

**RAJALAKSHMI
ENGINEERING
COLLEGE**

Consultancy

ABOUT US

Rajalakshmi Engineering College, an autonomous institution affiliated to Anna University, Chennai, was established in the year 1997 under the aegis of Rajalakshmi Educational Trust whose members have had consummate experience in the fields of education and industry. The College has grown from strength to strength in the last 20 years and has been progressing towards Excellence in Engineering Education, Research and Development.

The Department of Scientific and Industrial Research (DSIR), Government of India has recognized the College as a Scientific and Industrial Research Organization (SIRO), considering its potential for Research and Development activities.

The college presently offers 16 Under Graduate and 9 Post Graduate programmes. The college has 8 research centers approved by Anna University, in which presently 75 research scholars are working on various emerging areas, including industry oriented problems.





**CENTRE OF
EXCELLENCE
IN MACHINE VISION**

ABOUT MACHINE VISION

Centre of Excellence in Machine Vision at REC was established with seed funding from TIFAC-Core, Department of Science and Technology, New Delhi. The centre has been providing solutions for automated QC in Manufacturing Production Lines. Several solutions have been implemented for Industries such as Automotive, Pharmaceutical, Electronics and Packaging. The centre provides consultancy services, turn-key solutions, training for academicians and corporate executives as well as in house training for budding engineers.

scope

The following inspections can be carried out in the centre of excellence in Machine vision.

- 1.Packaging Defect
- 2.Assembly Control
- 3.Assembly Errors
- 4.Optical Character Recognition
- 5.Manufacturing Defects
- 6.Cutting Tools Inspection
- 7.Lens Profile Verification
- 8.Brake Piston Inspection
- 9.Profile Verification
- 10.Surface Finish

Also, the CORE has been supplied a customized vision solution setup to almost 20 industries all over India to satisfy their industrial needs. This centre has been supplied more than 25 projects to the industry since 2009.

FACILITIES:

- The center is an independent department functioning at REC campus with an exclusive area of around 1300 sq.ft comprising Laboratory, Seminar hall, Conference room and lecture halls.
- It has well equipped Vision System laboratory with smart cameras, image acquisition and data processing software with pre-set Algorithms.
- Eminent faculties both from academia and Industry.

PROJECTS

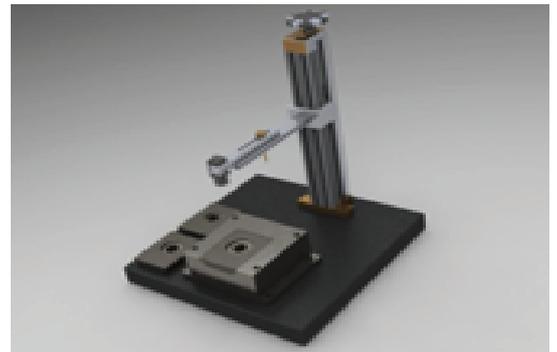
INSPECTION OF BRAKE PISTON CYLINDER (BPC) FOR AUTOMOTIVE BRAKING SYSTEM

BPC is an important component in the braking system of four wheelers. The component is having 16 holes in the periphery. Any small burr left in the BPC can cause serious breakdown of the brake system. This project involves detecting the presence of even the smallest burr in the hole, by rotating the component (through a servo controller). This system has been developed to operate with very high reliability and for 12 variants of brake piston cylinder.



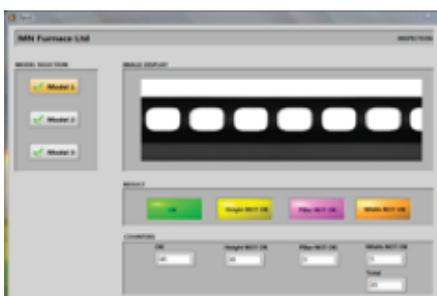
INSPECTION OF SPLINE GEAR

This product is developed for a leading automobile company and the company produces over 17 variants of spline gear. As the component is machined, there are chances of the same component being machined twice leading double broaching which is a fault. As the number of types produced and the number of components produces per day are large, a Machine Vision based Inspection has been developed for the company.



