The Institution of Engineers (India) invites applications, as per the format available on our link *http://www.ieindia.org*, for grant-in-aid in support of industry-oriented R&D projects for the session 2014-2015 for supporting students (B Tech/M Tech/Research Scholars) working under the guidance of faculty members who should be Corporate Member of IEI. After filling up the application as per the given format send the application through email to *ieirndcell@gmail.com* and one printed copy of the same to the following address:

Director (Technical)
The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020

Applications received in format other than given in the above link will not be accepted. Application should be forwarded through the Guide, Head of the Department and Head of the Institution. Please note that preference will be given to projects received from Institutions who are members of The Institution of Engineers (India), projects dealing with industry-oriented/applied research with matching grant from industry. In case of project proposal from UG students it is desirable that he/she be a member of the Students' Chapter of the IEI, if available in his/her institution. In case of proposals from PG and PhD scholars, the applicants should be members of IEI. The grant is not intended for the faculty members who have access to other avenues for research funding. Proposals received will be scrutinized and the recipients of R&D Grant will be informed accordingly.

Secretary & Director General
The Institution of Engineers (India)

Chairman, R&D Committee
The Institution of Engineers (India)

Hybrid Limbed Exploration Vehicle

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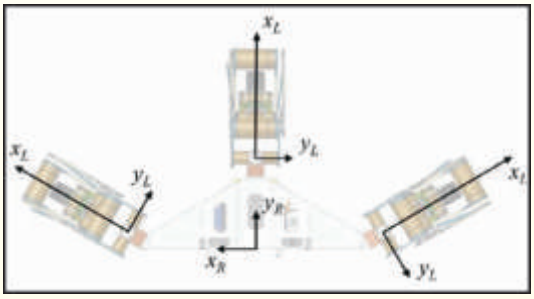
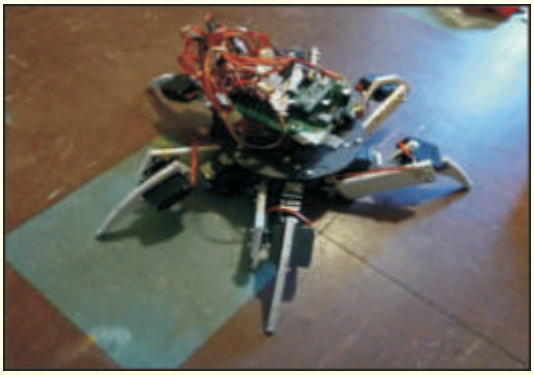


The hip yaw joint



Fabricated Hybrid Limbed Exploration Vehicle

OBJECTIVE

To give an innovative approach to develop a six hybrid limbed mobility platform which can be used in the exploration and unmanned ground vehicles for the different terrain maneuver. Modeling would be carried out using CAM software like Solid Works or Solid Edge. Fabrication of the chassis will be made using Rapid Prototyping Techniques. Servo motors and normal DC motors will be used for actuation of joints and legs. The motors will be interfaced with the Arduino Microcontroller for the control of the limbs. After the complete interface, the robot will be programmed with different gait pattern to perform motions of Tetrapod and Tripod by locking the wheels. Differential and Power Steering drives will be used for the wheeled locomotion. An attempt would also be made to involve robot in multi tasks like drilling, objects pick and place etc.

ACHIEVEMENTS

The S gait algorithm for ATHLETE is a mobility mode that represents a hybrid of both driving and walking capabilities. With active loading management and a walking gait, rover has the potential to enable a wheeled system to traverse soft, hilly, or obstacle-rich terrain beyond the capabilities of a standard passive suspension rover. Though similar to walking, rover keeps all wheels in contact with the ground throughout traverse, making it more time efficient and conservatively stable than a pure walking gait.

"To give real service, you must add something which cannot be bought or measured with money"

Sir M. Visvesvarayya

Intelligent Marine Voyage Data Recorder (MVDR- Blackbox) with High Security & Remote Alarm

Student
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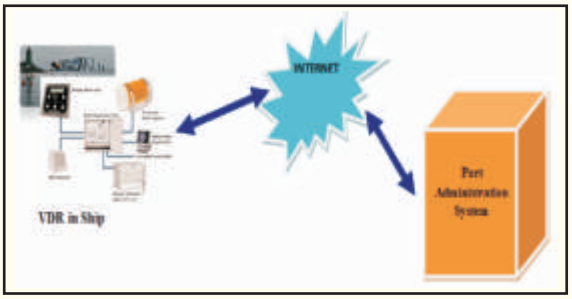
OBJECTIVE

- To develop a software for safety in MVDR to upload all information to a server and arise alarms about unwanted actions occurring in ships.
- To create a centralized web based MVDR database to know the details of the ships which have violated rules resulting in damage of vessel and also to track the movement of the ship.
- To develop a system with audio sensors for alerting the captain about a possible event.



Intelligent Marine Voyage Data Recorder Architecture

ACHIEVEMENTS

During the tenure of the project a number of things were learnt and new innovative ideas were implemented into the system. A brief account of the same is listed below:-

- During this period, we have collected several different audio data have been collected from various locations to provide a variety of inputs and tested the same with the system. The system successfully identified the abnormal voice and intimated an alert to the user.
- Attended a National Seminar on Recent Research Challenges in Image Processing and Network Security on 19-12-2013 from which we have learned lot of current research topics and these have been added in our MVDR Project system.
- Presented paper in National Conference in Emerging Trends and Applications in Computer Science on 29-01-2013 and secured second prize on the paper titled "AUDIO ANALYSIS USING SVM CLASSIFIER".
- The system provides a low cost and efficient monitoring system for ships along with a centralized database of all ships and its owners.
- The system will be very much useful to the Indian Shipping for monitoring the vessels that come inside Indian waters and also Indian ships that meet with accidents in international and foreign waters.
- The data collected from the VDR, GPS, the Automatic Identification System and the electronic chart confirms the abnormal events that have occurred in the vessel.
- This low cost and reliable system detects the misbehaviours and makes a fast and quick rescue.

- This System was tested audio with sea noisy background and it detects the misbehaviours and makes a fast and quick rescue alert in an wireless environment.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

- Presented paper in National Conference in Emerging Trends and Applications in Computer Science on 29-01-2013 and secured second prize on the paper titled "AUDIO ANALYSIS USING SVM CLASSIFIER".
- Submitted a paper titled "Secure Intelligent Marine Voyage Data Recorder (MVDR- Blackbox) using SVM" to Engineering - Signals & Communication , Journal of The Institution of Engineers (India): Series B , Electrical, Electronics & Telecommunication and Computer Engineering (Awaiting for result)

Legacy of IEI

Pandit Jawaharlal Nehru, First Prime Minister of India, during the Annual Meeting of Central India Centre of IEI in 1950

Laying of Foundation Stone of IEI Headquarters Building by Shri Profulla Chandra Sen, Chief Minister of West Bengal in 1963

Micro Mould Fabrication of Plastic Components by Vacuum Casting

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OBJECTIVE

1. Development of micro mould of the component.
2. Study of process parameters based upon Taguchi design.

Input Parameters:

- De-mould time
- Temperature
- Vacuum pressure

Output parameters:

- Accuracy and Surface finish
- Hardness
- Morphology/Micro photographs

Master Patterns with Moulding Box

Silicon Mould Ready for Casting

ACHIEVEMENTS

- The tolerance grades of the pieces produced are consistent within the permissible range of tolerance grades (IT grades) as per standard UNI EN 20286-I (1995) and all the parts are within tolerances as per DIN 16901 standards for plastics.
- The percentage contribution of material type, mixing ratio and temperature for dimensional accuracy is 86%, 1% and 9% respectively. Similarly for surface roughness the percentage contribution is 1%, 92% and 1% respectively. And for micro hardness it is 86%, 2% and 10% respectively.
- The result of study suggests that as regards to micro hardness; material VC 3340, mixing ratio 100:100 at temperature 80°C is giving best results. For surface roughness material VC 3370, mixing ratio 100:130 at temperature 60°C and for dimensional accuracy; material VC 3370, mixing ratio 100:130 at 60°C temperature are giving better results. The confirmatory experiments was conducted and result of study show percentage improvement in dimensional accuracy, surface roughness and micro hardness are 6.25%, 11.42% and 11.76% respectively. These results are valid for 95% confidence level.

Designing of Electro-mechanical System to Generate Electricity in a E-bike to Charge the Battery and Increase the Range

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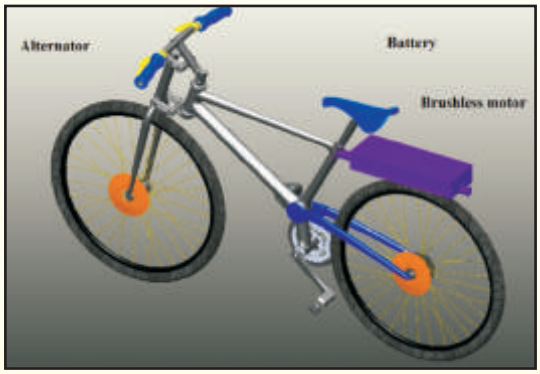
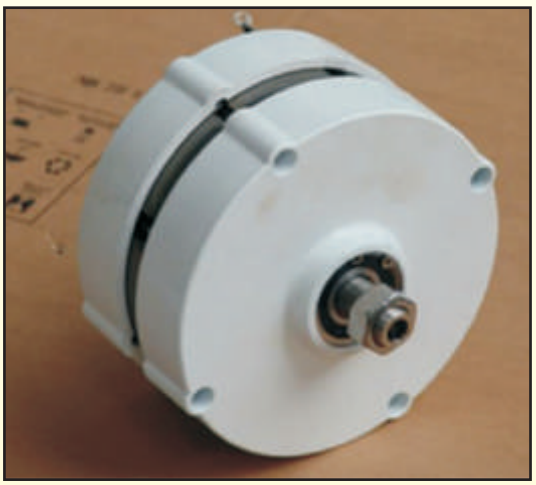


E-Bike Structure



Alternator used in the E-Bike

OBJECTIVE

The project aims at designing an Electro Mechanical System to generate electricity in an E-bike to charge the battery using the back emf and increase the range of the bike. In recent years the continuous hike in petroleum products has affected all the sectors. As an effect the utilization of manually powered vehicle like bicycles or electrically powered vehicle has come into picture. E-bikes have started getting attention among the urban people as it enables a quick local travel with minimal expenses both in purchase & maintenance and recurring fuel charges. The increase in popularity of a product should be backed by continuous research on performance optimization in order to make it successful.

This project is one such effort to attend to a technical issue concerning e-bikes. The electrically powered vehicle face problems in battery depletion even though it is charged, reducing the range of the vehicle. To fix this problem back emf is used to charge the battery with a block booster circuit. An E-Bike is developed to demonstrate the concept of using the back emf for battery charging. A 300W alternator is attached to the wheel unit to derive electricity from the rotating wheel which will be stored in a 12V Lead acid battery. This battery will also drive the entire unit. A 250W permanent magnet brushless motor is used to move the E-Bike. A BLDC controller is used as an Electronic Speed Controller and as the power management system. The developed prototype was tested and the back emf power generation is successfully demonstrated.

ACHIEVEMENTS

The project mainly emphasises on increasing the on-board power efficiency and endurance efficiency of the E-Bike.

Before the Project :

The E–Bike initially had a working endurance was 4 hours.

After the Project:

After the installation of the alternator setup the E-Bike has an endurance of 7 hours.

The Alternator is utilized in order to generate current this recharged energy is stored into the battery. Charging the battery helps in not getting the battery discharged quickly. The distance covered by the vehicle is increased which leads to a more efficient system than the earlier.

The device is designed and fabricated with a new permanent electromagnetic motor generator that recycles back EMF energy (re-gauging) thus allowing the motor to produce an energy level of COP=0.98, more or less, depending upon configuration, circuitry, switching elements and the number and size of stators, rotors and coils that comprise the motor. The rotor is fixed between two pole pieces of the stator.

The motor is initially energized from a small starter battery means, analogous to a spark plug that sends a small amount of energy to the motor, thus stimulating a rotating motion from the rotor. The alternator setup is fixed to the centre of the front wheel, where in the rotation of the wheel allows the rotor to rotate. As the rotor rotates, energy is captured from the surrounding electromagnetic field containing an asymmetrical pulse wave of back EMF. The energy produced and captured can be directed in one of several directions, including returning energy to the initial starter battery, rotating a shaft for producing a rotational movement, which responsible for the movement of the vehicle.

The Alternator generates electricity using the same principle as DC generators, namely, when the magnetic field around a conductor changes, a current is induced in the conductor. The rotating magnet (rotor) turns within a stationary set of conductors wound in coils on an iron core (stator). The field cuts across the conductors, generating an induced EMF (electromotive force), as the mechanical input causes the rotor to turn.

The magnetic field is constant hence the terminal voltage varies directly with the speed of the generator. An automatic voltage control device controls the field current to keep output voltage constant. If the output voltage from the stationary armature coils drops due to an increase in demand, more current is fed into the rotating field coils through the voltage regulator (VR). This increases the magnetic field around the field coils which induces a greater voltage in the armature coils. Thus, the output voltage is brought back up to its original value.

IEI MEMBERSHIP

The Royal Charter defined the classification of membership and only 5 classes; namely, Honorary Life Member, Honorary Member, Members, Associate Members and Companions were known as Members of the Institution. However, through decades of modifications, changes and demands of the engineering challenges and of the engineering profession the present Bye Laws of the Institution categorized the membership under several classes; they are (a) Honorary Life Fellow (b) Honorary Fellow (c) Fellow (d) Member (e) Associate Member (f) Senior Technician (g) Technician (h) Institutional Member (i) Donor Member.

Solar Mobile Sugar Cane Cutter and Crusher

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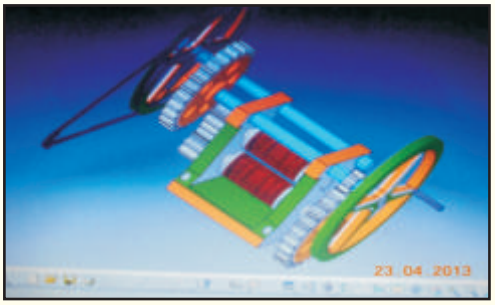

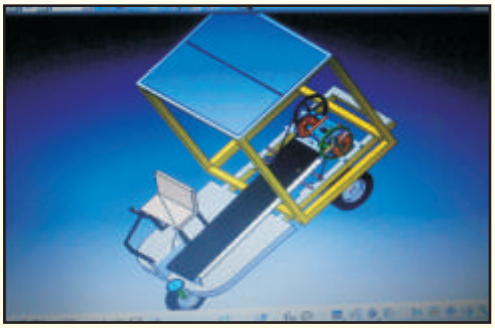

CATIA V5 Modeling

Solar Mobile Sugar Cane Cutter and Crusher

OBJECTIVE

The project "Solar Mobile Sugar Cane Cutter and Crusher" strives to increase the productivity of sugar industry and to decrease the human effort of agriculturists who are cultivating sugarcane. In the present work, it was proposed to eliminate the post harvest losses by fabricating a model which works by using solar power. The post harvest losses can be eliminated by simultaneous cutting and crushing of sugarcane on a single machine and the extracted juice can be preserved adding preservatives like sodium benzoate etc. This method of harvesting and crushing results in increasing productivity about 15% decreasing transportation and labour costs.

