Design Innovation Centre, Indian Institute of Technology Kharagpur
(Focus: Rural Technology Development)

Introduction

The proposed *Design Innovation Centre* will provide a platform to synergize and catalyze the growth of Rural India through simple mechanization and technology infusion. The concept of creating the Centre is to facilitate a congenial environment for user driven open innovation. This will open a new horizon of emerging business activities with the purpose of generating employment and income, reducing production costs, and improving the efficiency. It is essential to encourage sustainable rural progress through development and dissemination of technologies that are tailored to the specific characteristics of those living and working in rural areas. However, there are certain technological limitations, which need to be addressed simply and quickly for rapid technology dissemination. Indian Institute of Technology (IIT) Kharagpur, being situated in rural belt and with proven knowledge and expertise, have been developing innovative products and systems for rural uses and transferring the same to the villages. A short account of the facilities and practices available at IIT Kharagpur are given first followed by the proposal.

The Innovation-Entrepreneurship Ecosystem at IIT Kharagpur

Rural Technology Action Group (Rural Innovation Unit)

A transformation is needed today for changing the socio-economic status of rural India through innovation and implementation of new techniques. The RuTAG is sponsored by Principal Scientific Adviser to the Government of India had initiated several projects for interaction with rural people in the nearby villages and identified some of their problems and are trying constantly to provide need based solutions. During last seven years, RuTAG has been able to connect with more than 40 NGOs and taken up technological initiatives to develop and upgrade the existing technologies of NGOs working in the area of Science and Technologies and to organize workshops and training programs for NGOs located in Eastern India. Several workshops and training programs have been organized to disseminate the tested technologies among people who can derive benefits out of them. The RuTAG group

has made a significant impact in enabling penetration and deployment of technologies for rural areas. This is a unique strength of IIT Kharagpur and will be the central point around which the proposed Innovation and Design Centre will be built in the initial phases.

Technology Incubation Laboratory

The Technology Incubation Laboratory at IIT Kharagpur helps the students with facilities and administrative support to develop innovative ideas into industrial products. Its uniqueness is evident from its alumni coming back from overseas and creating companies and its graduating students setting up companies after graduation instead of going overseas. The success of this endeavor is evident from not only the amount of venture capital investment and post-investment valuation but also from number of entrepreneurs those who are seeded, quantum of technology transfer, indigenization of technology, etc. It actively commit itself to strengthen and expand the entrepreneurship of all the nearby colleges, driving forward the entrepreneurial enterprise of the Institute's staff members and students, setting up a bridge between knowledge and wealth and bringing into full play the role of science and technology as an entrepreneurship incubator.

M. N. Faruqui Innovation Centre (A Generics Students Innovation Centre)

IIT Kharagpur also has a Students' Innovations Centre named as the M. N. Faruqui Innovations Centre (MNFIC) which caters to the design and fabrication needs of students undertaking various kinds of projects. This facility has been setup with alternate funds at the institute primarily to support student activities. The Centre has a Design facility to support the design, brainstorming and discussions sessions that will be needed at the conceptualization and engineering analysis phase. **A Tinkering Laboratory is also provided under the center, which hosts a mechanical workshop, electronics lab and an integration facility to support such facility.** The workshop will have several metal working, wood working and other tools for mechanical related fabrication activities as well as an Electronics Lab along with Systems integration and testing center for aspects where electronics and mechatronics are needed. Under the proposed Design Innovations Centre for Rural Technologies these facilities will be made available and in addition would be supporting development of adequate green technologies for villages in India through augmented facilities. The center along with IIT Kharagpur academic system will ensure that

all its students go through a curriculum which emphasizes project based learning that can effectively be used to develop suitable skills in students. The framework for project based learning will be applicable to students of all years at IIT Kharagpur. In the Design Innovations Centre for Rural Technologies, these facilities along with other facilities in the institute will be used to support development of products/technologies for in village use in India. **A curricular framework under the concept of Project Based Learning is being initiated at IIT Kharagpur for all students so that this can effectively imbibe suitable skills that promote innovations**. In this project the framework will be extended for Rural Applications and be administered in parts through an academic program for students as well as a project based mode for all others who are involved.