INSPECTION OF CAGE SLEEVE

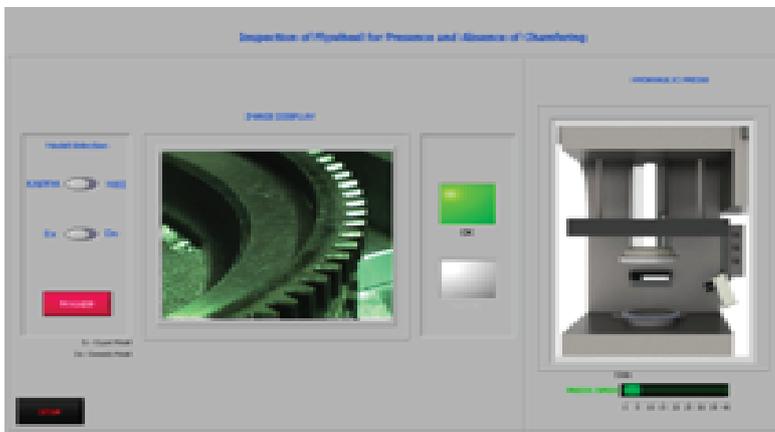
Cage sleeve is an automotive component whose dimensional accuracy is highly important for proper functioning. There exists six openings all round, whose dimensions are to be measured and defective and not defective components are to be segregated in the vision system.



PROJECTS

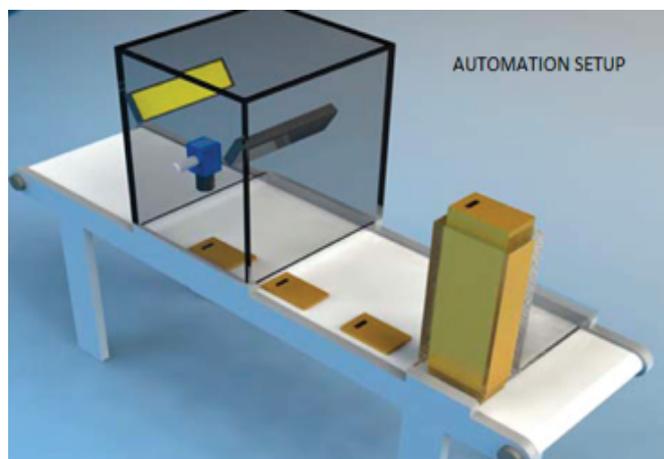
INSPECTION OF FLYWHEEL

Flywheel is an automotive component used in all vehicles. A hot geared wheel is placed on the flywheel and it is pressed by a 70 ton Fly wheel hydraulic press. The direction of the geared wheel is important for the different models. It is difficult for the operator to judge correctly the side and a large wastage of this product may be experienced due to improper side selection of the component. So in this a smart camera is used to detect the side of the ring and in case of wrong side selection, the 70 ton press is disabled.



INSPECTION OF BARCODE ON CONTACT LENS PACKET

Cataract lens packets are packaged in a plastic container and details are printed on sheet and pasted on the container. The requirement is to read the details of the cataract lens barcode and print the same details through a printer and paste it on the top cover. Inspection parameter is to read the barcode present in cataract lens packet and match with the print label.



PROJECTS

INSPECTION OF BRAKE SHOE HOLDER FOR HEAVY VEHICLES

Brake shoe holder of heavy vehicles is a forged component that needs to be inspected for very small inward and outward bend. There are 18 models for which the inspection solutions has been developed and the user interface is provided for easy selection of components.



AUTO VISUAL INSPECTION OF 3G BOX

The equipment to be inspected is a 3rd Generation Mobile Switching electronic equipment, manufactured for export purpose. The requirement is to inspect the object for its completeness, before it is packaged and dispatched.



PROJECTS

INSPECTION OF OIL SEAL

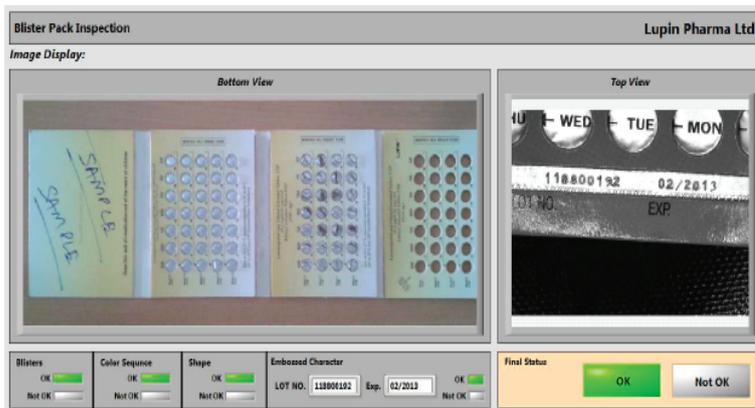
The oil seals are inspected for the following defects: Components will be streamed onto the inspection area on a conveyor. It may be singulated either with a vibratory bowl or using vertical dispenser. Once in the inspection area, the component will be inspected at four stations with seven cameras to inspect the component for any defect and dispense the same for rework or in the OK / NOT OK bins.