ACHIEVEMENTS

Some of the results that can be obtained by using the above method are

- Our project Solar Mobile sugarcane Cutter and Crusher enables the simultaneous cutting and extraction of sugarcane Juice.
- Simultaneous cutting and crushing results in reduction of post harvesting losses.
- By elimination of postharvest losses the increase in productivity is about 15%.
- Using renewable free solar power will decrease the cost of power requirement.
- Decrease in the lead times between cutting, crushing and processing results in significant increase in quality of sugar and decrease in processing costs because fresh sugarcane juice can be obtained without any contamination.
- It is easy to transport sugarcane juice in containers or through pipes rather than transporting Tons of sugarcane there by loading and unloading times and costs can be minimized.
- Scarcity of labour is one of the biggest problems faced by agriculturists now-a-days. By adopting this system we can eliminate this problem.

Design and Development of FPGA based Error Control Circuitry for OFDM based Wireless Applications

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OBJECTIVE

To design, develop and test various error control coding algorithms for wireless communication applications on FPGA platform. To design low complexity and efficient model of error control algorithms as far as FPGA implementation is concerned.

Burst errors in communication channel have detrimental role to play. Using interleaver, error bursts can be transformed into random like errors which thereafter can be corrected by forward error correction (FEC) coding techniques. Researcher faces challenges in designing hardware interleaver especially the address generator of the interleaver for wireless applications. This is due to the presence of complex mathematical functions like floor and modulus which are not hardware friendly. The objective of this work is to design and test low complexity and efficient FPGA based address generator for OFDM-WiMAX interleaver / de-interleaver.

Experimental Setup

Programming of FPGA board

ACHIEVEMENTS

In this project, a memory efficient Look up Table (LUT) based address generator for OFDM-WiMAX de-interleaver has been designed, simulated and implemented on FPGA platform. Here, a novel technique has been proposed to implement the address generator used in OFDM-WiMAX de-interleaver. The conventional Look-Up Table (LUT) based technique for address generation has been re-designed to use the memory blocks efficiently. During this work, it has been observed that within a modulation scheme, the address LUT of a smaller interleaver depth is the subset of the address LUT of larger interleaver depth in WiMAX de-interleaver address generator. This relationship between the address LUTs is used to propose a novel memory efficient LUT based address generator for WiMAX de-interleaver. The proposed scheme shows 81.25 % improvement in terms of saving memory blocks. A hardware structure for the proposed LUT based de-interleaver address generator is designed and is transformed into a VHDL model using Xilinx Integrated Software Environment (ISE). The model is then implemented on two reconfigurable platforms and comparative analysis in term of FPGA resources / parameters between the two is also discussed. Based on the equivalence drawn earlier [1], the implementation of the present work shows betterment of approximately 30% over earlier work [2] in terms of maximum operating frequency.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

B. K. Upadhyaya, P. K. Goswami and S. K. Sanyal, "Memory Efficient Look up Table (LUT) based Address Generator for OFDM-WiMAX De-interleaver", (accepted) 2014 International Conference on Advances in Electronics Engineering (ICAEE 2014), Singapore, 19-20th February, 2014.

References:

1. I. Kuon and J. Rose, "Measuring the gap between FPGAs and ASICs," in *Proc. of Int. Symposium on Field Programmable Gate Arrays*, Monterey, California, USA, ACM Press, New York, 2006, pp. 21–30
2. R. Asghar, and D. Liu, "2D realization of WiMAX channel interleaver for efficient hardware implementation" in *Proc. of World Academy of Sc. Engineering and Technology*, vol 51., Hong Kong, 2009, pp. 25-29.

IEI EXAMINATIONS

Right from the inception, the IEI was concerned to fulfil its social objective to provide upgradation and dissemination of engineering education. In its role as a qualifying body the Institution has opened up tremendous possibilities for those who aspire to become engineers but are short of the means or the opportunities to pursue a formal engineering degree course. For such aspirants, the Institution in conformity with the provisions of the Royal Charter, conducts examination bi-annually - the Studentship Examination (suspended since 1998) and the Associate Membership Examination in Sections A and B based on well-structured courses in nine engineering disciplines. The course and curriculum have been modified from time to time. In early nineties a re-structured curriculum of courses and syllabi compatible to the changing demands of the period have been introduced from Summer 1993 Examination. In the updated course structure, emphasis has been placed on the basics and common principles of Design, Production Processes and Management Systems as well as on Computer Science, Energy, Environment, etc. The Institution's examinations are held simultaneously at its various Centres all over India as well as at some overseas Centres and there is an ever-increasing demand for enrollment as Technician/Senior Technicians' Members of the Institution to become eligible to sit for the examination.

Development of Beaglebone Webcam Server for Security and Surveillance Applications

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OBJECTIVE

The goal of this project is to utilize the beagleboard as a low cost platform for webcam video feeds. Server capability:

- Broadcast webcam feeds for directly connected USB webcams.
- Relay webcam feeds from other servers, typically connected over wi-fi.
- Decimate MJPEG streams to match bandwidth limits.
- Monitor and control streams via HTTP.
- Advertise HTTP services locally via Zeroconf.

The beagleboard will require a functional Linux gspca driver for all USB webcams in use as well as USB wi-fi for remote service.

Beaglebone Webcam Server Device

ACHIEVEMENTS

Sri Sai Krishna Educational institution replaced TV camera with Beaglebone webcam server to provide security.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

Mr. P. Kiran Rao M.Tech, Mr. Balakrishna, Mr. Sashi Kanth "Development of Beaglebone Webcam Server for Security and Surveillance Applications" paper published in "International Journal of Advancements in Research & Technology, Volume 2, Issue 11, November 2013 Edition".

Legacy of IEI

Shri V P Singh, Chief Minister of Uttar Pradesh inaugurating 60th Annual General Meeting & Diamond Jubilee Celebration of Uttar Pradesh State Centre of the Institution in 1981

Characterisation of Edge Rounding Process in Vibratory Finishing

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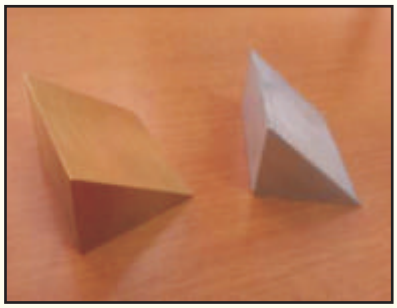


Brass and aluminium specimen

Heavy duty Vibro-Machine

OBJECTIVE

Edge rounding is an important consequence of the vibratory finishing process. This work focuses on characterizing the edge rounding process. In order to obtain the objectives of the study, 90° and 60° triangular samples are used to carry out the experiments in vertical, horizontal and free flow orientations. Each experiment run has been performed for six time periods ranging from 1 hr. to 6 hrs. After finishing, the sample profiles are recorded and their radius of curvature has been calculated. Radius of curvature Vs time graphs and the material removal rate Vs time graphs have been plotted from all experiment runs and were compared with two established studies to find a mathematical model that could be used to characterize the edge rounding process. The model can then be used to enhance the overall efficiency of the edge rounding process. Supporting the strain hardening theory, the work also provides an insight into the physical mechanism of the edge rounding process. The work involves developing a mathematical model of the experimental work and the model developed could be then used to enhance the overall efficiency of the edge rounding process. With this it is possible to predict, analyse and set the parameters for edge rounding process in vibratory finishing.

ACHIEVEMENTS

Vibratory finishing is a popular mass finishing technique that is used to polish plastic and metallic objects, remove sharp and unwanted edges, enhance hardness and clean surfaces. Owing to the economy and consistency offered by automated finishing equipment, mass finishing of parts in batches has largely replaced manual finishing of individual components in manufacturing. The current study is a subset of the bigger and more comprehensive project which involves modelling of the entire vibratory finishing process. This work focuses on developing an analytical model to predict edge rounding in the vibratory finishing process because it is one of the most common techniques employed to perform edge rounding, edge removal and deburring on a mass scale.

It is also important to study edge rounding because it constitutes the basic mechanism via which removal of sharp and non-round edge occurs.

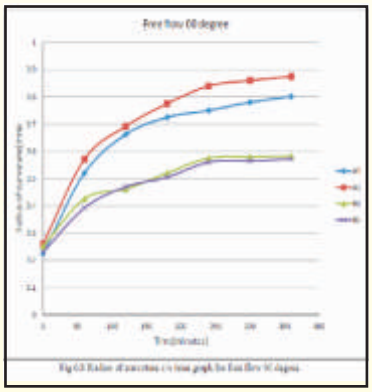
This project investigated the erosion of the specimen edges using the vibratory finishing machine. Primarily the removal was due to the impact of abrasives at the edges and after a particular radius was reached, it attains almost no deviation or a steady value showing that material removal has been less due to the formation of tribolayers. The result was specifically concerned to the edge radiusing. Edge

wear was due to the removal of micro-scale chips from the micro-scale edges of the specimens by the sharp protrusions of the abrasive used.

The rate of wear correlated to the surface topography of the specimens, such that the rate of wear decreased over time as the surface peaks of the specimens grew wider and more widely spaced. Edge radiusing of the triangular specimens of aluminium and brass under erosive wear conditions in bowl type vibratory finishing machine has been done experimentally. Wear by abrasive media was found to be a micro scale edge chipping process. Large scale radiusing was found in the initial stage and also material removal was more. Radiusing is found to be a function of the properties of the material used and also the angles included in the edge. At the final stage, it was found that edge radiusing occurs at a constant rate, almost steady for all angles and for both materials. As the results show that material properties have an important role to be played in the case of the material removal and radiusing. Compared to brass, aluminium is a softer material and it can be observed that the results are superior for aluminium than to the brass.

60° edge magnified on Video measuring system

In the case of free flow, the material removal is more uniform. There is relative motion between the specimen and the media. This causes the reduction of abrasive action in case of free flow. Since the material removal are less we can have a greater accuracy with free flow orientation. But for vertical and horizontal orientations we are fixing the specimen relative to the motion of the media. From the result graphs, it is visible that the edge radiusing and material removal are much more compared to free flow. The radiusing for vertical and horizontal is more, since there is no relative movement between the specimen and the media. This results in more action of the frictional force in the surfaces that comes first in the flow direction. The portion left behind becomes shadow and there will not be many deformations due to erosive wear. The material face projected to the flow is subjected to direct impact of the media and these results in a faster material removal due to the low velocity impact. Therefore, more material removal will be concentrated to the edges resulting in a rapid change in radius.



Radius of curvature v/s time graph for free flow 60° edge (Al&Brass)

Tribolayer is formed in the specimen and is the main reason for the reduction of material removal with the time.

Data and information can be used for making a numerical model, so that, model developed could be used to enhance the overall efficiency of the edge rounding process supporting the strain hardness theory. With this, it is possible to predict, analyze and set the parameters for the edge rounding process in the vibratory machine.

Engineering is an activity other than purely manual and physical work which brings about the utilization of the materials and laws of nature for the good of humanity.

R. E. Hellmund

Torrefaction of Lignocellulose Biomass by Utilizing Waste Heat from Engine Exhaust Gas

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Full Experiment View

Untorrefied and Torrefied Products

OBJECTIVE

The fuel of the previous generation was bulky, inefficient and did not need to be environmentally-friendly. The main difference is that the twenty-first century fuel has to be clean and efficient. The world is at a crossroads in terms of generating and utilizing existing energy resources effectively and efficiently. Statistical data compiled by IEA (International Energy Agency) suggests that India's oil and gas reserves will last up to 20 and 36 years respectively; whereas coal reserves will be exhausted within the next 114 years. According to the statistics of IEA, the development of renewable energy in the world has grown at an average annual rate of 1.7%. Renewable energy sources include solar, wind, biomass, geothermal, hydropower and ocean energies. In these renewable energy sources, biomass is the largest one which approximately accounts for 10% of the world's annual energy consumption in comparison to 21%, 27% and 33% from natural gas, coal and petroleum oil, respectively. This statistic shows that current research needs to be aimed towards developing the potential of biomass as a larger contributor to the global energy basket. Keeping these critical problems and statistics in mind, an un-conventional experiment has been designed and successfully performed.

ACHIEVEMENTS

To counter this critical issue, we have devised an experiment where commonly available biomass such as rice husk, coconut shells, tree bark and leaves have been torrefied using the waste heat (at a temperature 400°C) of a Kirloskar TV 2, 7.5 kW twin cylinder diesel engine. This experiment has several advantages. First and foremost, the source of fuel is commonly available within any agricultural set-up. Secondly, the experiment utilized waste heat from an engine to torrefy the agricultural products. This heat can be obtained from any standard energy producing equipment as well like a generator or a pump. Thirdly, biomass is considered as a carbon neutral fuel, i.e. the net carbon emissions from burning biomass are zero. Lastly, the final torrefied product can then be used as a significantly more efficient fuel and can be stored more easily as it is hydrophobic in nature. The aim of the project was to introduce a viable and cheap means of utilizing the various kinds of available biomass. More than 65% of India's population still resides in rural areas and a majority of agricultural and industrial

work is carried out within these area, which ensures that the research will have a wide impact upon completion. Torrefaction is a thermochemical process where biomass is heated in an inert environment at temperatures between 230^0-240^0 C to decompose complex chains of cellulose, hemi-cellulose & lignin into simple volatile organic compounds (VOCs) and char with fixed carbon content. This method ensures higher energy density and significant reduction of mass due to the release of VOCs and moisture. Torrefied products can be easily pelletized for co-firing along with conventional coal in boiler applications. Commonly available biomass, such as, rice husk, coconut shells, tree bark and leaves have been torrefied using waste heat from diesel engine exhaust gas. Based on FTIR analysis, the torrefied biomass has aromatic and aliphatic peaks similar to coal. The bond strength was found to be varying due to the presence of secondary natural compounds in the biomass. X-ray diffraction has been used to confirm the Carbon crystal structure. Oxygen has been detected in fingerprint region of FTIR in the form of carboxylic, whose composition was calculated using an element analyser. It has been observed that upwards of 31% of oxygen is contained in most of the samples, thus increasing O/C resulting better combustion. The relative calorific value of the torrefied products ranges from 82% to 194%.

Legacy of IEI

Shri Jawaharlal Nehru, First Prime Minister of India at the 4th Annual General Meeting in 1960

Shri Morarji Desai, Prime Minister of India is welcomed by Dr A Bhattacharyya, President, IEI at New Delhi, August 1977

To Design a Smart Micro-climate Control System

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Hardware Setup of SMCCS Prototype

Working Model of SMCCS Prototype

OBJECTIVE

Since ancient times, agriculture is an outdoor or open field production of crops; open field production is climate and weather dependent. In fact, growth and development of crops under a particular set of climate parameters defines geographical location, productivity and production period of different crops. The magnitude of impact of climate and weather on agricultural productivity and quality of production is appreciated by the farmers and the scientific community, including horticulturists. Abiotic and biotic environments govern crop production potential and quality of products. Among the major constraints in production of horticultural crops are temperature (hot or cold), sunlight duration and quality, water deficiencies or excesses, atmospheric moisture (relative humidity), weeds, deficiency of nutrients, heavy winds, carbon dioxide and host of diseases and insect pests.