Rajendra Mishra School of Engineering Entrepreneurship (RMSoEE)

RMSoEE was established in 2010, inspired by the momentous growth of entrepreneurship and the consequent economic development sweeping across nations in the recent years, with the vision to fuel innovation-driven engineering entrepreneurship in the country. The foundation of the initiative was pre-emptively laid long ago by establishing the Science & Technology Entrepreneurship Park and the Technology Incubation & Entrepreneurship Training Society nurturing budding entrepreneurs since 1986. Number of successful entrepreneurial ventures speaks volumes of the relevance of such pursuits. The faculty team with diverse specializations in the School has woven an interdisciplinary fabric of dexterity needed for entrepreneurial support and is in the process of developing germane curriculum and creating and infrastructure, including establishing state of the art laboratories to facilitate, Product Analytics & Modelling, Reverse Engineering, Innovative Product Development, Business Analytics, Healthcare Analytics, Energy, etc. Being part of a well-diversified engineering Institution, the School also shares the centralized research infrastructure as also departmental facilities for multidisciplinary product development initiatives. A rich pool of research scholars and the postgraduate students are engaged in cutting edge research and are developing new generation technology, products and processes in both specialised as well as in cross-functional domains. The school offers masters course in Engineering Entrepreneurship for dual degree students as also multidisciplinary doctoral research program. Besides, it offers Micro-specialization on Entrepreneurship and Innovation to undergraduate students of all disciplines, thereby bringing in a wide array of students within the fold of entrepreneurial education. The school also governs the student-run

entrepreneurship-Cell (e-Cell). Thus, the School is poised to give, through its activity continuum starting with innovative design conceptualisation with its realisation and finally culminating into entrepreneurial promotion, a thrust to the 'Make in India' and 'Start-up India' initiatives by providing an environment that inspires creative thinking and motivates entrepreneurial pursuits.

Design and Development oriented Product Analytic and Modelling Laboratory (PAM Lab) at RMSoEE

Technology based product design and development is central to engineering entrepreneurship and performance in this function provides competitive edge to any manufacturing business organization. Forward engineering has been the conventionally used in design, but simultaneously reverse engineering in recent time has occupied a prominent position and has drawn the attention of researchers as well as practitioners. It is increasingly being realized by the product developers that reengineering through the process of reverse engineering is a very effective method for product redesign. The PAM Lab supports product development (PD) efforts by students PD projects, research scholars, the technology business incubates, entrepreneurs, and start-ups as well as established industries to create 3D models from physical parts and products. In this lab, we can reverse engineer a part, make improvements through design modifications, and generate a prototype that can be used to test the new design. The Lab has capabilities of: 3-D Laser Scanning and point cloud generation supported with Portable Coordinate Measuring Machine, Digital Inspection of physical parts, Reverse Engineering of physical parts to CAD format as 3D solid model, CAD geometric configuration and creation of rapid prototype of parts in polymers with metal inserts. The Lab is backed-up with software capabilities for computer aided engineering and simulation.

Department of Industrial & Systems Engineering (ISE)

The Department of Industrial and Systems Engineering (ISE) caters to the design and improvement of product, processes and systems involving people, machines, materials, energy, and information. Its ergonomics and product development group caters to the ergonomic design of product, processes and systems with due consideration to the abilities and limitations of human workforce. It focuses on design for usability for comfort, safety and productivity of machine / equipment operators and other workforce for whom the products, processes or systems are designed. ISE offers courses on product development, human factors

and ergonomics, safety engineering, and quality engineering. While design quality is important from functional point of view, ergonomics of design is important from comfort, safety and productivity point of view. The ISE will look into three aspects of the DIC from rural innovation design point of view: (i) requirement analysis of the products or processes or the system and their functional considerations, (ii) manufacturability and maintainability of such products, processes and systems, and (iii) ergonomics and human factors considerations while designing. The ISE has also have laboratories like product development laboratory, ergonomics & human factors laboratory, and safety & virtual reality laboratory.