INSPECTION OF BLISTER PACK

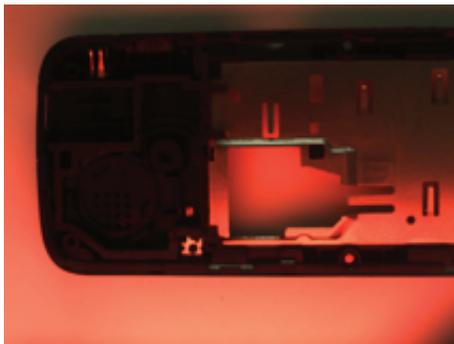
Blister pack – pack of capsules or tablets - is inspected for the following defects:

- Missing tablets
- Broken tablets
- Colour / shape sequence correctness
- Label / embossed character verification

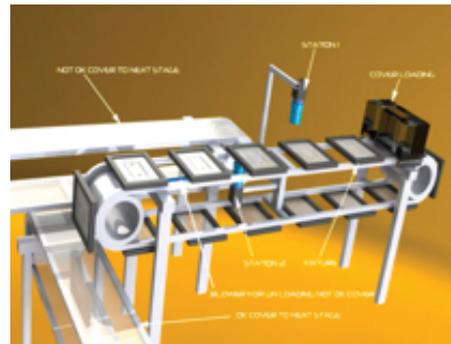


INSPECTION OF MOBILE PHONE PANEL FOR PART VERIFICATION

This system has been developed for the inspection of mobile panels which includes the mounted components like antenna, filter, lens cover, insulator etc whose presence/absence is to be identified and notified.



Mobile back panel sample

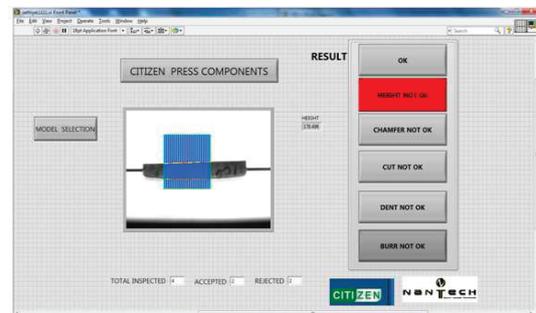
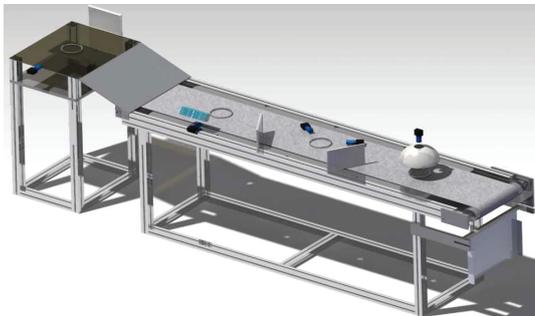


MV system

PROJECTS

INSPECTION OF METAL INSERTS

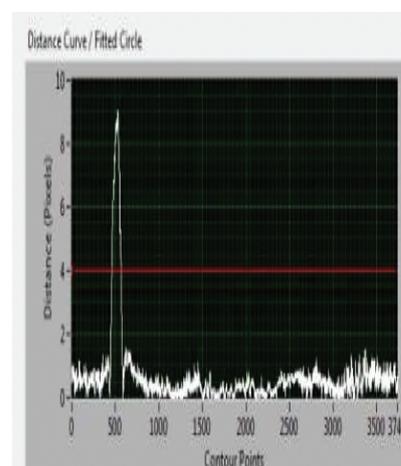
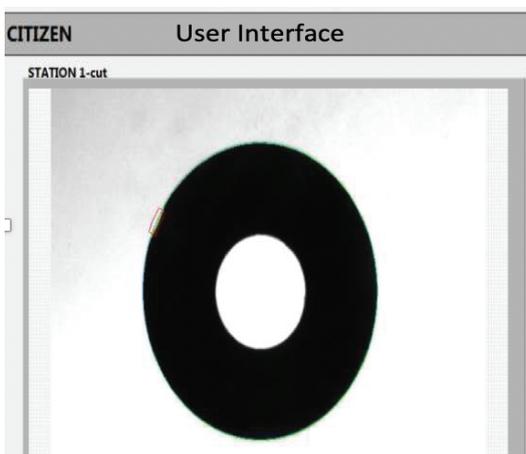
The punched metal inserts used in oil seals are manufactured by punching machines. There are varieties of models which range from 15mm to 200 mm. Sometimes few defects appear on the metal inserts. The defects that occur are, missing chamfer, height variation, cut, dent and burr. At present, these defects are inspected manually. Even then, the defects miss the attention of the inspector due to misjudgment, fatigue and oversight. Machine vision system helps to find such defects without manual intervention.