There are some ecological optima for obtaining production potential of each of the crops. Deviation from these conditions results in yield losses partially and sometimes totally. However, near optimal climatic conditions could be created by controlling the climate parameters with the help of smart micro-climate controller and such cultivation under controlled environmental conditions is termed as protected cultivation.

Thus the main objective of this work is to design a simple, easy to install, microcontroller-based circuit to monitor and record the values of temperature, humidity, soil moisture and sunlight of the natural environment. These can continuously modified and controlled in such a way to achieve maximum plant growth and yield. Thus, it will improve performance of crop production by ensuring adequate climate parameters when needed.

ACHIEVEMENTS

The proposed model has been implemented and established successfully by using microcontroller 89S52. The planned system is an embedded system which is able to closely monitor and control the parameters of a smart microclimate control system on a regular basis and round the clock, for cultivation of crops as well as specific plant species, that might maximize their production over the growth of crop season and to eliminate the difficulties concerned within the system by reducing human intervention to the simplest potential extent.

The system comprises sensors, Analog to Digital Converter, microcontroller and actuators. When any of the above mentioned environmental parameter crosses the safety threshold, that has to be maintained to shield the crops, the sensors sense the changes and the microcontroller reads this information from input ports which is regenerated by the Analog to Digital Converter. Now microcontroller performs the needed actions by employing relays until the strayed-out parameter has been brought back to its optimum level. Since microcontroller is used as the heart of the system, it makes the setup low-cost and effective. The system also employs an LCD display for continuously alerting the user about the inside condition of the smart micro-climate control system, all these makes entire setup user friendly.

Demonstration of Model

The present design is comparatively low cost with maintaining optimum sensitivity and accuracy employing sensors. It provides full automation over the climate parameters. Closed loop designs prevent any chances of disturbing the greenhouse environment. User is indicated for changes in actuator state thereby giving an option for manual override. It has low power & compact design hence is easily portable.


During Prototype Build Session

Also it provides a user-friendly interface panel hence will have a greater acceptance by the technologically unskilled workers. Thus, this system eliminates the drawbacks of the existing setup and is designed as an easy to maintain, flexible and low cost solution.

For further improvement some modifications have been done as follows:

The performance of the system can be further improved in terms of the operating speed, memory capacity, and instruction cycle period of the microcontroller by using other controllers such as AVRs and PICs. The number of channels can be increased to interface more number of sensors which is possible by using advanced versions of microcontrollers.

The system can be modified with the use of a data logger and a graphical LCD panel showing the measured sensor data over a period of time. A speaking voice alarm could be used instead of the normal buzzer. This system can be connected to communication devices, such as, modems, cellular phones or satellite terminal to enable the remote collection of recorded data or alarming of certain parameters.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

Publication in International Journals: Pankaj Gupta and Prof. Mahesh Kumar Porwal, "Smart Micro-Climate Control System, A Green House Farming Revolution" published in International Journal of Research in Computer and Communication Technology (IJRCCT) Volume-3, Issue-1, pages 148-152, January-2014, ISSN (O): 2278-5841, ISSN (P): 2320-5156.

The story of civilization is, in a sense, the story of engineering - that long and arduous struggle to make the forces of nature work for man's good.

L. Sprague de Camp

ARM Processor Controlled Thyristor based Harmonic Filter

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Final Enclosed Model of the Product

Inside View of the Components of the Proposed Harmonic Filter

OBJECTIVE

In this world, everything and everyone depend on electricity. Today, the power requirement of the loads has even exceeded the power generated at the generating end. But even on this condition, the quality of the supplied power cannot be compromised; power must be supplied without reduction in 'Power Quality'. Various factors affect a system's power quality, the important one being 'Harmonics'.

Harmonics occur only when the load comprises non-linear elements. This harmonic content causes problems like flickering of voltage, neutral conductor heating, over-heating, vibrations, de-rating of machines, etc. on the consumer end. It also pollutes nearby loads and sometimes even the source. The IEEE Standard 519 (1992) offers recommended practices for controlling harmonics in electrical systems. The goals of IEEE Standard 519 are that, the utilities present pure voltage to the load and, the load doesn't draw high harmonic currents from the utility. The THDV is limited to 5%; no individual voltage harmonic should exceed 3%.

This project work focuses on a new and innovative technique to mitigate the harmonics. Generally, Active & Hybrid harmonic filters produce appreciable results on varying load profile. Passive filters show excellent results for a fixed load. This proposed technique extends the efficiency of the passive filter over varying load profile. For the considered system, several 'variable single-tuned harmonic filters' are designed for different dominating harmonic orders. These harmonic filters are tuned with the help of Thyristor Switches.

The proposed work is to implement effective tuning of the harmonic filters based on the load's working conditions in accordance with a self-formulated efficient tuning algorithm. So, parameters such as voltage, current and power factor are sampled from the input signal. Based on the value of the parameters, the filters are automatically tuned to the best efficient value in order to mitigate the harmonics effectively.

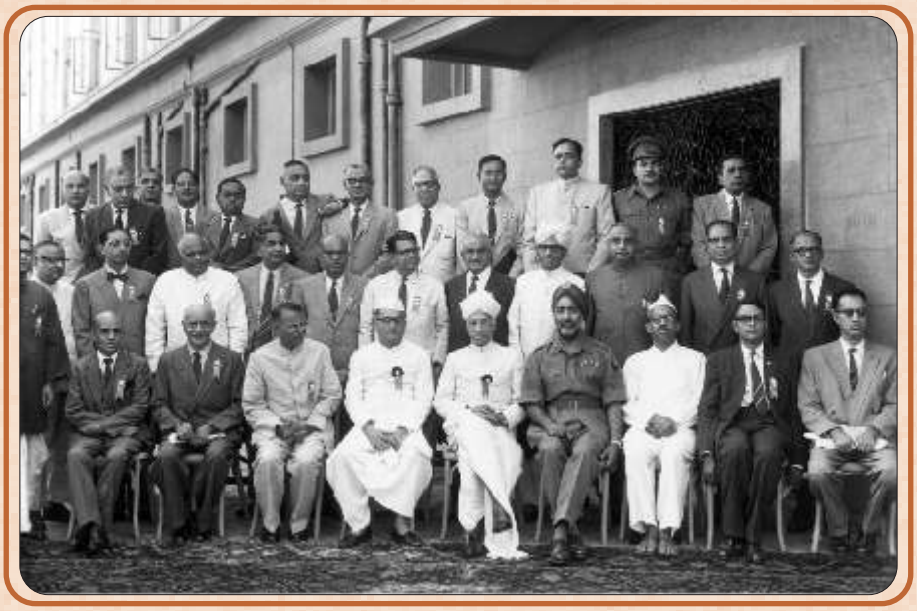
ACHIEVEMENTS

The Power System Harmonics cannot just be mitigated by connecting a dynamically switching passive filter bank at the point of common coupling (PCC) but the dynamic switching characteristics of the filter bank must be based on the consideration all the aspects of the load profile, monitored by a system with

high sampling rate. Generally, an active filter can mitigate harmonics over a wide scale but it only has limited efficiency. A passive filter, on the other hand, exhibits very high efficiency but it can be tuned only for a particular harmonic order at a particular load condition. For instance, the same filter that mitigates fifth order harmonics in one loading condition cannot mitigate the fifth order harmonics at another loading condition. But it can instead be used to mitigate the some other order at this load profile. This requisition, when calculated, gives the provision to choose the filters by actively monitoring the load profile and switching the filters appropriately. Thus, a set of filters can be efficiently used to mitigate the harmonics in a power system. Thus the proposed work based on dynamically switching passive filter can perform better in order to mitigate harmonics present in a dynamically varying load profile than other filtering techniques.

With the implemented system, the current harmonics of the load profile has been reduced from a Total Harmonic Distortion (THDI) value of more than 110% to lesser than 35%. Installing other filters would not have provided a better efficiency for such a varying load profile as this one. This has been designed for a 6KVA UPS powering about 33 computers. The same filter bank can be designed for other systems like VSD, ASD, Converter systems, Arc furnaces, etc. as well, which exhibits a dynamically varying harmonic rich load profile.

Legacy of IEI



Dr Sarvepalli Radhakrishnan, President of India, with Council Members of IEI in 1962

Design of Bioreactor for the Degradation of Textile Dyes by Developed Microbial Process

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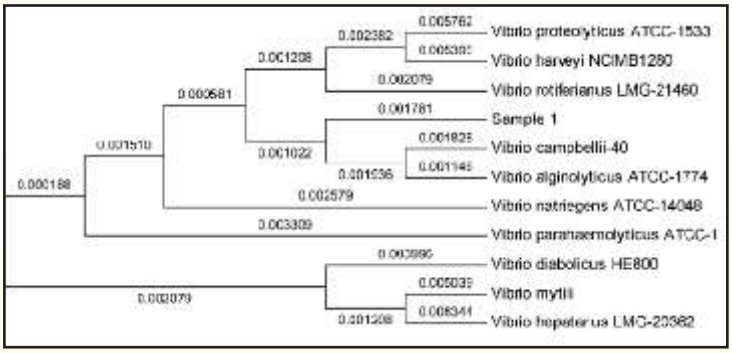
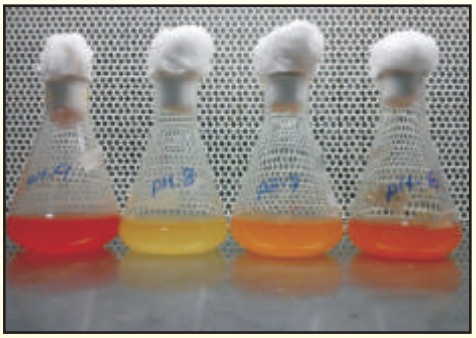


Phylogenetic Analysis



Effect of pH on Dye Degradation

OBJECTIVE

- Isolation and identification of dye degrading micro-organism.
- Process optimization for dye degradation by microbes.
- Process optimization for dye degradation by Fenton's process.
- Determination of steady state parameters for degradation of dyes.

In this research work, we intend to standardize a process for the complete degradation of textile dyes of industrial effluents. The process parameters for the organism's growth and dye degradation will be optimized and standardized. Based on the developed bioprocess, steady state parameters will be optimized for designing bioreactor for industrial application. Ultimately this developed technology will be transferred to nearby textile industry in thrissur (Kerala) where we have collected the effluent samples.

ACHIEVEMENTS

- Through this research work, we have isolated and identified the organisms capable of degrading azo dyes.
- Those organisms degrades the textile dyes at the rate of 50ppm/90minutes, this is comparatively very high from previous works done in the dye degradation.

In this study, a bacterium which degrades orange G-12 (OG-12) was isolated from industrial waste water. Test of pathogenecity was done and it was found as a non-pathogenic organism. It was identified as Vibrio campbelli. Influencing parameters like % of inoculum, age of culture, pH, temperature of the medium, agitation and aeration were optimized for the whole cells as 100%, 24hrs, 8, 35°C, static and unaeration respectively. Effect of substrate concentration was also analyzed. The degradation of dye was also performed by Fenton's method. The influencing parameters like H_2O_2, $FeSO_4$, pH were optimized as 1mM, 1mM, 6 respectively. Effect of substrate concentration was also analyzed.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

- B.Tech Thesis: MET'S School of Engineering, Calicut university, Kerala

Submitted sequence in NCBI: Vibrio campbellii strain pjkss 16S ribosomal RNA gene, partial sequence (GenBank: JX996169.1)

Conducting Polymer Nano-wire based Electrical Bio-sensor for Bacteria Detection

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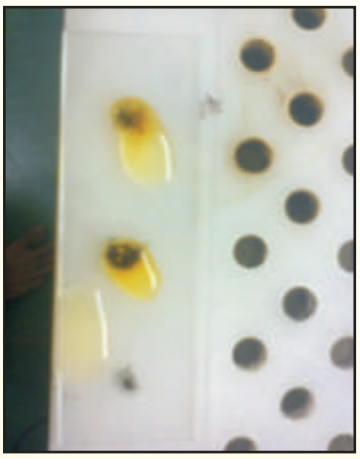
OBJECTIVE

The objective of this project is to develop a conducting polymer NANOWIRE BASED ELECTROCHEMICAL BIOSENSOR with high sensitivity and good reproducibility for BACTERIA DETECTION. Various experimental techniques were adopted to ensure the desired goal of developing electrochemical biosensor. Electrode fabrication and immobilization of PANI are some of the initial steps to build the basic components of biosensor. Some of the characterization techniques were also adopted to verify the results in order to standardize the process.

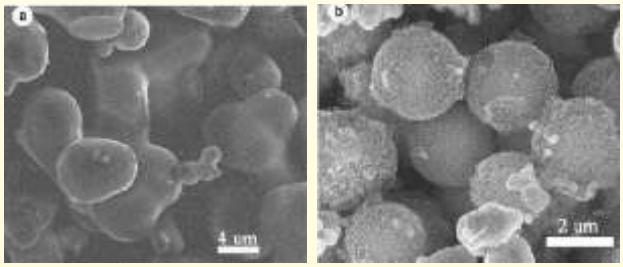


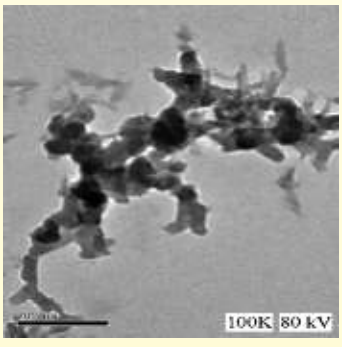
The PANI coated region which changes its colour as brown/yellow is treated by Ab-solution but that which remains same is only treated by Glutaraldehyde

ACHIEVEMENTS

Electrochemical biosensors are fabricated using the approach of chemically modified electrodes. Here, keeping the fact that sensitivity largely depends on the molecular size and oxidation states of conducting polymers in mind the sensitivity of biosensors may be enhanced significantly.

It is observed that 0.5 M of HCl solution is good enough to produce PANI deposits on gold surface. The conducting tape of gold-coated glass slide should be insulated from electrolytes during Cyclic Voltammetry, otherwise PANI shall be deposited on conducting tape instead of gold surface. EDX study shows that sample, which is treated by PANI and Glutaraldehyde, is having 2.26% nitrogen by weight where the later sample which is treated by PANI, Glutaraldehyde and Antibody is having 3.15% nitrogen by weight. This excess nitrogen in the later sample is due to the presence of covalently bound antibody.





SEM images of bulk PANI and interfacial PANI nanowire

Five mask patterns, with different dimensions have been designed by layout editor of AUTOCAD software and these masks are written on glass substrate with the help of laser mask writer. This photolithography technique is proved to be very useful for successfully transferring the patterns unto the glass substrate which ultimately leads to the design of working electrode. These five working electrodes are designed to study the dimensional influence of working electrode towards sensitivity.

