



Institutional Profile

Central Mechanical Engineering Research Institute

In India, mechanical engineering technology has accounted for nearly half of the total technology imported. In terms of products, nearly one third of the value of total imports is for mechanical engineering equipment. In order to develop indigenously mechanical engineering technology for the industries so that R&D can play a key role in self-reliance, the Central Mechanical Engineering Research Institute at Durgapur, West Bengal, was established in February 1958 with the specific task of development of mechanical engineering technology.

The Central Mechanical Engineering Research Institute (CMERI) is the apex R&D institute for mechanical engineering under the aegis of the Council of Scientific and Industrial Research (CSIR). Being the only national level research institute in this field, CMERI's mandate is to serve the industry and develop mechanical engineering technology so that India's dependence on foreign collaboration is substantially reduced in strategic and economy sectors. Besides, the institute is facilitating innovations and inventions for establishing the claims of Indian talent in international fields where Indian products shall ultimately compete. In the new millennium, CMERI is poised to expand its horizon of research activities so as to steer the country forward in cutting-edge and sunrise fields.

Research & Development

Robotics & Mechatronics

CMERI has acquired expertise in the field of Robotic Systems, Control Engineering and other related areas in the course of continued involvement with different projects. Initially, capabilities and knowledge had been generated through study and carrying out a number of in-house projects. CMERI had undertaken the development of a vacuum mopping system for spilled heavy water for atomic power plants and has developed the first indigenous 60kg payload SCARA Manipulator for TATA Automation. CMERI was involved actively in the Polymetallic Nodule Mining Program of the Department of Ocean Development, Government of India. It has also developed the first indigenous Remotely Operated Vehicle for a depth of 200m for the Department of Ocean development, Government of India.

Energy & Process Plants

Energy and Process Plants is a major research area for CMERI, and CMERI has accrued wide experience in the broad field of Thermal & Fluid Engineering. Credit of good standard of applied

research and R&D work and publications in journals of national and international repute has endowed the Group with a strong expertise base for offering quality research and technical support to the industries.

Groups lying down under Energy & Process Plants in CMERI:

1. Heat Power Engineering
2. Process Plant Engineering,
3. Chemistry

Sonalika Tractors

The novelty of this Tractor developed by CMERI (ranging between 35 - 60 hp) lies in deep cultivation capacity, efficient soil gripping, increased carrying capacity while climbing, maintaining very good speed while running in roads, economy in fuel consumption and above all minimum maintenance cost. With continuous demand of tractors for farm mechanization, CMERI developed design know-how of 35 hp Tractor and released the know-how to M/s International Tractors Limited, Hoshiarpur for commercialization as Sonalika Tractor. The tractor is suitable for medium and large holdings.



Heat Power Engineering

Heat Power Engineering Group (HPE) is one of the major constituent groups of CMERI having a wide spectrum of R & D capability in the board area of Energy, Thermal & Fluid Engineering. Credit of good standard of applied research, R & D work, publications in journals of national and international repute, modernized infrastructure have endowed the group with a strong expertise base for offering quality research and technical support to organizations and industries. The essential focus is on process design and development in the area of thermal / fluid systems in

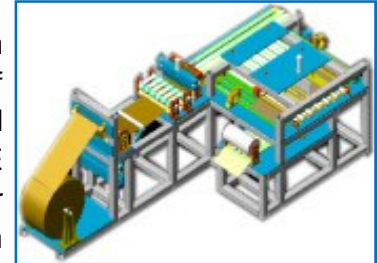
Power and Process Plants, Drying for Agro industries and Advanced Energy Heat Power Conversion.



Spouted Bed Dryer

Process Plant Engineering

The Process Plant Engineering (PPE) group of CMERI, is engaged in the design and development, installation and commissioning of different kinds of process plants. This group has developed a good number of designs and technologies for the industries. The PPE group has also made significant contributions in executing a number of national mission programmes. The PPE Group is also involved in the life assessment of process plants structures.



Chemistry & Biomimetics

The research activity of the chemistry group mainly focuses on mechanistic studies of thermal reactions (catalytic and bio-chemical importance) in solution, and photochemical studies (environmental relevant processes and usable form of energy evolution). Modern kinetic techniques are applied in order to elucidate the molecular nature of the investigated reactions. The goal of these studies is to contribute towards a better understanding of these reactions and their detailed mechanistic course.

Mechanical Design & Manufacturing Technology

CMERI possesses a comprehensive CAD tools environment that supports collaborative design through concurrent consideration of trade-offs to satisfy contrary design and manufacturing requirements. This environment allows early insight into the constraints of downstream activities and enables the designer to control the total design process upfront. With the help of the latest generation of CAD and associated facilities, it is possible to analyse mechanisms, tolerances, interference of the designated parts and components in an assembly and verify the geometric and functional relationship between them.

Machine Design & Development



Machine Design Development Group (MDDG) in CMERI is equipped with a number of workstations networked extensively with high end PCs. Modern software tools e.g. I-DEAS, CATIA, MDT, AutoCAD are available for analysis, design and drafting.

This group undertakes development of various types of Special Purpose Machine (SPM).