Science and Technology Entrepreneur's Park (Incubation Centre)

Science and Technology Entrepreneur's Park (STEP), has been engaged in various kinds of activities to enhance the economic condition of this part of the country through innovation and enterprise creation since its inception over 26 years. Now it has established itself as a self-sustaining innovation and entrepreneurship ecosystem as a platform for enterprise creation. STEP provides cutting-edge technical, financial, managerial, legal and expert mentoring support to innovators and entrepreneurs in and around Eastern India. It facilitates various kinds of financial support, i.e., financial grants and seed loan facilities for product development and enterprise creation with support from various departments of State and Central Governments and nodal agencies. **As part of proposed Design Innovation Centre (DIC),** STEP is interested in developing an entrepreneurship ecosystem in the thrust areas of high end health care technologies, ICT for remote connectivity & big data analytics in finance / technological data mining, and advanced manufacturing for machineries in industries, agriculture, social / civil infrastructure and energy storage devices. STEP will provide all expertise back up in registering new Companies by rural entrepreneurs, as well as for their regular mentoring. We can cover entrepreneurship extended to 500 villages, in 5 years.

Entrepreneurship Cell and Technology Transfer Group

Entrepreneurship Cell(e-Cell), IIT Kharagpur is a non-profit student organization, working under the aegis of Rajendra Mishra School of Engineering Entrepreneurship, IIT Kharagpur, that is dedicated to the cause of promoting the spirit of entrepreneurship and innovation among students, in the campus and beyond. Guest Lectures, Case Studies, Knowledge

Camps, Patent workshops are conducted throughout the year to involve students in activities that are essential to an entrepreneur. E-cell also actively promotes networking among investors and the right entrepreneurs. Entrepreneurship Cell has two annual flagship events: Global Entrepreneurship Summit (GES) and Empresario, the Business Model Competition Event. Two recent initiatives of the E-Cell are KPIN and KAN. KPIN (Kharagpur Product Innovation Network), a network to connect innovators with the proper co-founders and KAN (Kharagpur Angel Network), an initiative connecting the alumni, angel investors and VC's to the IIT Kharagpur Startup Community. The Entrepreneurship Cell and **Technology Transfer Group** (TTG) prepare the students to manage their own technologies and help them to establish their own enterprises. It provides a platform to discuss and solve problems that arise during establishment of an enterprise using their own technology.

Proposal for Centre for Design & Innovations with Rural Technologies Focus

The problems of rural industries, in farming and in processing of the farm produces have a different outlook. These areas require appropriate level of technology infusion that will maintain the labor in place at the same time improving productivity per worker, improving quality of the product and reducing cost of production. Many of the traditional craft and industries are being lost gradually because of poor remuneration they bring and poor market due to poor product qualities. The children belonging to the houses of such craft men are going for other jobs, even as casual labor, due to the very low income generated by the trade. Infusion of technology will enhance the productivity and increase the margin of saving by these craft men. Strengthening of rural industries will strengthen the villages and in turn it will strengthen the country. Village industries will also become source of semi-finished raw materials for use in big industries established in the cities.

The Centre is proposed to be adequately equipped with all amenities for interacting, formulating, designing, fabricating / developing, testing and perfecting various need based technologies which can subsequently be verified for their successful performances at the actual user's premise and finally confirm for 'transfer of technology' among the potent beneficiaries. The proposed Centre will provide a platform to translate the innovative ideas into realities in terms of useful appropriate technologies in the form of processes / products /

machines for testing and application in the rural areas. Besides, undergraduate students of the Institute will be involved in the Centre for their project work, summer and winter internship, event competition, extra-curricular activities, etc. to inculcate with them a sense of responsibility towards the nation. Engaging undergraduate students for innovative activities will bring creative ideas and solution in the developmental process that will give unique answers to the rural industry problems. This Centre will create a feel of rural India and their problems and prospects in the mind of the young brains as a platform to encourage them to choose their career to do innovative work for rural masses through the Make in India initiative.

Objectives

- To identify the technological problems, develop processes and fabricate products through people's participation.
- To train artisans / entrepreneurs on established technologies through training, workshops and demonstrations.
- To orient undergraduate students in order to develop innovative solutions and institutional networks for innovations in the thematic areas.
- To conduct courses for UG / PG students on design innovations and related areas.
- To develop collaborations with Institutes/organizations in the areas of design and innovation.

Details of work plan

1. ***Formulation of technology intervention problems***

   Problems related to the rural industries are brought by the NGOs, SHGs and interested farmer groups working in the area. They bring the problems for finding technical solutions. After taking up any work they will be contacted continuously in order to ensure that the developments take place in the right direction and the solutions are acceptable to them. This will ensure easy transfer of technology.