Developing a Low Cost Microcontroller based Wireless Data Acquisition System to Monitor Civil Structures

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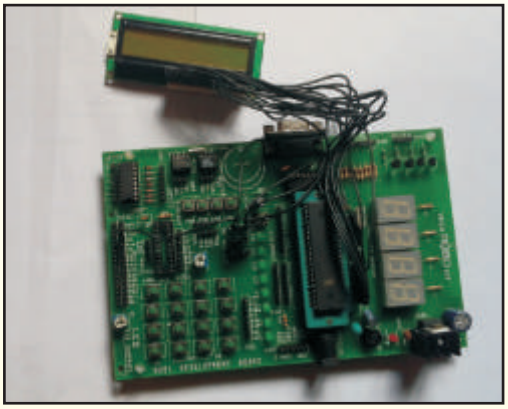

Part of the Circuit using Development Board

Ultrasonic Transducer and Wi Fi Router used in the Project

OBJECTIVE

Ultrasonic measurements are used in structural engineering to determine material properties, detect defects and assess deterioration. Ultrasonic wave propagation characteristics that can be used for these purposes are: velocity, attenuation, frequency, and energy. Rapid growth in demand for value-added techniques for health monitoring of structures has focused worldwide interest on sensors as the provider of an effective solution to measurement problems. Recent advances in measurement technology have demonstrated that ultrasonic sensors are suitable for the monitoring of civil structures.

Nowadays, civil engineers are inventing new sophisticated measuring instruments regularly. Unfortunately, due to high cost, these instruments are procured only by large companies. Most of the small and medium size companies cannot afford this due to economic problem. So our main target to develop or invent some good measuring instruments at low cost for the benefit of these companies. The aim of our project is to design a microcontroller based circuit to detect any defects in a concrete structure that is easy to handle and is pocket friendly.

ACHIEVEMENTS

In this project we have tried to use the transmitter circuit which generates 40 kHz ultrasonic frequency. So it was our hope that it will penetrate the plasma state of concrete structure. But later we have studied that only 54 kHz transducer can penetrate concrete. The price of this transducer is more than one lakh which exceeded the total project cost. So we could not carry out our R and D work after a certain level. In this project, we made the transmitter circuit and checked it using a CRO, which

generates the 40 kHz frequency. Here, we used many of components like capacitor, inductor, resistor, crystal oscillator, Ic4017, IC4013 etc to design the transmitter. Then we have burned the program in the microcontroller chip. We have not tested the setup practically because it is partially completed. But if the 40 kHz transducer can be replaced by the 54 kHz transducer, then the system may work fine. The network setup also could not be tested practically due to above mentioned problem. In future, we will study further the incomplete part if we get sponsorship from IE(I). These project after completion will be helpful to many real estate companies, as well as, small entrepreneurs.

Students have got practical knowledge about 8051 microcontroller. This project will help them to design circuits in microcontroller based measuring instrument. They have learnt also about characteristics and behaviour of various materials which are widely used in civil engineering. Moreover they have got knowledge about wi fi setup in small area.

Legacy of IEI

Shri B Patnaik, Chairman, Planning Board, Orissa State and former Chief Minister of Orissa addressing the 5th Annual General Meeting at the Orissa Centre of the Institution

Dr Triguna Charan Sen, former President of IEI and former Education Minister, Govt. of India, delivering the Presidential Address at 43rd Annual General Meeting of IEI

Design and Fabrication of Water Hyacinth Removing Machine

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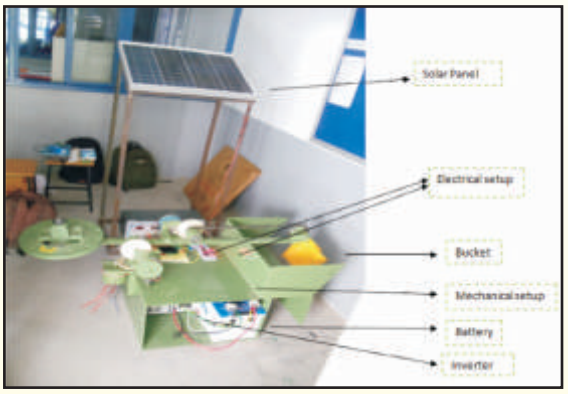
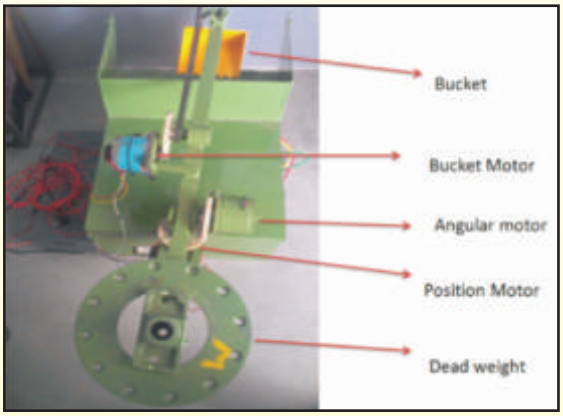


Overall View of Water Hyacinth Removing Machine



Mechanical View of Project

OBJECTIVE

The objective of the project is to design and fabricate a machine which removes water hyacinth from water bodies efficiently. This project work applies concepts of mechatronics to increase the effectiveness of the machine and optimizes the current trend of water hyacinth processing by implementing engineering solutions. The project aims to avoid number of iterations in cleaning the water bodies by both the mechanical removal and chemical disposal methods.

ACHIEVEMENTS

Water hyacinth (Eichhornia crassipes) is an alien, floating water weed that has spread throughout vital freshwater bodies in India and many other countries. It poses serious socioeconomic and environmental problems for millions of people in riparian communities and is, therefore, an added constraint on development. The present project deals with the removal of the water hyacinth efficiently from the water bodies such that it does not affect the other living organisms.

The project prototype model is developed based on the IE(I) funding. The mechanical actions are controlled by ON/OFF control of ac motors. This is achieved by using a dc battery and an Inverter. The project is RF controlled for remote operation from the bank. This is the main achievement of this work. Other important features of this method are its operator's safety and its eco-friendly nature.

Through this project, a good solution is provided for the existing problem in our society. Due to the increased population and shortage of water, it has become a worse case to waste the water for an inhabitant plant. Earlier, no existing system could remove water hyacinth permanently. But, with this project, a new scenario is created where hyacinth can be removed permanently. A perfect mechatronic solution is applied in this field to solve this problem in the society. The government also took action to control the hyacinth growth to reduce the water wastage. The cost effectiveness of the project is thus increased. The whole setup can be operated by a single operator using a remote. It shows the flexibility of the project. The time consumed to do the removal process is also reduced.

Development of Fully Autonomous V-tail-MAV

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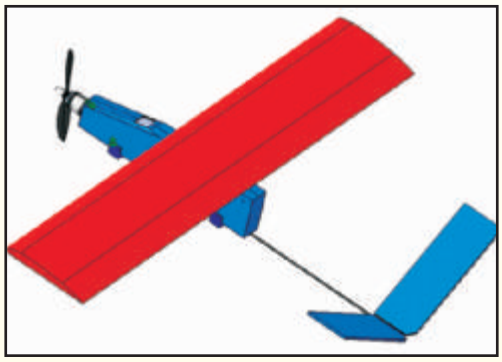
OBJECTIVE

The main aim of the project is to develop a miniature UAVs range from mini air vehicles (MAVs) that can be carried by an infantryman, to man-portable UAVs that can be carried and launched like an infantry anti-aircraft missile.

Fuselage constructed from the flexible polystyrene and carbon fiber rod, and wings from flexible material, mini air vehicles are stored fully assembled and ready to launch from an assault pack. The outer pockets of the assault pack hold a rugged laptop computer, the ground control station, and antenna assembly, leaving the large inner compartment of the pack for other required gear. MAVs are designed for civil applications like civil reconnaissance, civil security, mapping, survey and monitoring and digital elevation model, photography in general. The systems use electric engine and a puller propeller on the front part of the aircraft. The MAV have an advanced navigation system and an autopilot which enable the aircraft to fly with the range of 5 km and flight endurance from 20 to 35 minutes.



CAD Model of V – Tail MAV

Fabricated V – Tail MAV

ACHIEVEMENTS

The aim of our project was to develop a V-TAIL MAV with autopilot system which is capable of directional motion based on operator inputs. During our test flight we made our mission successful with the function of autopilot and GPS system. Losing and gaining altitude are measured accurately with help of ground station as per our design. In this paper the, case for the development of V-TAIL MAV suitable for control system research is motivated. All components have been designed to be of light weight and high performance so as to maximize payload capacity. Fail safe mode is intended to be activated to recover the aircraft in case of failure Manual and auto flight test have been conducted and V-TAIL MAV is capable of sustained flight with a full load of electronics and can be stabilized by simple controllers for common use in aircraft.

The engineer has been, and is, a maker of history.

James Kip Finch

Voice Operated Intelligent Fire Extinguishing Robot

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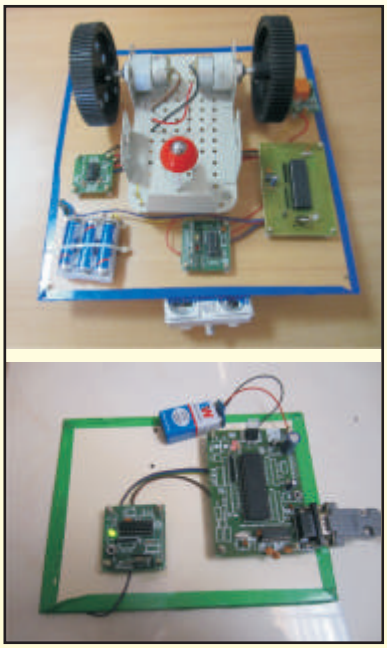
Overall View of the fire extinguishing robot



View of the internal components and the communication subsystem

OBJECTIVE

While thinking of the human loss when they indulge in fire extinguishing duties, as a beginner in engineering field I planned to think out certain solutions for the tragedy. This project aims at designing an intelligent voice operated fire extinguisher Robot, which can be operated with the help of radio frequency communication (RFC) technology. To design and develop a fire extinguishing robot that should be able to manoeuvre well in hazardous situation. Using wireless communication technology, one will be able to visualize the scenario under threat and action can be carried out accordingly.

ACHIEVEMENTS

The goal of this project was to develop a speech controlled fire fighting robot was fulfilled with quite good results. With fairly limited code it is possible to reach high robot control performance. This project was implemented such that the robot obeys the following commands: left, right, front, back, spray and stop. Our system is operated by voice commands from a distance within 10 m. The robot was tested to extinguish fire flames of 800° C. The bottleneck of the performance lies on the speech recognition part of the system. For users with a strong accent, the performance will not be very high. For people with a good accent, and even for native speakers, it takes a while to learn how to speak to achieve good results. The existing systems involved in fire fighting is less and also too costly (e.g. Thermite, South Korea).We happily admit that this idea has been realized at an affordable cost of few tens of thousands of rupees for a developing country like India. Obviously, this project has commercial applications. But the security of the system can be increased, for instance, by implementing a confirm mechanism. Still much of the performance results depend on the speech software, which hopefully will improve over the next years.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

This project has been presented as a paper entitled **"Voice Operated Intelligent Fire Extinguishing Robot "** in the National conference on embedded systems **NCE'13** held on **12-04-2013** by the department of Electrical and Electronics Engineering of Anna University regional centre at Tirunelveli.

Cost-effective Micro Propulsion Through Indigenous Development of Valveless Pulsejet Systems

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OBJECTIVE

To develop an indigenous design methodology for valveless pulsejets of medium thrust range towards the goal of powering unmanned Mini Air Vehicles (MAV) or ground vehicles (UGV).

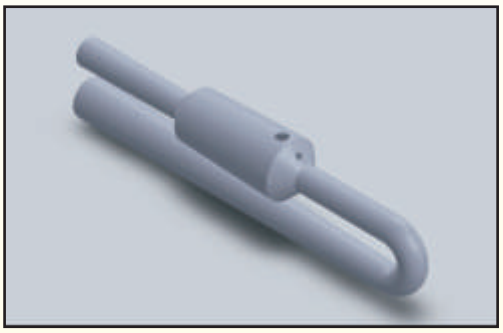
The expected deliverables are :

i. To evolve an indigenous design methodology for valveless pulsejets for MAVs.

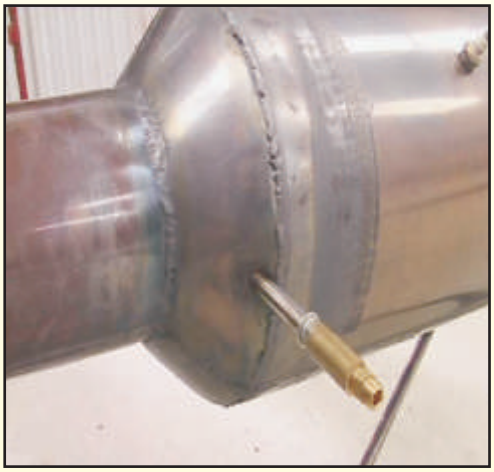
ii. Demonstrate both gaseous and liquid fueled operation with a valveless pulsejet and examine its scalability characteristics.

ACHIEVEMENTS

A small scale valve less pulsejet engine is developed with the refence to that of larger models by scaling it down. First the model is made in CAD. Subsequently, a prototype of the CAD model is developed which is tested with fuel which produces thrust about 800 grams with average thrust for 10 seconds. Scaling it will consume 1 litre of fuel for an hour of average flight hence indigenous design of valve less pulsejet of medium thrust range for propelling a mini air vehicle is developed.



CADD Design of Mini Pulse jet



Zoomed View of Fuel Injector and Igniter

With engineering, I view this year's failure as next year's opportunity to try it again. Failures are not something to be avoided. You want to have them happen as quickly as you can so you can make progress rapidly.

Gordon Earle Moore

Multi-disciplinary Approach for Dip based Thermal Analysis of Automobiles through Temperature-sensing Chemicals

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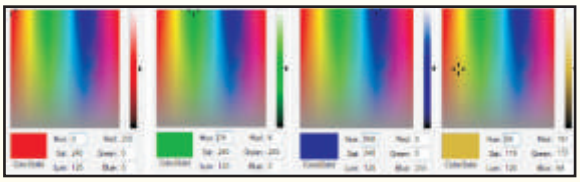
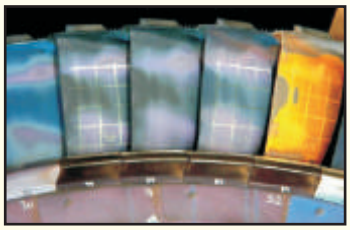
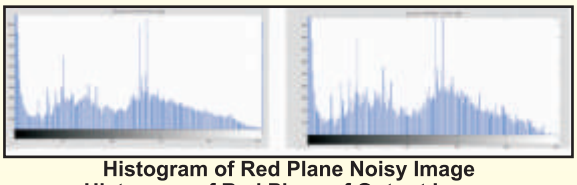


Red, Green, Blue and Brown as a display of colour measurement using MS Paint with a RGB and HSV scale



Thermal Paint applied to Gas Turbine Blades



Histogram of Red Plane Noisy Image
Histogram of Red Plane of Output Image

OBJECTIVE

Thermal paints are used by most automobile and aeronautical manufacturers in dedicated tests to record temperature profiles over the surface of engine components. This project examine the chemistry of thermal paints by using X-Ray Fluorescence (XRF) Spectrometer in order to obtain a quantitative dataset that accurately describes and predicts colour change based on high temperature-time gradients. Thermal paints are identified as effective thermal sensors for thermal mapping of complex aeronautical components compared to conventional thermometry techniques. This project will develop a novel approach for real-time thermal mapping using temperature-sensing chemicals which in turn is useful for automotive industries for compliance with emission norms and useful for gas turbine industries for performance evaluation of combustor. Also, this project will demonstrate the use in full-field analysis of industrial structures through a digital image processing (DIP) approach.