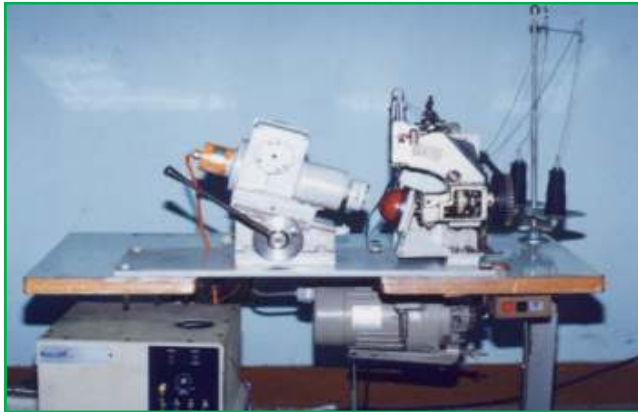
Following SPMs has been developed by MDDG:

- Cricket Ball Stitching Machine
- Stitch Bonding Machine
- Jute Bag Stitching Machine
- Cricket Ball Throwing Machine
- Jute bag stitching machine
- CTC Roller Sharpening Machine



Tribology-A

Wear is the major source of materials wastage and loss of mechanical performance and any reduction in wear can result in considerable savings. Friction is principal cause of wear and energy dissipation. Improving friction control can make a substantial savings. It is estimated that



one third of the world's resources in present use is needed to overcome friction in one form or other. Lubrication is effective means of controlling wear and reducing friction. Tribology is field of science, which applies an operational analysis to problems of great economic importance such reliability, maintainability and wear of technical equipment ranging from household appliances to spacecraft.

Cricket ball stitching machine

Manufacturing Technologies

Manufacturer of hard prototypes is an essential part of product development that requires high grade capability for manufacturing precision and reliable components.

To facilitate this, CMERI has equipped its workshop with a state-of-the-art facility that comprises CNC Lathe, EDM Wire-cut & Sinking Machine, 4 Axis CNC Milling Machine, Honing Machine, Precision Cylindrical Grinder, Very High Speed Grinding & Milling Spindles, Jig Boring, Tool Presetter, Central Hole Grinding Machine, Jig Grinder Attachment, etc.

Spin Casting & Investment Casting

For the specific purpose of manufacturing high-grade castings and precision near net-shape component castings for product development, CMERI has installed modern foundry facilities with computerised methoding facilities to meet strict product delivery deadlines. The Rapid Prototyping System has been usefully integrated with downstream processes and now RP models can quickly be converted into functional components of metal or plastic. Spin

Casting and Investment Casting are significant facilities available with foundry to produce net-shape and near-net-shape functional components in the desired ferrous and non-ferrous metal specifications.

Condition Monitoring

Today's industrial policy and globalization has made industrial environment very competitive. Hence down-time for maintenance is of great importance. Substantial savings in energy and production cost can be achieved by applying Condition Monitoring in industry.

Plant machineries are invaluable assets and are designed to operate under extremely harsh condition, where a failure may be catastrophic, both in safety and economic aspects.

Rapid Prototyping & Tooling

To reduce product development lead-time and to impart greater flexibility in incorporating client customisations, CMERI has replaced the traditional and wasteful methods of prototype development based, to a large extent, on manual skills.

Rapid Prototyping is a new and powerful tool for rapid product development. A class of technologies has emerged during the last decade by which a CAD file of an object can be converted into a physical model through special material sintering, layering or deposition techniques. The major application of this technology is for early verification of product designs and quick production of prototypes for testing.

Solid Modeling

Design is a creative activity to transform ideas into reality. With the advent of softwares for creation of CAD Solid Models, the visualization of ideas has become possible in the design stage itself and such Solid Models can also be converted to 2D drawings which in turn reduces the product development cycle time.

There are different software available at CMERI, for CAD Solid Model creation which comprise I-DEAS, UG, Pro-Engineering, CATIA and so on.

Rapid Prototyping

Rapid Prototyping (RP) is also known as Generative Manufacturing, Layered Manufacturing, Solid Freeform Fabrication, Toolless Model Making etc. Basically all these terms refer to creation of three-dimensional objects directly from CAD files.

Unlike conventional or NC/CNC machining, the model is created by adding material layer after layer instead of cutting it away from a solid block. Therefore, generation of complex shapes do not pose any problem at all. However, what is obtained from the machine is a model not usually an end-user item, which means that the new technology is used for prototyping, not actual production.

Rapid Tooling

With the emergence of RP systems, the concept of Rapid Tooling (RT) has arrived. The challenge and greatest potential for RP lies in providing a direct integrated route to tooling through reduced lead-time and production cost. Even though Rapid Prototype parts may be produced directly in layers, most Rapid Toolings are produced indirectly (by using the RP part as the pattern) like Silicone Rubber Mould, Metal Spray Tooling etc. which are available at CMERI

Farm Machinery & Post Harvest Technology

In the new millennium, the Institute is proud to be continuing its commitment for development of agricultural machinery. Like in the past, a major component of R&D effort has gone in towards the development of appropriate machinery for productivity enhancement in the agricultural and the post-harvest processing sectors. CMERI is still adding to the list of agricultural machinery it has developed, the latest being the 35 HP Tractor and the Engine Operated Tea-leaf Plucking Machine. In addition, CMERI devoted its highly competent Heat



Power Engineering Group for developing appropriate dryers for use in processing agriculture produce. Out of this effort emerged different dryers, details of which are provided in this section. CMERI also undertook the optimisation of process parameters for yielding a standardised class of expander-extruders for the production of edible oil.

OTHER AREAS

- Metrology Laboratory in CMERI
- Testing and Calibration Laboratories of CMERI
- Metrology
- Mechanical testing
- Material testing
- Metallurgical testing
- Non-destructive testing
- Fluid flow and thermal evaluation
- Chemical testing
- Pressure vessel testing
- Electronics and electrical measurements

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Note: Various references have been used in the preparation of this profile. For further details please contact the Institute.

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