2. ***Design and development of machines, equipment and processes:***

   Development of processes, products and equipment will be carried out by interested faculty members by involving their students. At each step of development, the NGOs will be consulted for their feedback. The work involves innovation of technologies to improve

efficiency, work rate and productivity, to improve ergonomic efficiency, and to reduce drudgery keeping cost within affordable limits of rural industries.

3. ***Fabrication of prototypes for testing and distribution to the user groups:***

   Wherever the prototypes have to be produced in larger numbers and for production of machines on commercial level the manufacturing technology will be developed. The artisans will be trained on production techniques and will be assisted with various jigs and fixtures. Suitable entrepreneurs will be identified to take up the job of fabrication after providing them necessary training on the product developments.

   The equipment once made / fabricated will be first tested in laboratory and again demonstrated to the rural people through NGOs, SHGs, etc. to assure whether it will serve their purpose or not. If any modification is suggested by them, it will be incorporated.

   The equipment will then be tested in actual village conditions and with the actual end users whose evaluation/endorsement is most important. So their feedback will be taken by the students.

4. ***Training, workshops, demonstrations and dissemination of technology:***

   The technologies thus established will be transferred to the end users. Relevant training will be imparted to the interested farmers / entrepreneurs / fabricators for the purpose. Dissemination strategy will comprise the following steps:

   - Upon successful development of a product, workshop and training would be arranged with NGOs and SHGs on regular basis in order to train them on the new machine and to invite feedback regarding the new machine and related problems with a view to solve them leading to final acceptance of the solution.
   - A link will be set up with an ITI or MSME agency that provides diploma in relevant area - the centre can be a learning ground by means of workshops.
   - Dissemination programmes will be organized through training to fabricators as well as through entrepreneurship development programmes.
   - Summer schools, annual national conferences and one international conference on rural technologies, course development with a course on 'Frugal Technologies', and a MSME Workshop will be organized.
   - Web portal on rural technologies will be developed and launched.

- A number of satellite / outreach centers will be set up for effective spread of the activities.

5. ***Orienting interested faculty members and students:***

The students and the faculty members will jointly interact with the villagers, farmers and NGO representatives and listen to their needs, the village scale technology they are following and the problems they are facing in increasing of the production or reducing of the drudgery and in operation of small equipments. The farmers point out their needs sometimes and that will be beneficial for the students and faculty members to have a clear idea of the demand of the end users.

Discussion with the rural people and with the NGOs will help to identify the problems. After sorting out those problems, it can be distributed among students, which they can take up in the Design Innovation Centre, IIT Kharagpur that is being proposed. Students of the Institute will be given opportunities to work on their own ideas for solving the rural industry problems.

6. ***Technology transfer and long term testing in field conditions:***

The technology developed would be transferred to the target groups when adequate testing has been carried out. Simultaneously long term test results will be collected from the users in order to carry out further improvements when required.

7. ***Academic curriculum***

Courses on design and innovations will be offered to undergraduate and postgraduate students. Around 40-50 students will participate in the courses during an academic year. The proposed courses are as follows:

(i) Subject name- **Product Development** (Credit- 3)

Syllabus:- Basic concepts, Alternative product strategies, Steps in new product development, Technology forecasting, Sales forecasting, Product design, Life testing, Quality and reliability considerations, Manufacturing and maintenance, Defining product market structure, Consumer perception and product positioning.

(ii) Subject name-**Design for Manufacturability** (Credit-3)

Syllabus:- Product and process design, Process integration of product and process design, concept of integrated product development, Manufacturing, Design and design for manufacturing, Functional designed objects, Product realization process, Industrial

design, Engineering design, Production design, Tolerances, Mechanical and physical properties, DFM guidelines, Design for manufacturability/ producibility, Cost, reliability and maintainability, Concept of production design, Design economics – budgets, tolerancing, materials selection, design alternatives, Optimal design of products and process: Trade-off analysis, Overall design framework for product quality and product robustness, Simplification and standardization – Application of GT and CSM systems, Modular building block for assembling product, Evaluation of design alternatives: Use of design tools such as CAD/CAE, Solid modeling, Case examples, Exercises.