INSPECTION OF WASHERS

The washers are manufactured by punching machines. While manufacturing, various defects can occur. This includes height variation, cut, dent and burr. At present, these defects are inspected manually. Thus, errors occur due to operator's misjudgement, fatigue, and oversight. To improve the effectiveness, machine vision based inspection has been used to check the following inspection parameters.

- a) Height variation
- b) Cut
- c) Dent

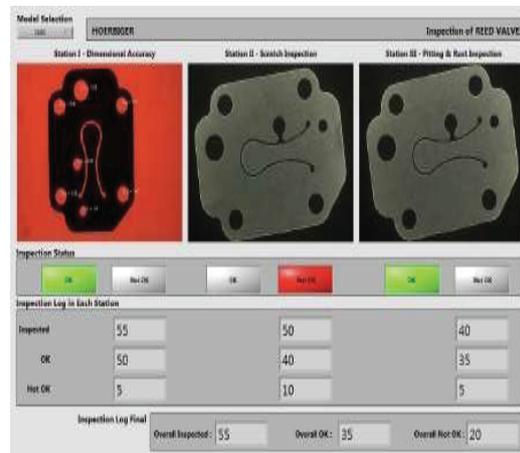


PROJECTS

INSPECTION OF REED VALVES:

Reed valves of different sizes and shapes are used in automotive, domestic and other commercial air conditioner applications. These items produced in large number are to be inspected for the following defects:

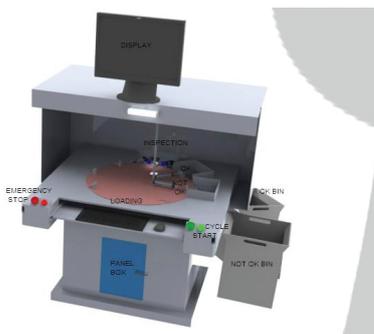
- Dimensional Accuracy: Inspection of hole dimensions and Double Punch.
- Profile Inspection: Pattern Inspection, Missing Hole, Improper Size/Cut in the Profile.
- Surface Inspection:
 - Inspection for Pitting, Rust and Burr
 - Surface Scratches



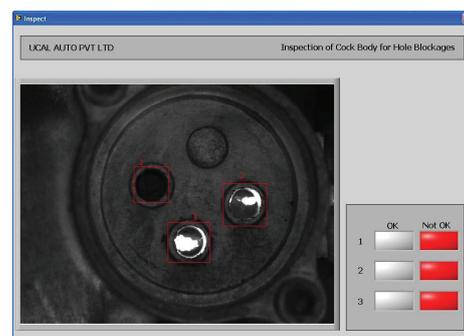
INSPECTION OF FUEL COCK OF TWO WHEELERS

Two Wheelers fuel cocks are to be checked for the following defects:

- Presence of through holes
- Presence of burr inside the holes.



Automation Setup



User Interface

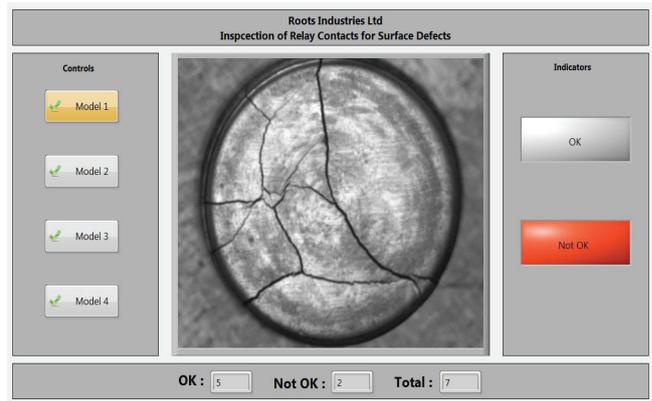
PROJECTS

INSPECTION OF POINT PLATES FOR SURFACE CRACKS

The Point Plate is a relay contact which is used in automotive horns . The surface is to be free of any crack. An MV system has been developed to check of cracks.