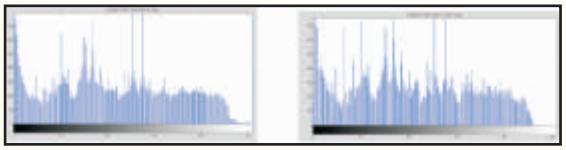
ACHIEVEMENTS

Firstly, this project was conducted in such a way that the elements within all the available paint types were analyzed using an X-Ray Fluorescence (XRF) Spectrometry. Secondly, an algorithm is developed to interpret the thermal paint data by digital image processing technique. Image of the thermal paint color pattern after testing is acquired and fed as an input to the developed software which analyses the image pixel by pixel and gives the temperature as the output. Deposition of the carbon exhaust on the paint colors during testing generates a noisy image incapable of data interpretation. A filter is designed to remove the effect of carbon deposition on the paint color, de-noising the image and making it suitable for further interpretation.

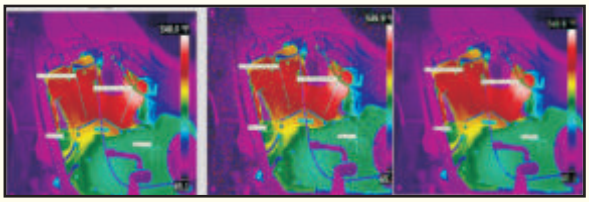
The first part of conducting the experiment for this study was to select which paints were to be used. A total of three paints, two SC and one MC, were to be selected for the study. The selection of the three paints was based upon the results of analysing all 15 paints under the XRF spectrometer. The paints which contained one transition metal as the dominant element in the paint would be most suitable for testing. The transition metal reaction within the paint compound causes the change in colour, and so selecting a thermal paint with as few or even only one transitional metal would make data easier to

analyse and thus the inter relationship between chemical elements within the paint and the colour could be more accurately explored.

Histogram of Green Plane Noisy Image
Histogram of Green Plane of Output Image



Histogram of Blue Plane Noisy Image
Histogram of Blue Plane of Output Image



Original Image, Noisy Image, Denoised Image

Within the sample test pack of permanent change thermal paints used in this project there are fifteen paints, each have a different initial colour and change colour at different temperatures. Permanent-change thermal paints can be separated into two groups: Single Change (SC) and Multiple Change (MC). Within this sample pack, there are 8 SC and 7 MC paints. For explanatory purposes the name of paint has two parts to it, the first either SC or MC, indicates whether the paint has a single or multiple change of colour, and the second comprising of three digits, indicates the temperature at which the paint undergoes the first colour change when heated at that temperature for ten minutes. However this is only true for SC paints, in the case of MC paints, after the first three digits, there is a dash and another number, e.g. MC 350-8. This indicates the paint will have multiple changes, where the first occurs at 350 degrees Celsius when heated for 6 minutes (as stated by the manufacture, Thermographic Measurement Company - TMC) and there are a total of twelve colour changes. This design of this experiment was to heat the paint to a range of temperatures and at each temperature, identify the colour in wavelength, and the chemical species that are present. The relationship between the colour and the chemical species will then be attempted to be identified for a colour-chemistry relationship.

Two different thermal paints are applied on two test plates and exposed to a heating flame for a fixed predefined time one after the other. Contours are obtained on the test plates with different colors embedded within them, exhibiting the range of temperatures to which they were exposed. The images of the contours are taken and are referred as original images. The test plates are further exposed to an engine exhaust allowing a considerable amount of carbon to be deposited on the contours distorting their structure. The images of these degraded contours are further taken and referred as noisy or degraded images. The filter is applied on these noisy images to filter the effect of the carbon soot deposition. The filtered images are termed as denoised images. The filter is also designed to give the histogram output to check the filter performance. The histograms of the red, green and blue planes of the noisy and denoised images approve the reliable performance of the filter.

Engineers participate in the activities which make the resources of nature available in a form beneficial to man and provide systems which will perform optimally and economically."

L. M. K. Boelter

Implementation of Micro Factories for Micro Components in Mechanical Industries

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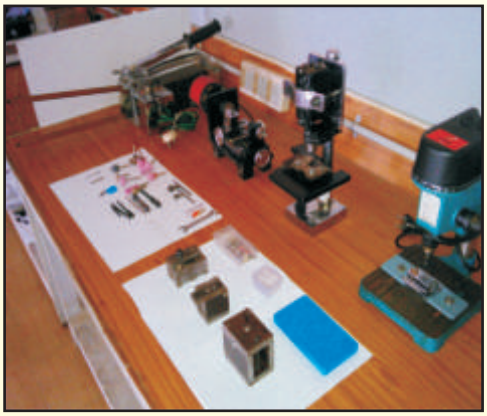
Micro factory for Micro Components



Micro factory for Micro Components

OBJECTIVE

1. Fabricate Micro Lathe, Micro milling, Micro drilling, Micro grinding and Micro spot welding machine for production of Miniature components.
2. Conduct performance test and design optimization for all micro machines.
3. Optimize the machining parameters of Micro lathe, Micro milling, Micro drilling, Micro grinding with different factors and different levels and achieve larger metal removal rate with smaller machining time.
4. Achieve high speed machining (10,000 rpm) from micro machines for getting better surface roughness.
5. Construct micro factory for miniature of components with enormous saving in energy, power, time, space and materials and other resources.

ACHIEVEMENTS

1. Fabricated Micro lathe with dimensions of 185mmX 100mm and weight about 4.5 kg. The rotational speed of spindle is 10,000 RPM and achieve 2 micrometer surface roughness.
2. Fabricated Micro milling with dimensions of 160mmX 160mm and weight about 3.5 kg.The rotational speed of spindle is 10,000 RPM and achieve 2 micrometer surface roughness.
3. Fabricated Micro drilling with dimensions of 170mmX 170 mm and weight about 2.5 kg. The rotational speed of spindle is 10,000 RPM and achieve 2 micrometer surface roughness.
4. Fabricated Micro grinding with dimensions of 270mmX 100mm and weight about 1.5 kg. The rotational speed of spindle is 10,000 RPM and achieve 2 micrometer surface roughness.
5. Optimization of machining parameters with different levels are conducted and predict larger metal removal rate with smaller machining time for all micro machines.

6. Erect all micro machinery in Table top and run with 230 V single phase AC supply .It need only 300 watts to run micro factory.
7. Micro factory was installed successfully on Table top and external dimensions are 900 mm X600 mm. It is suitable production for miniature of components for Bio medical & Automotive components.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

1. Patent registered in IPR –Chennai. (Application No: 5040/CHE/2013). Title: Non automatic Table top Portable mini lathe.
2. Paper presented in National conference conducted RVS College of Engineering and Technology.

   Topic; Optimization of Micro end milling parameters on Al 6082 using DOE concept.
3. Paper presented and Got FIRST PRIZE in National conference conducted Mother Theresa College of Engineering and Technology. Topic; Optimization of Micro drilling parameters on Printed circuit board using Taguchi method.
4. Project Model (Micro Spot Welding machine) presented and got SECOND PRIZE in National level Technical symposium conducted by Kodaikanal Institute of Technology.
5. Project Model (Micro lathe) presented at National level Technical symposium conducted by Kodaikanal Institute of Technology.

Legacy of IEI

Shri Atal Bihari Vajpayee, Hon'ble Prime Minister of India, greeted by Shri G P Lal, President of the Institution on the occasion of World Congress on Sustainable Development during January 20-23, 2000

Design and Development of Ornithopter Test Rig

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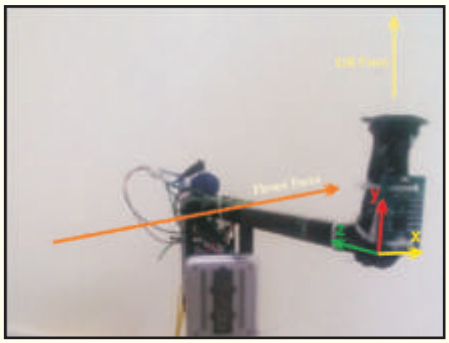
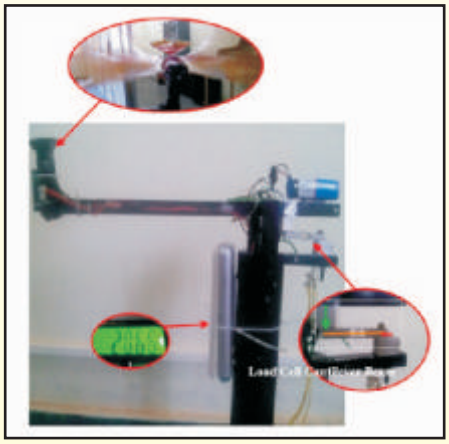


Schematic Representation of Positioning of Accelerometer and Load Cell



Measurement of Lift Force using Load Cell

OBJECTIVE

To design, develop and prototype a versatile test rig for the dynamic characterization of Micro and Macro sized Ornithopters. The developed test rig will have the ability to measure thrust as well as lift forces with the resolution of 0.1g. The costing of the rig is proposed to be minimized by utilization of indigenous available resources. The rig will be designed in such a way that it will have compatibility with the Micro Air Vehicle configurations that are being developed at a certain Indian centres. The ability to measure the flapping frequency with sophisticated acoustic sensor system will be developed. The proposed work aims at design of test rig which is of less weight to support Micro–Ornithopters. The design of test rig is carried out using PRO ENGINEER software. In order to obtain the rigid body motion signals from the test rig, a set of accelerometers and gyros will be embedded which measures the linear acceleration and angular velocity of the body of interest. Utilizing these results' the lift as well as thrust forces will be computed using LabVIEW.

ACHIEVEMENTS

In this project, the characteristics of Ornithopter, such as, lift, thrust forces and also flapping frequency are measured using the developed test rig. The test rig is designed in such a way that it encompasses all the necessary sensors namely accelerometer to measure the tangential acceleration, load cell to obtain the lift force and also microphone to measure the flapping frequency. A sophisticated LabVIEW based system is incorporated to measure all these parameter in real time. Various methods of utilizing the sensor for an example accelerometer to measure the flapping frequency and also lift force are also attempted to validate the results. The loss due to unbalance in the mass, manufacturing error for the calculation of inertial properties, time delay and also friction is neglected. The proposed test rig can be effectively employed in various sizes (wing span) of Ornithopters. The rotational speed of spindle is 10,000 rpm and achieve 2 micrometer surface roughness.

Development of a Jute based Bio-composite Utilizing Polyolefin and/or Polylactic Acid-its Characterisation and Industrial Process Development

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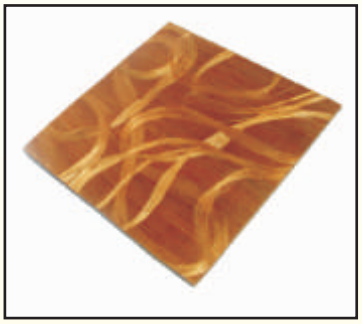
OBJECTIVE

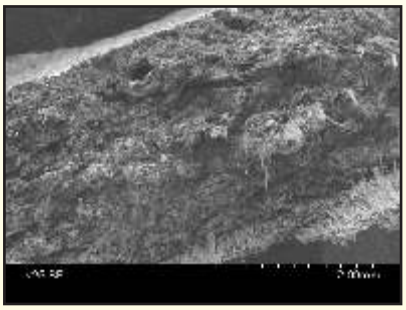
The aim of the proposed project is to develop a jute fibre biocomposite as green and cost-saving to its' optimum value. For the purpose of manufacturing of interior furniture. The requirements of eco-friendliness are facing the contradictory requirements of a long durability and lower cost.

The aims of the present research are:

- Selection the best matrix and the best chemical treatment;
- Improving the selected composite and its characterisation;
- Development of process in view of a production.



A jute/polylactic acid sample



Fracture of a jute/polylactic sample showing a good impregnation of the treated fibre with the resin

ACHIEVEMENTS

A literature review on biocomposite, on different thermoplastics, techniques, jute fibre and chemical treatment initially has been carried out. Substantially, the different objectives of the planning have been conducted for convenience in using the hot-press and as the flexural measurement at SMSE could be done only at once.

Around 230 samples have been drawn. The first sets of experiments aimed at adjusting the fibre quantity, quality, machine temperature, pressure and timing. Different dimension moulds and a cooling system have been designed, built and adjusted. The Polypropylene required a treatment with maleic anhydride and this exact treatment has been experimented and settled. Bigger dimension samples of 26 cm^2 have been prepared.

After pressing, the samples have been analyzed by visual observation, tensile measurement and through Scanning Electron Microscope.

The water absorption behaviour of jute/PLA composites, jute/maleated polypropylene has been investigated regarding its' interior applications followed by the standard test method in accordance to ISO 16983:2003 'Wood-based panels - Determination of Swelling in Thickness after Immersion in Water' and compared to the standards of wood-based panels. It has appeared that untreated and treated jute/PLA composites exhibited a superior water resistance property compared to particle board, MDF and hard board and they are by far below the minimum requirement of the ISO standard 16983.

The most important characterization test has been specified as the aging resistance due to the possibility of PLA biodegradation and the water affinity of the fibre. The accelerated-aging test ASTM D 1037« Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials » has been chosen. Yet the untreated material haven't showed sufficient aging resistance which is an important problem. Till now, different 130 samples have been undergone aging test.

Currently the experimentation is carried out on the final treatment of the fibre and PLA to achieve a sufficient ageing resistance. Biodegradation, UV, flexural and internal bonding test are also in the pipeline.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

A paper titled 'Water Absorption of Jute/Polylactic Acid Composite Intended for an Interior Application and Comparison with Wood-based Panels' (DOI 10.1007/s40033-014-0040-x) has been published in Volume 95, Issue 1 of the Journal of The Institution of Engineers(India): Series D .

'Water Absorption of Jute/Polylactic Acid Composite Intended for an Interior Application and Comparison with Wood-based Panels'.