(iii) Subject name- **Human Factors Engineering** (Credit-3)

Syllabus:- Introduction to Simple and Complex Worksystems and Relevance of Human Factors or Ergonomics; History and Recent Trend in Human Factors; Anatomy, Posture, and Body Mechanics; Anthropometric Principles in Worksystem Design; Design of Manual Handling Tasks and Hand Tools; Workload, Work Capacity and Fitness for Work; Measuring Work by Physiological Methods; Choice of Work Posture; Fatigue Measurement and Evaluation; Physical Work and Heat Stress, Noise Exposure and Hearing Loss, Design of Thermal, Auditory, and Lighting in Physical Environment; Industrial Product Design; Illumination at Work; Whole Body Vibration; Design of VDT Work Station.

(iv) Subject name- **Engineering Design Process** (Credit-4)

Syllabus:- Introduction to Engineering Design Process; Design Approaches -Forward and Reverse Engineering; Reverse Engineering Process; Definition and goal of Reverse engineering (RE); Methods and techniques of reverse engineering; Contact and Non-Contact RE; Technologies and equipment - Laser Scanner with Portable Coordinate Measuring Machine, Control software. Reengineering, Redesign and Engineering Product Development; Innovative Product Design and Engineering Optimisation; Relation between Reverse engineering and Rapid prototyping; Introduction to Modelling Cloud Data in Reverse Engineering, Data Processing for Rapid Prototyping, Integration of Reverse Engineering and Rapid Prototyping for Layer-based Model Generation; Rapid Prototyping Technologies. Benchmarking and establishing engineering specifications; Design Requirement Analysis and Planning; Integrated Product and Process Design; Theory of inventive problem solving (TRIZ): Fundamentals, methods and techniques, inventive design strategies. Modelling and Simulation in Engineering Design - Computer Aided Engineering and Simulation; Multi Agent Simulation in Product Development Identifying Agents, Study of Behaviour of Agents, Output Measures, Scenario Design,

Scenario Analysis; Engineering Product Design Analytics through Machine learning and Data Mining; Remanufacturing and Product Design: Enabling Design for Remanufacture; Remanufacturing Processes and Product Realisation; Engineering Manufacturing and Materials; Computational Intelligence in Remanufacturing; Sustainability and Design: Recyclability; Reliability and Lean Design Engineering; Interface with Industrial design; Economic considerations in design; Ecodesign and Green Engineering Product Development.

(v) Subject name- **Frugal Engineering** (Credit 3)

Syllabus:- Introduction to Frugal Engineering; Principles of Frugal engineering; Affordability driven innovation; Frugal Re-engineering Process; Importance of frugal engineering; Approaches of frugal engineering; Frugal Engineering in Indian Industries; Appropriate technology for rural development; Strategies for Frugality; Frugal engineering and sustainable development; Fundamental requirement for Frugal Products; Frugal innovation Vs. Standard innovation; Dimensions of frugal innovation; impact of frugal engineering and innovation on organization and culture; frugal engineering and resource efficiency; Lean thinking - lean design and manufacturing; Optimization of product life cycle with frugal engineering; frugal engineering for new product development; frugal engineering for marketed products; Frugal engineering and organizational agility.

(vi) Subject name- **Technology Entrepreneurship** (Credit-3)

Syllabus:- Technological Innovation and Entrepreneurship; Technology Strategy; Design for Competitiveness; Managing Technology and Innovation for competitive advantage; Technology Acquisition and Assessment; Generation and Diffusion; Absorption and Adaptation; Development of indigenous technology for import substitution and global competitiveness; Product Engineering; Technology Intelligence and R&D Management; Industrialisation Design; Technology-Business Incubation and Venture Creation; Competitiveness across Value Chain and technology deployment. Techno economic Feasibility analysis – Technology business plan: Technical Marketing Research; Demand Assessment; Plant, Equipment, Machinery and process selection decisions; Production/Operation system design and capacity planning; Technical Sourcing; Technology Project Management; Preparation of Technology-Business Plan. Protecting innovation through patents; Steps involved; Technology Transfer; Appropriate Technology and Frugal Engineering in entrepreneurship; entrepreneurial engineering.

(vii) Subject name- **Design Driven Innovation** (Credit-3)

Syllabus:- Introduction to the innovation process and the individual affective characteristics that are critical for successful innovation; Human-centered design and achieving deep customer understanding; Design thinking and innovation; Identifying opportunity areas including problem framing and definition; Idea generation, concept development, implementation of innovation; Managing innovation including understanding and predicting technological innovation: new data and theory in terms of statistical analysis methods and decomposition models in order to extract useful insight on the determinants of technological innovation.