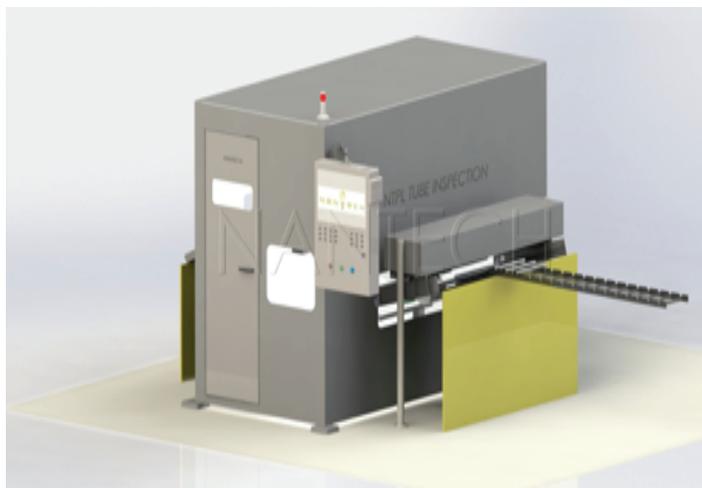
Automation Setup



User Interface

INSPECTION OF TUBE PRODUCT USED IN AUTOMOTIVES

There are a number of tubes manufactured for automotive applications. Models of length more than 550 mm which undergo straightening process and their length need to be measured. The length of the tubes is to be measured to an accuracy of 50 microns.



PROJECTS

INSPECTION OF BLOOD TRANSFUSION NEEDLES

An MV system has been developed for finding the correct orientation of needle with respect to base and the needle is inspected for the presence of the red dots. The needles that are assembled in an indexing table are to be inspected for the following defects:

- a. Inward Bend
- b. Outward Bend
- c. Blunt tip
- d. Needle Alignment with Base
- e. Inspection of Glue fix (Cone) at the Base of Needle
- f. Presence of Red Mark for needle direction indication





**CENTRE
OF
EXCELLENCE
FOR
MEMS &
MICROFLUIDICS**

CENTRE OF EXCELLENCE FOR MEMS & MICROFLUIDICS

About MEMS

Centre of Excellence for MEMS & Microfluidics (CEMM) at REC motivates research activities in the field of MEMS and Micro-fluidics from design to fabrication of prototypes. The main objective of the centre is to design and fabricate successful devices using non-silicon substrates and low-cost process flow suitable for mass production. The Centre has the laboratory facilities such as National MEMS Design Centre, Electronics Wet lab, UV Exposure room, Characterization lab and Thin Film Deposition Lab.

Recently, this centre is augmented with Clean Room facilities of type ISO 6 and ISO 7. We designed and fabricated several micro devices such as Micro Tweezers, MEMS Gyroscope, Micro Heater, Triaxes Accelerometer, Digital Microfluidics etc. under NPMASS and INUP Programs. We fabricate polymer micro-fluidic devices using soft lithography technique. We are carrying out sponsored research projects under various funding agencies such as DST, DRDO, AICTE and UGC. We also collaborate with Industries and National Research

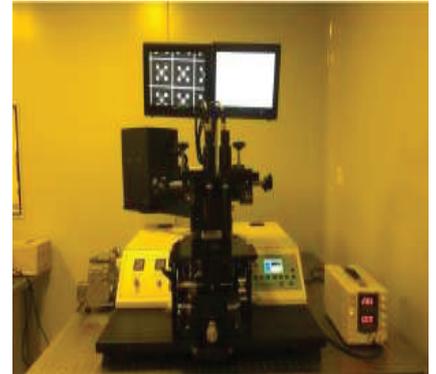
FACILITIES

- Clean Rooms
- Semiconductor Wet Lab
- Thin Film Deposition
- UV Exposure System
- Electro-Plating Bath
- High Resolution Microscope
- Optical Profiler



INSTRUMENTS AVAILABLE

- Mask Aligner
- UV Exposure System
- DC & RF Sputtering System
- Electroplating Work Station
- Oxidation Furnace
- Programmable Spin Coater
- Dry Film Laminator System
- Thermal Evaporation Systems
- Thermal Compression System
- Oxygen Plasma System
- HD Optical Microscope
- Fluorescence Spectrophotometer
- Electro Chemical Workstation
- Data Acquisition/ Switch Unit
- Precision Source/ Measure Unit
- TSE Programmable Syringe Pump
- High Precision Weighing Balance
- UV Chamber
- Agilent LCR Meter