Legacy of IEI

Smt Pratibha Devisingh Patil, President of India lighting the lamp to mark the General Assembly 2007 of the World Federation of Engineering Organizations (WFEO), hosted by The Institution of Engineers (India) at New Delhi

Fabrication of Cost Effective Oxygen Reduction Catalyst for Low Temperature Fuel Cells

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OBJECTIVE

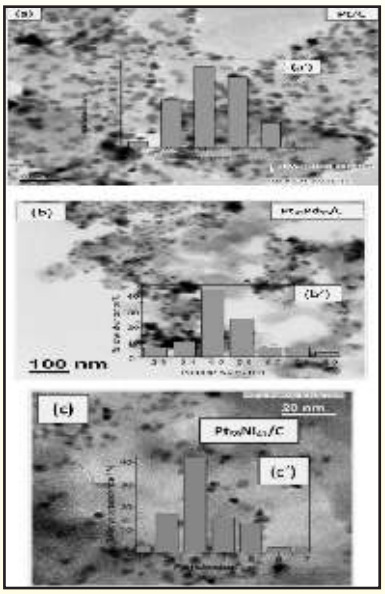
To design some Pt base alloyed nano catalyst with proportionate addition of Pd and Ni for the study of ORR in fuel cell operating in alkaline medium. The catalysts were synthesized by the usual borohydride reduction method. The structural and physico-chemical properties of the alloyed catalysts were characterized using XRD, TEM and EDAX techniques and the catalytic activity of the synthesized catalysts was derived by employing a series of electrochemical techniques described next. The following experimental sections therefore entail the detailed description of several experimental studies involving catalyst synthesis and the physico-chemical and electrochemical characterisations.

ACHIEVEMENTS

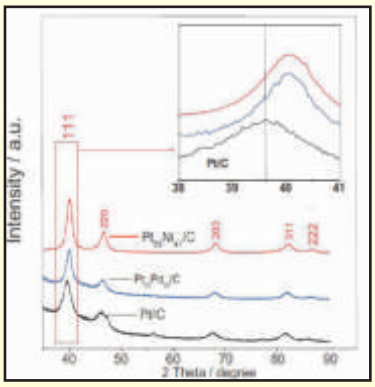
Some salient aspects of the present study are as follows.

The desired stoichiometry is obtained by adopting the NaBH4 reduction process to get zero valent metal nano particles of the metal precursors. The alloy formation of the individual metal nano-particle is evident from the physico-chemical characterizations of the binary metal catalysts. From the surface characterization of the individual catalyst electrode prepared, it is evident that all the catalyst shows discrete voltammetric regions for electrochemical process studied. The potentiodynamic plots for different catalysts in the Oxygen saturated alkaline medium shows the distinguished voltammetric regimes of corresponding processes. For PtPd/C catalyst it can be observed that the limiting current is reached at more positive potential compared to PtNi/C binary catalyst, showing better catalytic activity than the other binary catalyst. The oxide reduction region of the PtPd/C catalyst is sharper than the Pt/C and PtNi/C catalysts. Considering the half wave potential, kinetic current and the onset potential and corresponding overvoltage, it can be concluded that PtPd/C shows better catalytic for ORR in the alkaline medium than PtNi/C and far better than Pt itself. However, in the PtNi/C binary catalyst the Pt content is decreased to 50% without affecting the catalytic property, which signifies the cost-effectiveness of the prepared catalyst composition. The magnitude of the slopes of the linear Levich- koutecky plots is close to 4 for all the catalyst electrodes, confirming the complete reduction of the oxygen to water. The higher magnitude of the Tafel slope for the PtPd/C catalyst ensures the better catalytic property of the binary catalyst.

The outcome of the investigation in the present study leads to futuristic scope of extending the work to some of the critical studies involving variation of several parameters like, alkali concentration, sweep rate, potentials, temperature to evaluate the activation parameter and also the effect of ethanol crossover in a DEFC to reveal the functional property of the nano-materials.



TEM images of Pt/C (a), Pt45Pd55/C (b), Pt59Ni41/C (c) catalysts and inset (a', b', c') shows the corresponding particle size distribution histogram



XRD spectroscopic plots of Pt/C, Pt45Pd55/C, Pt59Ni41/C catalysts

Autonomous Robotic Boat for Marine Water Sampling

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Autonomous Robotic Boat during testing

Robotic Boat and its control system

OBJECTIVE

To develop an autonomous robotic boat using Raspberry pi Linux based onboard computer, which refers to any vehicle that operates on the surface of the water without a crew, capable of sampling water.

Some reason for the sampling of water are: long-term monitoring of the water quality; to determine whether the water quality is generally good or bad for the intended use; to identify specific areas of concern such as points of suspected contamination; or to determine if a particular problem has been corrected. The position and time at which the sampling is done will be recorded and stored on data recorder for later data processing.

ACHIEVEMENTS

- In this project work the development of USV is mainly for water sampling, sea patrolling and environmental monitoring.
- The developed USV is equipped with Autonomous system, Optical flow sensor, Sonar range finder, GPS, ESC and Servo Motor for several applications.
- Wireless communication with 2.4 GHz frequency will be utilized for monitoring, control and real-time communication between a base station and the USV.
- The device is capable to collect water sample from contaminated area.

Legacy of IEI

Shri V V Giri, President of India, being received at the Annual Convention of IEI in 1971

Development of UV Post Curing Apparatus for Transparency Studies on Stereo Lithography Parts

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OBJECTIVE

The goal of the project is to develop a post curing apparatus which employs ultraviolet energy to solidify the partially built stereo lithography parts. Stereo lithography is a process in which photo polymerizable epoxy is used to make the molds by exposing individual layers of resin to light in the pattern desired for that layer. Stereo lithography is increasingly being used to make prototypes and experimental models.

The Post Curing Apparatus (PCA) that is to be developed in this project will provide a spectrally-matched, long-wavelength, Ultraviolet (UV) energy required for final solidification of stereo lithography parts. The partially cured or green part placed on a turn table will be cured by the actinic fluorescent bulbs and the resultant fully cured parts will be fit for functional applications like flow-visualization.

The apparatus will have provision for changing the curing times with direct implications on the strength and transparency properties of the cured polymer parts.

To develop a low cost and efficient device for post curing process of polymer parts.

Internal Components of the Apparatus


Developed UV Post Curing Apparatus

ACHIEVEMENTS

Necessity of Post Curing Apparatus:

Rapid Prototyping (RP) is a relatively new field that makes use of computer aided design (CAD) models to produce three dimensional physical models. Several RP technologies exist today, including Stereo lithography, the first such technology. The stereo lithography process, patented by Chuck Hall in 1986, is a layered process in which an ultraviolet laser is focused onto the surface of a vat of photo-curable polymer.

The ultraviolet laser energy does not provide enough energy to cure the parts fully. Because of this, it is necessary to post-cure the parts to cure the resin further by placing them in the Post Cure Apparatus (PCA). The PCA is a chamber with a rotating table and ultraviolet light bulbs. The built model is placed in the PCA for about an hour to get fully cured.

Another importance of PCA is, by controlling the curing time the model can be set with the required hardness. Also, while performing transparency enhancement, PCA plays an important role. Thus an individual PCA is required for any research conducted based on RP.

National & International Status:

Companies like 3D Systems, Fusion UV are well known worldwide for their UV systems. 3D Systems build entire stereo lithography machines and supply for major research establishments. In India, there are few manufacturers of UV curing systems like UV India, ACSUV, APL Machineries, Taniya and Sunman Engineering. These major companies mentioned manufacture UV curing systems and supply for bigger industries and major research establishments. The bottom line is, the cost of purchasing PCA equipment is immense and not suited for universities and smaller research agencies. Hence a unique design with the cost of manufacturing that can be made use by the universities.

Major outcomes of the work :

The UV Curing apparatus finds its use in research projects handled by universities and research establishments to carry out strength and transparency studies of rapid prototyped parts. Currently, UV curing apparatus available in the market are too costly to be purchased for small research projects but transparency enhancement is integral in the projects involving flow visualization. In such cases, the product developed in this project can be used as this equipment has been developed very economically.

Post curing apparatus can used to obtain completely cured parts from the partially cured parts through photopolymerization process with the use of ultraviolet light. Time based transparency, strength and hardness properties can be studied using this apparatus.

Scope for Future work:

As a continuation to the current project, it is proposed to work on improving the various surface finishing methods handled in the post processing of rapid prototyped parts. Since polishing has a direct relation to the strength of the component, there is a scope for employing more intricate methods compared to the conventional finishing techniques, for obtaining better results.

Legacy of IEI

Mohammad Hidayatullah, Vice President of India, Mother Teresa and Shri Jyoti Basu, Chief Minister of West Bengal during the Diamond Jubilee Celebration of the Institution of Engineers (India) in 1980

Analysis of Cervical Cancer Progression using Computer Vision

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OBJECTIVE

The primary objective of this work is to diagnose the Cancer at early stage and also identify the disease progression.

The secondary objectives are:

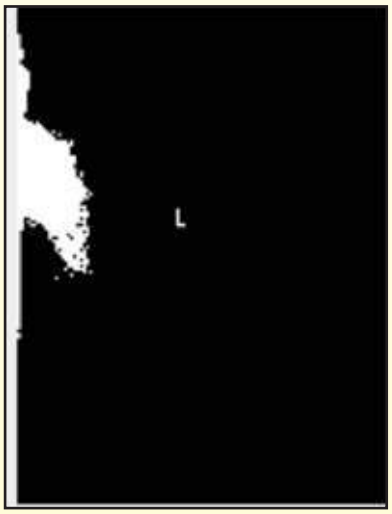
- to examine the architectural progression of Cancer.
- to detect border for skin lesions collected by dermoscopy.
- to validate Cancer or Non Cancer Lesions.

Input Mammogram Image

ACHIEVEMENTS

Get interest created in this Research Area

1. Published the outcome in Conferences
2. The medical Practioner in Aarthi Scan Centre has appreciated the project & its outcome
3. Examination of images which has been used for this project.



Detected Tumour Region

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

1. The outcome of project is published in the International Conference on 'Emerging Marvels in Information and Computer Science & Engineering' organized by Maria College of Engineering & Technology on the topic "Analysis of Cancer Progression" during 25-26 Feb, 2 014.
2. The outcome of project is published in 'Recent Trends in Engineering & Technology' organized by CSI Institute of Technology, Thovalai on the topic "Analysis of Cancer Progression" during 13-14 March, 2 014.
3. The outcome of project is published in the National Conference on 'Networking & Intelligent Computing' organized by Dr. Sivanthi Aditananr College of Engineering, Tiruchendur 628215 on the topic "Detection of Cancer using Mammogram Images during 26-27 March 2014.

Design and Implementation of Hybrid Harmonic Filter for Converter System

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Final enclosed model test system

Inside view of the components in the system

OBJECTIVE

Both electric utilities and end users of electricity are becoming increasingly concerned about the quality of electric power. The term power quality has become one of the most buzzwords in the power industry since the late 1980s. A great number of nonlinear loads like adjustable speed drives and static power switches including those of large capacity ground the power quality strife. Unbalanced loading of the three phase supply causes some detrimental effects such as under utilization of power supply equipment and overloading of neutral conductors with the fundamental frequency in addition to the harmonic currents. The electric power engineers see power quality as anything that affect the voltage, current and frequency of the power being supplied to the end user i.e., the ultimate user of electricity.

Among the various power quality problems the harmonics is the major one that creates lots of effects on the equipments that were connected to the power system. Harmonic interferences in power systems, which are caused by the harmonic producing loads such as diode or thyristor converters and cyclo converters, have been serious problem to solve. As a result of this, current Total Harmonic Distortion (THD) values have been raised and violates its limit as mentioned in standard IEEE 519-1992. Hence the objective of the proposed work is to minimize the current harmonic distortion present in the load current waveform of the converter system with the placement of hybrid harmonic filter that is a combination of passive filter and small rated active filter. A three phase PWM voltage source inverter is acting as active filter. The control signal to the active filter is generated by instantaneous reactive power theory. ARM Processor is used in the proposed work to extract the harmonic current component from the instantaneous real and reactive power. The proposed work is experienced in three phase diode bridge rectifier rated at 2.2kW. Experimental results obtained from prototype models are shown to verify the theory implemented in the proposed work.

ACHIEVEMENTS

In electric power system, the passive filters have always been considered a good alternative for current harmonics compensation. In general, the passive filters have the disadvantages like effect of source impedance on filtering characteristics, parallel resonance between a source and a passive filter causes amplification of harmonic currents on the source side at the specified frequencies. The above mentioned disadvantages can be overcome by the use of active filters consisting of voltage or current source PWM inverters. However it is difficult to construct a large rated current source with a rapid

current response as well as the initial cost is also high. Hence in the proposed work, the rating of the active filter is reduced by the combination of the active filters with the passive elements such as capacitors and reactors.

This active filter connected in series with the passive filter is used for the purpose of improving the characteristics of passive filter. Basically the active power filter acts as a controlled voltage source and forces the utility line currents to become sinusoidal and in phase with the respective phase to neutral voltage by pushing all current harmonics to circulate through the hybrid scheme. In other words, because the active filter connected in series with the passive filter through the coupling transformers, it imposes a voltage signal at the primary terminals that forces the circulation of current harmonics through the passive filter, improving its compensation characteristics, independently of the selected resonant frequency or filter parameters.

According to the theory utilized in the proposed work, a new instantaneous reactive power compensator is proposed, comprising the switching devices without energy storage components. This compensator not only eliminates the fundamental reactive power in transient state but also the harmonic current. Hence the current waveform will be sinusoidal as well as the power factor of the system is also get improved.

Legacy of IEI

Shri Pranab Mukhejee, President of India, inaugurating 27th Indian Engineering Congress by lighting the lamp at New Delhi in 2012

Flexural and Impact Charactrisation of Rapid Protoyped, ABS Prototypes

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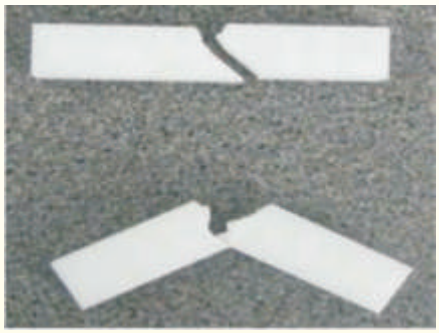
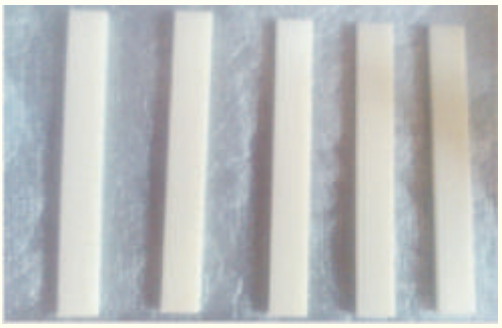


Specimen After Izod Impact Test



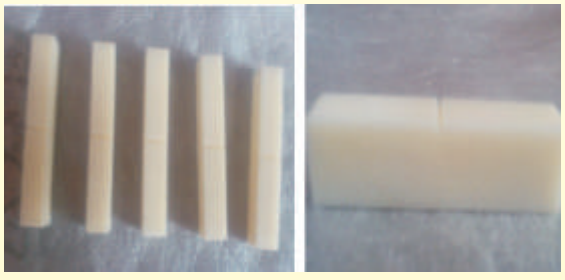
Specimen for Flexural Test

OBJECTIVE

The aim of this project is to spread the use of flexural and impact characterisation of ABS-Rapid prototyping technology into mechanical engineering. The flexural and impact tests on ABS were carried out in order to find out the major mechanical properties such as flexion and impact (notch toughness) characterisation of the samples of ABS material (prototype). The RP process involves translation of the CAD file to STL format followed by slicing of the model into multiple horizontal layers, each of which is reproduced physically in making the prototype.