(viii) Subject name- **Rural Technology Project Planning and Management** (Credit-3)

Syllabus:- Development and management of rural / cottage industries; Allocate resources to different activities in project planning; Technology based rural entrepreneurship; Dynamics of marketing of rural products; Credit flow and life cycle in rural enterprise; Development of corporative and group based industries in rural areas; Technological design process of rural and cottage industries products; Project performance evaluation.

(ix) Subject name- **Entrepreneurship & New Ventures** (Credit-2)

Syllabus:- Introduction to entrepreneurship; Entrepreneurial process; Opportunity identification, idea generation and evaluation; Building the team / leadership; Business plan / business models; Finance / funding / valuation of a new company; Sales / marketing; Company growth, acquisitions and exit strategies; Intellectual property and corporate law; Final panel presentations new venture feasibility study.

Courses for rural entrepreneurs

- Fabrication technique for machines and equipments
- Establishment of workshop facilities on rural and cottage industries
- Management of finance and production of rural and cottage industries
- Organization of group based and cooperative structure for rural production
- Micro financing and raw material collection for industry activities
- Ergonomic concepts in development of small equipment and machines

8. ***Satellite centers***

Four satellite centers namely – (i) National Institute of Technology (NIT), Jamshedpur, (ii) National Institute of Technology (NIT), Patna/Durgapur, (iii) National Institute of

Technology (NIT), Rourkela and (iv) Indian Institute of Engineering Science and Technology, Shibpur (IIEST, Shibpur) will be set up as partner with the IIT Kharagpur

Activities of satellite centers

- Interaction with the main hub for policy formulation, preparation of activity schedule and distribution of work and responsibilities
- Interaction with user groups for design / development, fabrication, production system management, etc. for rural industries in the areas nearby their locality
- Testing support, design and process dissemination for the user groups in the villages
- Follow up of training activities and surveying of new training requirement for the user groups
- Interaction between entrepreneurs and rural industry owners on day-to-day basis
- Training of youth and potential entrepreneurs in order to attract them towards rural and cottage industries specific to their localities
- Certification and interaction with financing agencies for rural industries
- Market survey for potential products in the nearby areas

9. ***Deliverables***

- Design of machines / equipment and development of technologies useful for the rural industries and artisans
- Engagement of trained manpower in rural and cottage industries
- Modification of technologies and processes for improvement of labour productivity, wage earning capabilities and profitability
- Improved quality of materials in the rural and cottage industries so that they become more attractive in market
- Capacity building of rural youth and entrepreneurs on rural and cottage industries based activities so that they can remain in the village and earn a better livelihood
- Increased employment opportunities through strengthening fabrication, production, repair and maintenance facilities in the village
- Attractive work opportunities in the village through reducing drudgery involved in various rural and cottage industries

10. **Facilities required**

1. Infrastructure
    a. Office space for interaction with potential users, NGOs, SHGs and interested farmer/entrepreneurs groups.
    b. Seminar cum Training hall.
    c. Technology display and demonstration hall.
    d. Workshop for fabrication facilities.
2. Machinery for mechanical and electrical fabrication work.
3. Computer based modeling, simulation and analysis facilities.

Manpower required

1. Research Associate/Consultants/visiting faculty
2. Technicians: Senior mechanic/Junior mechanic/Job supervisor/Office assistant

Student involvement and facilitation

a) Undergraduate and post-graduate student projects
b) Rural innovation work as an Extra Academic Activity
c) Summer and winter internship activities
d) Training / Workshop / Summer school
e) Annual innovation / National level technology design competition

Leadership Team:

1. Prof. P. B. S. Bhadoria, Coordinator RuTAG.
2. Prof. E. V. Thomas, Agril. & Food Engg, Deptt.
3. Prof. H. Raheman, Agril. & Food Engg, Deptt.
4. Prof. N. S. Raghuwanshi, Agril. & Food Engg, Deptt.
5. Prof. D. K. Swain, Agril. & Food Engg, Deptt.
6. Prof. Siddhartha Mukhopadhyay, Electrical Engineering
7. Prof. C. S. Kumar, Mechanical Engg, Deptt., Head of M. N. Faruqui Innovations Centre
8. Prof. S. De, Head Chemical Engg, Deptt.
9. Prof. P. P. Das, Head Rajendra Mishra School of Engineering Entrepreneurship
10. Prof. P. K. Dan, Rajendra Mishra School of Engineering Entrepreneurship
11. Prof. S. Dey, Biotechnology
12. Prof. J. Maiti, Head Industrial Systems Engineering.
13. Prof. K. K. Guin, Dean Vinod Gupta School of Management