PROJECTS

- Fabrication of on-chip polymer microwave arrays for micro fluidic systems
- Development and characterization of a surface acoustic wave hydrogen sensors
- MEMS 3-axis accelerometer for vibration and orientation sensing
- Microgc column using microfluidic device with integrated heater
- Fabrication of low cost MEMS and microfluidic
- Devices using metal embossing technology on glass for lab on chip applications
- Modelling & analysis of fused quartz pendulum type accelerometer
- Development of analysis of optimal coating for HRG components
- Fabrication of low cost hybrid technology based MEMS acoustic transducer using polyimide membrane
- Fabrication of an EIS biosensor for detection of uric acid level in human body
- Fabrication of MEMS accelerometer
- Fabrication of MEMS accelerometer for vibration sensing in gas turbines
- Fabrication of polymer micro moulds for MEMS bio sensor using soft lithography techniques
- Fabrication of MEMS devices with thin film technology
- Fabrication of Nano oxide based sensor
- Stabilized Nano Zirconia for detection of H₂S
- Fabrication of super capacitors using conducting polymers for automobiles



**CONSULTANCY
BY THE
DEPARTMENTS**

DEPARTMENT OF AERONAUTICAL ENGINEERING

AREA OF EXPERTISE

Providing solutions for Aerospace laboratories.

PROJECTS

- Study of Subsonic/Supersonic Jet Characteristics
- Study of Acoustic Characteristics
- Study of mixing characteristics
- Study of jet spread characteristics

FACILITIES



DEPARTMENT OF AUTOMOBILE ENGINEERING

AREA OF EXPERTISE

Providing solutions in Alternate fuels for IC Engine, Combustion study in an IC Engine, Configuring Electric vehicle. Ground vehicle Aerodynamic study, Automotive Components Design and Simulation, Automotive Computer Aided Engineering works (CAE).

PROJECTS

- Vision based quality inspection in automotive assembly lines
- Aerodynamic profile optimization in vehicle body using CFD
- Electric vehicle development
- Harmonic analysis of automotive components
- Engine testing and alternative combustion strategies
- Fatigue study of IC engine components
- Optimization of heat transfer analysis in engines
- Combustion chamber design in IC engines

FACILITIES



Fuel Injection Pump Testing



FSA Vehicle Analyzer



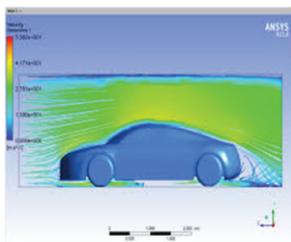
Test Bench for Electrical System



Two Pole lifter



Air Conditioning



Modeling and Analysis
- Thermal, Structural
and CFD



Two Wheeler
Chassis Dynamometer



Alternate Fuels and
Emission Control



Electric Vehicle
Design and Fabrication

DEPARTMENT OF BIOTECHNOLOGY

AREA OF EXPERTISE

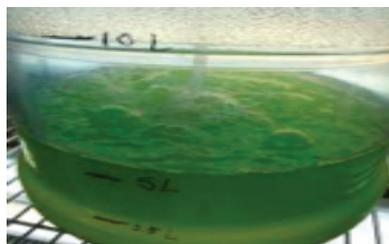
Providing solutions in the Food Processing / Preservation / Packaging, Treatment of Environmental Toxins / Effluents / Wastes, Anti Bio-fouling for Biomedical and Industrial Applications, Immobilised Enzyme Applications, Testing of Poly-Herbal formulations in Disease Treatment / Medical Applications. Biopolymers and Nano composites, Bio pesticides, Nature inspired product development, Microbiology.

PROJECTS

- Herbal mosquito repellents
- Testing purity and safety of the water quality inspection
- Biosol (A product to stabilise disinfectant product) – This consultancy established the efficiency and long lasting nature of the disinfectant produced from cattle farm waste by verifying its antimicrobial properties for Shri Godhan Biosol Pvt Ltd
- Bioflocculation and Biosurfactant activity of various algal species. Different algal species were studied as biofuel source and their EPS explored for their utility as coagulants, flocculants and adhesives for ABAN Infrastructure (Biotech Division)
- Validation of amber based polyherbal formulations whose efficacy, pharmacological and toxicological properties for Care and Cure Herbs Ltd
- Immobilisation of enzymes used in poultry feedstock production to improve the shelflife of the said enzymes for TEX (Formerly TEXTAN) Biosciences
- Improving the shelf life of Padhaneer. Novel food packaging technology has been developed for Pals-Rutag

FACILITIES

- GE AKTA start protein purification system
- UV-VIS Spectrophotometer
- Thermocycler
- ELISA reader
- Waters HPLC system
- Spectrofluorometer
- Bioreactor
- Fermentor
- Inverted Microscope



DEPARTMENT OF CIVIL ENGINEERING

AREA OF EXPERTISE

Providing solutions in Geotechnical engineering and Sustainable construction materials.