ACHIEVEMENTS

ABS piping has higher impact strength than PVC, especially at lower temperatures. However ABS can deform under sun exposure. ABS is highly durable with high impact strength when compared with PVC is less durable. The flexural modulus of ABS is higher, when compared with other polymers, such as, Nylon6, Polycarbonate, Polyethylene (MDPE), Polyethylene Terepthalete (PET) and Poly Propylene. The results of this project are useful in defining the most appropriate raster orientation for FDM components on the basis of their expected in-service loading. Results are also useful to benchmark future analytical or computational models of FDM strength or stiffness as a function of void density.



Specimen for Izod Impact Test

Specimen After Flexural Test

Earlier Detection of Alzheimer Disease using Intelligent Algorithm

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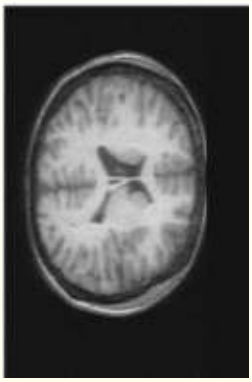
OBJECTIVE

The primary objective of this work is to diagnose Alzhemier Disease at the early stage and also identify the disease progression.

The secondary objectives are,

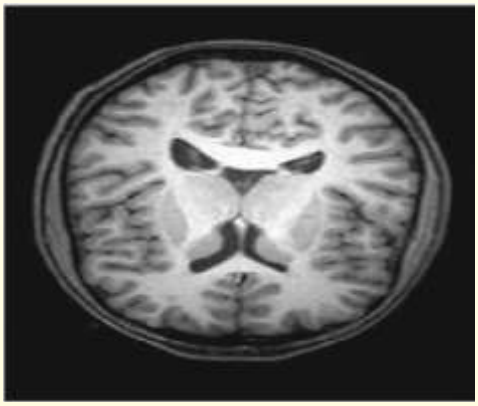
- to examine the architectural progression of Alzhemier Disease
- to detect its stage.



Alzheimer MRI Brain

ACHIEVEMENTS

1. Get interest created in this Research Area
2. Published the outcome in Conferences
3. The medical Practioner in Aarthi Scan Centre has appreciated the project & its outcome
4. The examination of images which has been used for this project.



Normal MRI Brain

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

1. The outcome of project is published in the International Conference on "Emerging Marvels in Information and Computer Science Engineering" on the topic "Earlier Detection of Alzheimer Disease using Intelligent Algorithm" at Maria College of Engineering during 25-26 February, 2014.
2. The outcome of project is published in the International Conference on "Recent Trends in Engineering and Technology" on the topic "Detection of Alzheimer disease in brain images using PSO-SVM approach" at C.S.I Institute of Technology during 13-14 March, 2014.
3. The outcome of project is published in the IEEE international Conference on "Advanced Communication Control and Computing Technologies" on the topic "Detection of Alzheimer disease in Brain images using PSO and Decision Tree Approach" at Syed Ammal Engineering College during 8-10 May, 2014.
4. The outcome of project is presented in the National Conference on "Networking and Intelligent Computing" on the topic "Earlier Diagnosis of Alzheimer Disease in functional Brain Images" at Dr. Sivanthi Aditanar College of Engineering during 26-27 March 2014.

Study on Mechanical Behaviour of Natural Fibre Reinforced Biodegradable Natural Resin Polymer Composite

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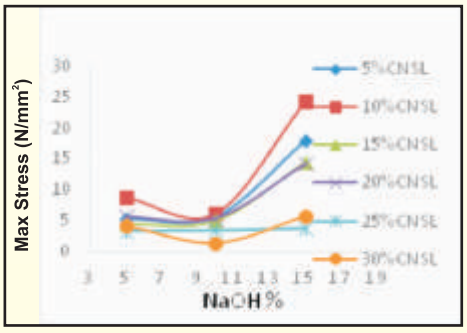
Banana fibre composite and mould



Ultimate stress against Concentration of Alkali

OBJECTIVE

The objective of this project is to study the properties of the composites prepared using Hybrid Matrix [General purpose resin and Cashew Nut Shell Liquid (CNSL)] and natural fibers as reinforcements (Banana fiber, Coir fiber, Gongura fiber). Matrix used is a hybrid one, which is a mixture of synthetic and natural resin. The composition of the hybrid matrix is varied by changing the volume fraction of CNSL in each sample. The effect of alkali treatment, treatment duration and CNSL proportion on mechanical properties of composite material has been studied in this work.

ACHIEVEMENTS

The ultimate and failure stresses decrease with increase in the CNSL%. This is the general trend observed in most of the cases. But the biodegradability increases with increase in the CNSL%. Maximum strength of natural fibre reinforced composite material initially decrease till a critical point and then increases as duration of treatment and NaOH concentration increases. Same is observed for breaking strength of composites. As CNSL concentration increases, strength of composites decreases. The only exception in this general observation is 10% CNSL composites in banana and gongura fibre reinforced composites. Hence there is a tradeoff between biodegradability and strength. The selection of the composite ultimately depends on the area of application of the composite; whether importance is given for strength or that to biodegradability.

Legacy of IEI

Dr Zakir Hussain, President of India with the Council Members in 1969

Wall Climbing Robot

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OBJECTIVE

This project is to build a wall climbing robot. This robot is a suction type of wall climbing robot; using PIC to do the interfacing, control the movement of the robot, ventilation fan and the sensors. The position sensors are used to sense any things blocking its path while it is climbing up, therefore it can be rotated left, right, up and down. The on-board pump has been replaced by computer fan which will lower the cost as well as the weight of the original product. The cost of building this robot must be cheaper than the commercial robots.

A Servo Motor for Continuous Rotation for Wall Climbing Robot

ACHIEVEMENTS

The Wall climbing Robot developed can be utilised for the following applications:

- Pipe inspection in chemical
- Ship cleaning/inspection Octopus Cybernetics,
- Welding robot Rest CSIC
- Airplane cleaning and inspection
- Oil tank inspection IQS
- Nuclear plant inspection Nero Uni
- Steal bridge inspection Roma Uni
- Cleaning and Inspection of glass wall

With few modifications the wall climbing Robot can be converted into military UGV to transport military supplies and cross boarder surveillance.

A Wall Climbing Robot

The Wall climbing robot can also be applied in AGV with the following modifications.

The development of the Autonomous Ground Vehicle (AGV) includes 4 vital steps:

- Design a CAD model for the external body of the robot and perform design iterations of the CAD model,
- conduct the stress analysis for the body made and make respective corrections
- CFD simulation
- Tailoring the Graphical User Interface according to our requirement and interfacing it with the On-Board computer.

Development of Ground Station with Wireless Telemetry

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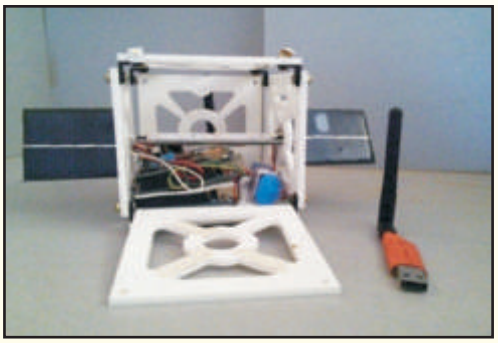

Ground Station Model

OBJECTIVE

Objectives of the proposal are the design and development of telemetry ground station system for satellite launched with weather balloon which carries instruments aloft to send back information on atmospheric pressure, temperature, and humidity and wind speed by means of a small, expendable measuring device called a radiosonde. Telemetry is the highly automated communications process by which measurements are made and other data collected at remote or inaccessible points and transmitted to receiving equipment for monitoring.

ACHIEVEMENTS

Wireless telemetry made early appearances in the radiosonde, developed concurrently in 1930 by Robert Bureau in France and Pavel Molchanov in Russia. Mochanov's system modulated temperature and pressure measurements by converting them to wireless Morse code. In the US early work employed similar systems, but were later replaced by pulse-code modulation PCM. Later Soviet interplanetary probes used redundant radio systems, transmitting telemetry by PCM on a decimeter band and PPM on a centimeter band, Telemetry is the highly automated communications process by which measurements are made and other data collected at remote or inaccessible points and transmitted to receiving equipment for monitoring. The word is derived from Greek roots: tele = remote, and metron = measure. Systems that need external instructions and data to operate require the counterpart of telemetry, tele command. Although the term commonly refers to wireless data transfer mechanisms it also encompasses data transferred over other media such as a telephone or computer network, optical link or other wired communications like phase line carriers. Though it is an advanced technology it is possible to develop a ground station capable of transmitting large pack et of data.

Expected beneficiaries of the project:

1. Government organization like ISRO, DRDO, where working on development of small satellite, government institution like IIT's, VTU are working parallel with the government institute in small satellite development setting up ground station, few private companies and nonprofit organizations are in the development of recovery system for balloon experiment.
2. Telemetry was an important source of intelligence for the US and UK when Soviet missiles were tested; for this purpose, the US operated a listening post in Iran. Eventually, the Russians

discovered the US intelligence-gathering network and encrypted their missile-test telemetry signals. Telemetry was also a source for the Soviets, who operated listening ships in Cardigan Bay to eavesdrop on UK missile tests performed in the area.

Telemetry is used in complex systems such as missiles, RPVs, spacecraft, oil rigs and chemical plants since it allows the automatic monitoring, alerting, and record-keeping necessary for efficient and safe operation. Space agencies such as NASA, the European Space Agency (ESA) and other agencies use telemetry and/or tele command systems to collect data from spacecraft and satellites. Telemetry is vital in the development of missiles, satellites and aircraft because the system might be destroyed during or after the test. Engineers need critical system parameters to analyze (and improve) the performance of the system. In the absence of telemetry, this data would often be unavailable.

Legacy of IEI

Shri Jyoti Basu, Chief Minister of West Bengal addressing the gathering during Diamond Jubilee Celebration of IEI in 1980

Shri B D Jatti, Vice President of India and Shri D Devaraj Urs, Chief Minister of Karnataka during Annual Convention of IEI in 1977

Solar Powered Tricycle for Physically Challenged People

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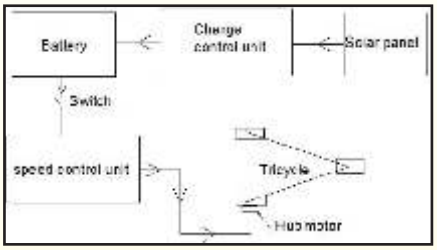

Circuit of Solar Powered Tricycle


Final Assembly of Solar Powered Tricycle

OBJECTIVE

The main objective of this project is to utilize the solar power, which is a renewable source of energy, to bring increased mobility to physically challenged people in India. Presently, hand-powered tricycles are used by many of the disabled on the roads, but some current users of the hand-powered tricycles do not have the physical strength or coordination to propel themselves on the tricycle with their arms and hands. As such they can also not able to travel long distances on roads.

Now- a-days, a small fraction of disabled persons are using tricycles run by petrol engines and electric power. They need non-renewable energy sources, and cause pollution problems. Thus, in the present project work, a solar powered electric motor is added to the current hand-powered tricycle used on roads in India to provide tricycle users with improved levels of mobility.

The main components of the solar powered tricycle (Fig.1) includes solar panel which absorbs the solar energy from the sun, hub motor which receives the electrical energy and provides the motion, charge controller which makes sure that the batteries are always fully charged and ready to go all the time. Finally, the battery is a storage place for the energy received by the panel.

The design aspect of the project mainly includes the calculation of the centre of gravity of the vehicle, maximum speed of the vehicle and check for static and dynamic balance of the tricycle and details of controls. It is estimated that it can run at a maximum speed of about 26 Kmph. The stability of the vehicle is also good because of the fact that the C.G of the vehicle lies low, due to wider wheel base. The test run of the fabricated model of the tricycle concludes that the developed model is reliable, sustainable and functional.

The Solar powered tricycle designed and fabricated under this project (Fig.2) can carry two persons in a drive and the solar panel fitted as roof top to the SPT provides shelter to the people on drive. It is a low speed, stress free vehicle and very environmental friendly as it takes power from the renewable source of energy – SUN. Therefore, it makes this project to be acceptable by each and every one in the society.

ACHIEVEMENTS

1) A news item on this project has been published in "The Hind" daily news paper, a national media, and also in all Telugu news papers on 20th May 2014.The edited part of the news item published is

given below:

"A solar-powered tricycle fabricated by a group of engineering students from S. R. K. R. Engineering College here helps the physically challenged defy their disability and move around freely like any other normal person. The students developed the vehicle with a financial aid of ₹ 50,000, extended by the Institution of Engineers (India), Kolkata, in a period of six months under the guidance of Dr. V. Durga Prasad, Professor in Mechanical Engineering. The students involved in the project were Vivek, Lokesh, Bhavishya, Sudha, Chandini and Sadgun, all from the Department of Mechanical Engineering. A battery fitted to the tricycle stores solar power and helps it run for 5-6 hours. Mr. Durga Prasad said the tricycle could accommodate two-persons, including the driver, and run at a speed ranging between 15-20 kmph. He said the solar power-based tricycle was developed in their college when only hand-driven vehicles were in use. It is 100 percent eco-friendly and pollution free, he asserted. Mr. Durga Prasad said the upgraded tricycle could run manually and with solar power as well. The college principal Prof. D. Ranga Raju appreciated the students for their novel initiative".

2) A special news bulletin has been telecasted in "E TV" Andhra Pradesh, in the program titled "YUVA" at 9.30 PM on 23rd May 2014. The program has highlighted the features and the very purpose of the vehicle meant for physically challenged people. Certain portion of the show included the riding of the vehicle by a physically challenged person having leg impairment.

PAPERS PUBLISHED IN JOURNALS / PAPERS PRESENTED IN SEMINARS / M.TECH THESIS / PH.D THESIS / PATENT GENERATED FROM THIS PROJECT

1) V. Durga Prasada Rao, et.al, "Fuzzy Genetic approach to Economic Lot-size scheduling Problem", Jordan Journal of Mechanical and Industrial Engg., Vol. 3, No. 1, 9-16, March 2009, ISSN 1995-6665, Imp.factor : 0.201.

2) K. V. Muralikrishnam Raju, V. Durga Prasada Rao, et.al, "Optimization of cutting conditions for surface roughness in C. N. C. end milling", International Journal of Precision Engineering and Manufacturing (Springer), Vol.12, No.3, 383-391, June 2011, ISSN 2005-4602, DOI 10.1007/s12541-011-0050-7, Impact factor : 1.06.

3) A. Balakrishna, V. Durga Prasada Rao, et.al, "Material selection processes and exchange of material information in concurrent engineering environment using neural network and web technology", International Journal on Interactive Design and Manufacturing (Springer), Accepted for publication & online version available, ISSN 1955-2513, DOI 10.1007/s12008-013-0195-y.

4) V. Durga Prasada Rao, et.al, "Genetic Algorithm approach to solve Multi-Item Inventory Problems", Proceedings of International Conference on Operations Research Applications in Infrastructure Development (ICORAID-2005-ORSI), Abs.29, Conducted by ORSI-Bangalore Chapter, I.I.Sc., Bangalore during December 27 – 29, 2005.