Annexure - I

Some activities and achievements of RuTAG-EI Cell

1. Amber Charkha / Solar Charkha

Leg-driven at KVIC Jhargram

Traditionally, women operating this charkha earn meagerly and are subjected to dire drudgery because of the charkha being physically demanding. The drive of the machine had shifted from single hand to the two legs. This has made it easy to operate and ergonomically suitable while reducing the drudgery. Force exerted by the two legs in succession ensures more uniform rotational speed of the driving shaft, thereby reducing breakage of thread. The productivity has increased from 16-18 to 32-34 spindles per day. So the earning has increased two times compared to the hand-driven charkha.

2. Integrated Motorized Muri (Puffed Rice) Making Machine

Integrated Muri machine at Keshiary

(Muri) is a type of puffed grain made from rice; usually made by heating rice kernels. It allows the production of 30-40 kg Muri per hour as against 4kg/hr by traditional method.

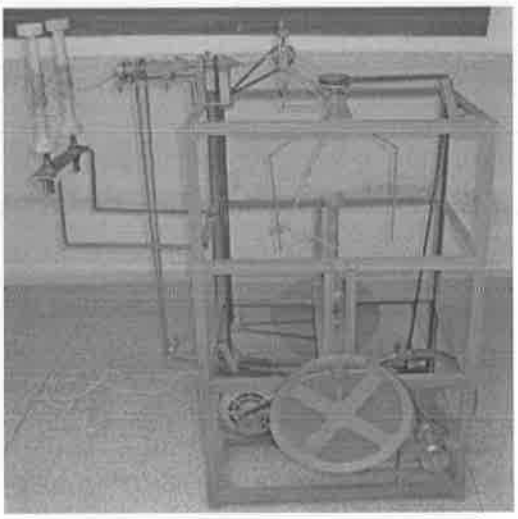
3. Sabai Grass Rope Making Machine

Motorized sabai grass rope making machine

A large number of rural people are engaged in making ropes out of this grass round the year and the physical drudgery is enormous. The developed machine is operated by 0.5 hp electric motor at a speed of 1440rpm and all the above process is done with the help of the V-belt, pulley drives and set of pinion and bevel gears, which rotates the bobbin with the ideal angular velocity, grass yarns are fed through feeding cone and the rope is winded over the bobbin. Hence, this machine helps in reducing the menial work involved and provides good working conditions. The working situation is ergonomically safer resulting in higher level of productivity and is much superior compared to previous leg-driven machine.