PROJECTS

- Mix design for concrete
- Testing of concrete for Construction work
- Testing to find the suitability to use waste materials as construction material
- Water quality testing
- Evaluating soil characteristics

FACILITIES

- Compression Testing Machine
- Flow Table Machine
- Flexure Testing Machine
- Los – angel abrasion testing machine
- Marshall Stability Apparatus
- Aggregate Impact testing machine
- Elcometer
- Rapid chloride Penetration test set up
- Optical microscope
- Oven
- Steam curing chamber
- Autoclave
- 100 Ton Loading Frame for Testing structural elements (Beam, column, slab)



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

AREA OF EXPERTISE

Providing solutions in Internet of Things, Cyber Attack Resisting Infrastructure, Mobile and Web Application, Image and Video Processing.

PROJECTS

- Developed an Inventory Management System for Ram Automations, Padi.
- “Centralised Versatile Secure Management System for Documents” for ISRO
- RMART - To promote cashless transactions, to avoid crowding at canteens and to maintain social distancing, an exclusive mobile app RMART has been developed for ordering foods at REC-Café.
- Attendance Monitoring System to automate the task of manual attendance marking.
- IoT– Smart Boat for AnDnRSoft Solutions Pvt. Ltd- Developing hand held devices for the monitoring of various features present in boat like GPS tracking, Battery level, Fluid and water level, Blige pump water flow, temperature, security and a wireless control for gadgets in a boat along with web and mobile application for further operations.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

AREA OF EXPERTISE

Providing solutions in RF Frontend components, Home Automation Systems, Fabrication of MEMS Accelerometer, Designing of Antenna for various Frequency requirements, Design and Fabrication of PCBs.

PROJECTS

- Thermo Compression System
- Profiler Measurements
- Development of Analysis of Optimal Coating for HRG Components
- Development of RF Frontend Components for Autonomous Passenger Vehicle
- Smart Home Automation with Wi-Fi on Energy saving channels
- Design of geo information based mapping system using Broadcom system on chip
- Fabrication of MEMS accelerometer for vibration sensing in gas turbines

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

AREA OF EXPERTISE

Providing solutions in Design and Testing of Electric Motors, Micro Controller Based System Design, Embedded System Design, System Design using MATLAB, FPGA Based System Design, Optimization of Power System Problems, Design and development of Passive and Active Filters, Design and development of Linear and Non Linear Controller, Solution for Solar PV system, Energy Analysis for Reducing Tariff, Temperature Sensor Testing, Design and Development of High Power DC Supply.

PROJECTS

- Temperature monitoring systems for ultra low freezers
- High power ac-dc converter for electro-coagulation system
- Process and temperature controllers effective energy saver for air conditioning systems
- Design and fabrication of renewable energy lab equipment emulators
- Temperature controller using fuzzy control.
- Design and implementation of biased transformer for hybrid heating application
- GSM based on - off control of starter for water pump in agriculture application
- Prototype for Renewable Energy Systems Laboratory
- Fractional order fuzzy speed control for BLDC
- Inverter controller for BLDC drive applications by using dSPACE-1104.
- Solar Powered Energy conversion system with Internet of Thing

FACILITIES

- Harmonic Analyzer
- Fluke and Metrel
- DS1104 R&D Controller Board
- Various types of DC and AC Drives
- DSP based Motor Controller Trainer Kit with TMS 320C50
- Special Electrical Machine
- Switched Reluctance Motor
- Brushless DC Motor
- RIGOL make 100 MHz Digital storage Oscilloscope for Transient Measurements.
- Programmable power supply - precision grade with facility to inject harmonics, noise etc.
- 30A, 30V regulated DC supply
- PV Emulator
- Wind Turbine Emulator
- Temperature calibrator machine



DEPARTMENT OF FOOD TECHNOLOGY

AREA OF EXPERTISE

Providing solutions in product development, physico-chemical quality evaluation, Innovative Food Products, microbiological safety of food formulations and effective testing of food samples to conform to legal standards.

PROJECTS

- Development of ready-to-eat/Ready-to-serve/ snack food products
- Food products from under-utilized and profused agricultural produce
- Evaluation and analysis of developed products

FACILITIES

1. Food Microbiology laboratory
2. Food processing and preservation Laboratory
3. Quality analysis of Food Packaging equipment
4. Bakery and Confectionery Laboratory
5. UV Spectrophotometer
6. Gerber Centrifuge
7. Brookfield Viscometer
8. Pin mill
9. Burr mill
10. Hammer mill
11. Rotary flash evaporator
12. Soxhlet apparatus
13. Fermentation cabin
14. Laminar Airflow chamber
15. Pasteurizer
16. Texture analyser
17. Universal Packaging Testing Machine
18. Kjeldhal apparatus
19. Dean and stark apparatus etc.,



DEPARTMENT OF INFORMATION TECHNOLOGY

AREA OF EXPERTISE

Providing solutions in Image Processing, Web Portal Development, Data Analytics, Cognitive Vision, ERP process documentation, Reverse engineering, Computer vision, Machine learning solutions, Data science solutions.