5) V. Durga Prasada Rao, et.al, "Genetic Algorithm to solve Constrained Multi-Item Inventory Problems", Proceedings of 10th Annual International conference of the Society of Operations Management, organized by IIM, Ahmedabad during December 21 - 23, 2006.

6) V. Durga Prasada Rao, et.al, "Study and Optimization of Process parameters for minimum Surface Roughness in machining of Aluminium Metal Matrix Composite", Proceedings of International Conference on Advanced materials (ICAM - 2011), Abs. B044, Conducted by P. S. G. College of Technology, Coimbatore during December 12 - 16, 2011; pp. 364-368.

7) V. Durga Prasada Rao, et.al, "Multi-objective optimization of Fibre Reinforced composite plate using a Non-dominated Sorting Genetic Algorithm", Proceedings of 2nd International Conference on Advances in Engineering and Technology (ICAET 2012); MECH-512; Published by Coimbatore Institute of Information Technology, Coimbatore; Organized by E. G. S. Pillay Engineering College, Nagapattinam during 28th & 29th March 2012, ISBN 978-1-4675-2245-8.

8) V. Durga Prasada Rao, et.al, "Design optimization of Compound Gear train using Improved Harmony Search ", Proceedings of Indian Conference on Applied Mechanics (INCAM 2013), 51-52, Conducted by IIT Madras during 4 – 6 July 2013, ISBN 978-93-5137-273-8.

9) A. Balakrishna, V. Durga Prasada Rao, et.al, "Mathematical Formulation of Biomechanical Parameters used in Orthodontic treatment", accepted for publication in the proceedings of International conference on Mathematics, Engineering and Industrial Applications (ICoMEIA-2014) to be organised by Institut Matematik Kejuruteraan (IMK) at The Gurney Resort Hotel & Residences, Penang, Malaysia from 28th – 30th May 2014.

Legacy of IEI

Shri Pranab Mukhejee, President of India, in the inaugural programme of the 28th Indian Engineering Congress at Chennai in 2013

Innovative Modeling and Rapid Prototyping of the Turbocharger Impeller

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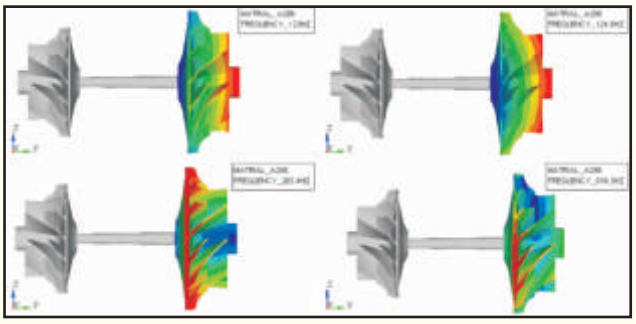
OBJECTIVE



Four mode Shapes of a Turbocharge Impeller

The Impeller Prototype

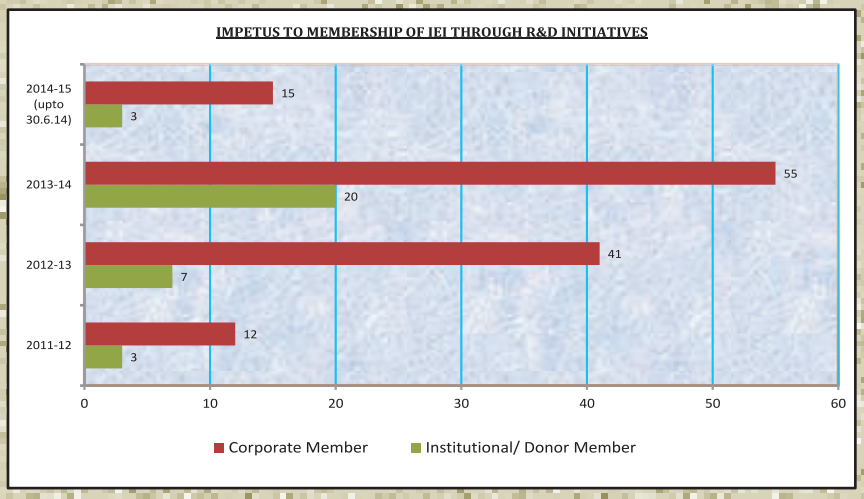
A Turbocharger is a forced induction device that is used to allow more power to be produced for an engine of a given size driven by the engine's exhaust gases is used in petrol, diesel powered cars, trucks, marine applications, aircraft etc. In exhaust gas turbo charging, part of exhaust gas energy, which would normally be wasted is used to drive a turbine. The turbine shaft is connected to a compressor, which draws in combustion air, compresses it, and then supplies it to the engine. The increased air supply enables more fuel to be burnt; hence the engine develops higher power and thus leading to lower fuel consumption and less emission. Development of impeller for turbochargers through conventional manufacturing has got many challenges due to the blade geometry complexity and high competition in industries due to cost management. If small modification requires in impeller means the entire tooling system has to be changed. The normal manufacturing route involves casting and machining this would lead the cost. Time consumption and not efficient for small manufactures. The aim of the project is to make impeller for turbochargers with great design flexibility, less time consumption by integrating the reverse engineering (RE) and rapid prototyping (RP) techniques called Stereolithography apparatus (SLA). Prototype of the turbocharger impeller is for the visualization, mechanical testing. For this prototyping of impeller ABS material has been used.

ACHIEVEMENTS

Since from decades Sand casting process has been acceptable for the development of turbocharger impeller. Today the emphasis is on meeting customer's requirements and meeting those requirements in ever shorter period of time. This reality is new challenges for impeller manufactures and caused a rethinking of the processes of design, development and implementation of the product. The project focused on how rethinking is applied in terms of the application of advanced engineering tools and methods to specify the design and development of products. Development of the turbocharger impeller using conventional manufacturing process (sand casting) is very complicated, difficult and also time consuming. Preparation of small size sand moulds is difficult with conventional patterns.

Perfection in producing the contoured patterns is always the problem. Pattern making takes lot of time and more costly and also any modification in the pattern design is very difficult for conventional process. In this project work we are mainly concentration on the turbocharger impeller design and development methods. For all problems overcome by using the one of the Rapid Prototyping technology called stereolithography apparatus (SLA) are used to produce prototype of the impeller. And also Rapid tooling technology was used to produce the master pattern for mass production. In the design of the impeller we are go through checking possibility optimization process, with three different materials. And also Analysis to be carried out for optimization of component to analyze the design is safe or not using static and modal analysis. From the analysis part concluded that we can do optimization on impeller.

Considering the above discussion we are conclude that replacement of the conventional manufacturing process with the rapid casting process for development of turbocharger impeller. The development of the impeller using SLA process is used for visualization, mechanical testing and Rapid tooling for mass production.



Some of the Partnering Institutes under IEI R&D Grant-in-Aid programme

R&D Activities of IEI over the years

The Institution of Engineers (India) initiated an effort to Promote R & D activities in applied research at college / university level by direct financial support in 2001. In the first year, 9 (nine) project proposals were given financial support amounting to Rs 2.26 lakhs. With sincere and dedicated effort to promote Research and Development in the country with the passage of time there was a remarkable increase in the numbers of projects being sanctioned allocating larger sum of grant-in-aid. Over a period of 10 years, in 2010 total number of sanctioned projects jumped to 64 with an outlay of Rs 25.34 Lakhs. In 2011 the total outlay stands at 43.68 Lakhs to 76 project proposals. During the FY 2013-14 the total budgeted amount has been enhanced to Rs 60 Lakh to facilitate more students in taking up the R&D projects.

One of the unique features of the R&D Grant-in-Aid program is that this particular program is targeted mainly for students in Under Graduate Level. This has been done to encourage and inculcate among the students the passion for Research and Development. When these students grow up this embedded passion of R&D will be the driving force to put them in the trajectory of Advanced Research.

To broaden the Horizon of the R&D effort of IEI and to enhance the visibility and accessibility of the R&D, new concepts are nurtured continuously. One of the most promising proposals is formation of IEI Research & Innovation Group - IERIG. This is actually a model through which various engineering institutes across the country and The Institution of Engineers (India) can partner each other and jointly promote R&D culture in the country.

The Institution of Engineers (India) has also initiated setting up of R&D Centre at its Headquarters, which will facilitate the utilization of the in-house talents for carrying out R&D. This will add another feather in the crown of the Institution and it will be in a position to be rightly called as an R&D Institute.

The ever increasing interest of the students across the country for R&D project coupled with the prospects of joint venture with other engineering institutions and the nurturing of the in-house talent at the proposed R&D facility at headquarters, the R&D effort of The Institution of Engineers (India) will definite get a boost and move thumping ahead through the path of success in future.

Thrust & Emerging Areas of R&D

- Autonomous Unmanned Air Vehicles
- Big Data Analytics
- Cyber Security
- Information Management Security (IMS)
- Small Satellites
- 3D Printing & Additive Manufacturing
- Composites / Light weight Structures
- Engineers Analysis & Simulation.
- Cloud Computing
- Renewable Energy Solutions.
- Intelligent Imaging System
- Stereo 3D Imaging
- Unmanned Under water Vehicles
- Automotive Safety Block Box

Certification as Professional Engineers

Basic Requirements

1. Bachelor's Degree in Engineering or equivalent recognized by Statutory Authority or Government of India;
2. Experience of 7 years in engineering practice;
3. Professional experience of 2 years in a responsible position of significant engineering activity;
4. Membership of recognized professional engineering institution/association;
5. Maintained continued professional development since graduation at a satisfactory level;
6. At least three sponsors, who are either Fellows of IEI/Fellows of any other recognized professional engineering institutions, must support any application for PE;
7. Passed the Assessment Examination as prescribed.

Exemptions for Experience for Professional Engineers

1. Credit up to 12 months of experience may be given if he/she has a recognized Post Graduate Engineering Degree or equivalent.
2. Credit upto 24 months of experience may be given if he/she has obtained a recognized PhD Degree.
3. Maximum exemption for higher education shall not exceed 24 months.
4. Engineers registered, as International Professional Engineer by the members of IPEA is exempted in appearing in Online Examination. Shall be certified in India, through an interview via Video Conferencing (VC).

Additional Requirements for International Professional Engineering Certification:

1. Good Knowledge of International codes/standards.
2. Conversant with International practices/ procedures in engineering.
3. Demonstration of capabilities to be an International Professional Engineers to the satisfactory of respective National Committee and Board for Certification.

PE/IntPE Certification Fee:

1. For PE Certification : ₹ 4,000

   US $ 400 for applicants other than citizens of India & Nepal

   Interview through Video Conferencing : ₹ 3,000

   Totaling : ₹ 7,000

2. Renewal of PE Certificate : ₹ 3,000

   US $ 300 for applicants other than citizens of India & Nepal

   Interview through Video Conferencing : ₹ 3,000

   Totaling : ₹ 6,000

3. Transfer fee from PE (India) to IntPE (India) : ₹ 10,000

   US $ 300 for applicants other than citizens of India & Nepal

   Interview through Video Conferencing : ₹ 3,000

   Totaling : ₹ 13,000

4. Renewal of IntPE Certificate : ₹ 16,000

Break-up of Fee

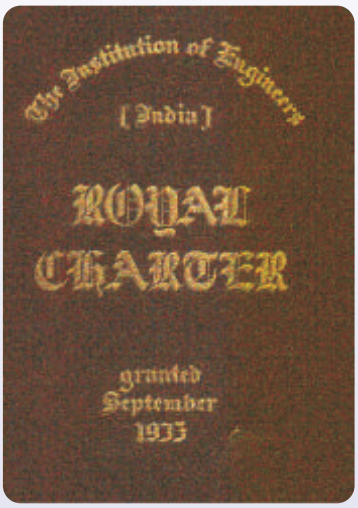
₹ 3,000 for renewal of PE Certification;

₹ 3,000 for video conferencing charges;

₹ 10,000 for transfer from PE (India) to IntPE (India).

For more information visit our website: *www.ieindia.org* or send email to: *pe@ieindia.org*

Telephone : 033-22233296



ROYAL CHARTER

AT THE COURT AT BUCKINGHAM PALACE,

The 13th day of August 1935

PRESENT,

THE KING'S MOST EXCELLENT MAJESTY

IN COUNCIL

The objects and purposes

(a) To promote and advance the science, practice and business of Engineering in all its branches (hereinafter referred to as "Engineering") in India.

(b) To establish, subsidise, promote, form and maintain local Associations of members belonging to the Institution and others engaged or interested in Engineering so as to assure to each individual member as far as may be possible equal opportunity to enjoy the rights and privileges of the Institution.

(c) To diffuse among its members information on all matters affecting Engineering and to encourage, assist and extend knowledge and information connected therewith by establishment and promotion of lectures, discussions or correspondence; by the holding of conferences; by the publication of papers, periodicals or journals, books, circulars and maps or other literary undertaking; by encouraging research work; or by the formation of a library or libraries and collection of models, designs, drawings, and other articles of interest in connection with Engineering or otherwise howsoever.

(d) To promote the study of Engineering with a view to disseminate the information obtained for facilitating the scientific and economic development of Engineering in India.

(e) To establish, acquire, carry on, control or advise with regard to colleges, schools or other educational establishments where students and apprentices may obtain a sound education and training in Engineering on such terms as may be settled by the Institution.

(f) To encourage, regulate and elevate the technical and general knowledge of persons engaged in or about to engage in Engineering or in any employment manual or otherwise in connection therewith and with a view thereto to provide for the holding of classes and to test by examination or otherwise the competence of such persons and to institute and establish professorships, studentships, scholarships, rewards and other benefactions and to grant certificates of competency whether under any Act of the Government of India or Local Governments regulating the conduct and qualifications of Engineers or otherwise howsoever.

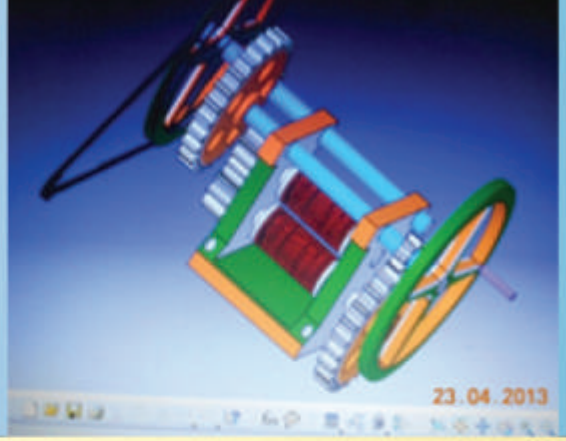
(g) To give the Government of India, the Local Governments and Municipalities and other public bodies and others, facilities for conferring with and ascertaining the views of Engineers as regards matters directly or indirectly affecting Engineering and to confer with the said Governments, Municipalities and other public bodies and others in regard to all matters affecting Engineering.

(h) To encourage inventions and investigate and make known their nature and merits.

(i) To arrange and promote the adoption of equitable forms of contracts and other documents used in Engineering and to encourage the settlement of disputes by arbitration and to act as or nominate arbitrators and umpires on such terms and in such cases as may seem expedient.

(j) To promote efficiency and just and honourable dealing and to suppress malpractice in engineering.

(k) To do all such other acts and things as are incidental or conducive to the attainment of the above objects or any of them.



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