PROJECTS

- IoT Smart Boat
- Face recognition attendance system , voice snap solutions
- Mask face shield
- ERP documentation - reverse engineering work done for consolidated construction consortium limited (CCCL) for upgradation of their ERP software.
- V-art gallery-developed a web based application for maintaining the e commerce activity of an art gallery.
- Weld-R- developed a web portal to automate the process of generating and issuing the welding certification.
- Tele Radiology Packs for sentinel radiology solutions, to automate and maintain the daily activity of the scan centre.

FACILITIES

- Incubation Cell
- Assistive Technology Lab
- Mobile Application Lab
- Data Mining and Machine Learning Infrastructure

DEPARTMENT OF MECHANICAL ENGINEERING

AREA OF EXPERTISE

Providing solutions in design and development, prototype, measurement systems and analysis.

PROJECTS

- Finite element analysis of truck chassis
- Vibration analysis
- Stress analysis of lathe bed
- Finite element analysis of lathe head stock
- Motorized temperature measurement system
- Prototype development by 3d printing diagram to 3d model
- Resource Balancing Data and Analysis: H-block, Head (Weight reduction) at M/s. Ashok Leyland Ltd., Ennore.
- Knowledge Enhancement Program in Mechanical Engineering for Electrical Engg. Diploma holders for M/s. Mando Brake Systems India Ltd., Sriperumbudur.
- A study on the feasibility of Women Employability at M/s. Ashok Leyland Ltd., Ennore.
- Consultancy for design and development of automatic nut insert assembly machine for six auto components of Yamaha Fascino at m/s. India Yamaha motor Pvt. Ltd.
- Modulus of Rupture & Modulus of Elasticity at M/s. Saint Gobain Glass India Ltd., Sriperumbudur.
- Graduate Engineering Trainee Induction Programme for M/s. PHA India Private Ltd., Sriperumbudur.
- Utilization of Compression mould furnace and optimized paver mould for manufacturing of plastic paver blocks and Waste Plastic paver bricks at M/s. Thick Green Enterprises.
- Experimental Studies on Building Cooling by Incorporating Phase
- Change Material on The Roof at ISHRAE.
- Effect of compression ratio on a single cylinder diesel Engine operated with Ternary fuel at Saveetha School of Engineering, Chennai.
- Effect of Titanium oxide Nano particles in Tamanu biodiesel operated in a single cylinder diesel engine to estimate performance, combustion and emission characteristics at Saveetha School of Engineering, Chennai.
- Effect of waste transformer oil in bio diesel operated in a single cylinder diesel engine to estimate performance, combustion and emission at saveetha school of engineering, Chennai.
- Design and development of turbocharger test rig at M/S. Shakthi tech manufacturing India PVT. Ltd., Chennai.
- Design and fabrication of TVS-Leak Test machine at M/s. TVS, Chennai.
- Design and fabrication of Hot Plate Welding Machine for Sintex BAPL at M/s. Sintex BAPL Ltd., Chennai.
- Wood Testing for M/s. Saint Gobain Glass India Ltd., Sriperumbudur.

DEPARTMENT OF MECHATRONICS ENGINEERING

AREA OF EXPERTISE

Providing solutions in Automation Systems to Improve Productivity, Autonomous Vehicle, Design and Development of fixtures for Assembly and Welding, Designing Testing System for Complete Inspection.

PROJECTS

- Design and Fabrication of Fixture for an Ultrasonic Welding Machine
- Design and fabrication of Leak Test Machine
- Battery Operated Four Heeled Autonomous Vehicle for Disabled Persons
- Intelligent Light Control System



NUMERICAL ENGINEERING SIMULATION LAB

AREA OF EXPERTISE

- Simulation and modelling for product re-engineering and new product development
- Design and development test rigs and special purpose equipment for aerospace and defence applications.
- Support SMEs in design and product development using cutting edge simulation & analysis.
- Interdisciplinary research in the field of medical engineering such as bio-fluidics, bio-mechanics and orthodontics.

PROJECTS

- Thermography as a tool to detect foetal Abnormality
- Fabrication of special purpose machines and development of ultra low cost HVAC system
- Design of a compressor test rig for a small gas turbine
- Trajectory estimation of a large object inside an intake duct of an aircraft
- Design and development of rotating measurement system for combustor test rig



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