4. Jute Rope Making Machine

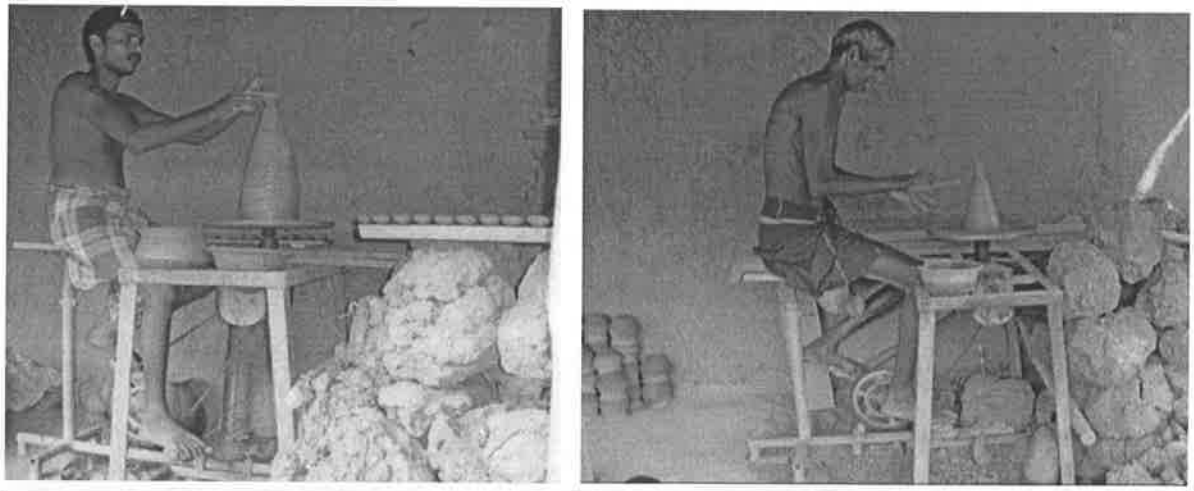
Leg operated



Motorized Jute rope machine

The developed leg driven Jute rope machine is easy to operate, reduce the drudgery, high productivity and its capacity is four times compared to traditional method. A new model, which is fully motorized, involves negligible drudgery and the efficiency has increased substantially by 10 times compared to leg operated.

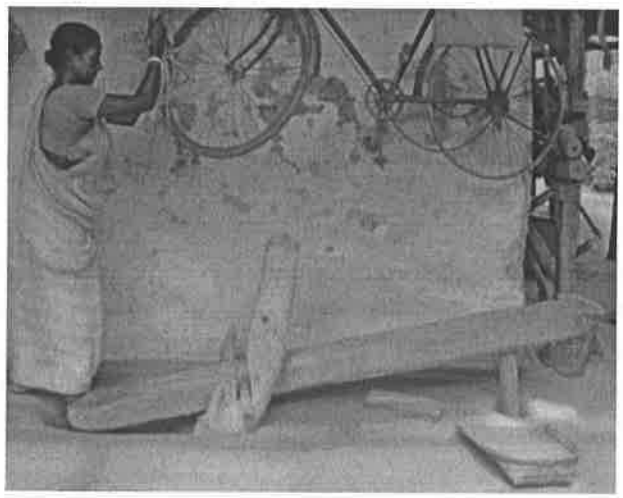
5. Pedal driven Potter's Wheel



Pedal driven Potter's Wheel

The wheel is based on a revolutionary concept using the bicycle pedal as the source of power; enabling the potter to work in a comfortable sitting position with little strain on the back. It consists of a circular turntable rotating at 250-300 rpm. Moulding of the pot and driving the wheel carried out simultaneously.

6. Mechanized Dhenki



Traditional dhenki

Mechanized dhenki

The traditional paddy milling practices including hand pounding / foot pounding (*Dhenki*) are still in vogue in interior villages. In traditional dhenki two persons are involves for dehusking and it yields about 4-5 kg/hour milled rice. A low cost domestic level mechanized dhenki with a capacity of 14-15kg/hour has been evaluated.

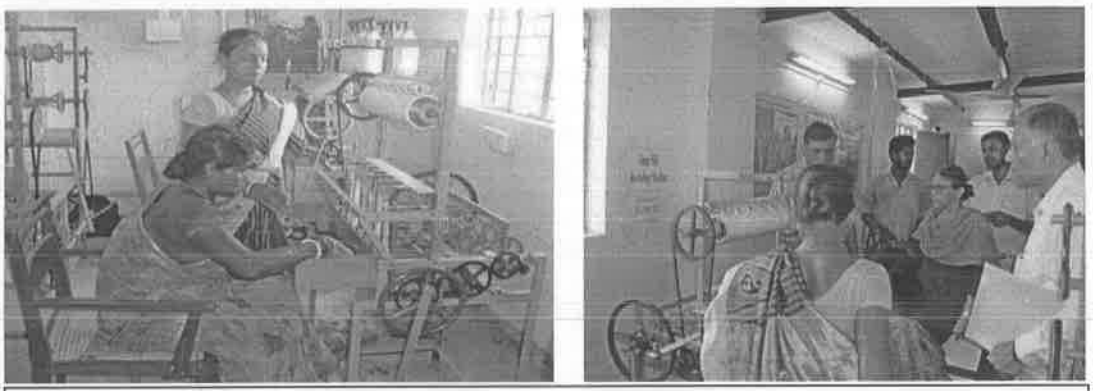
7. Coir Rope Door Mat (Papose) Making Machine

Papose (doormat) is widely used in India, it is consists of coconut coir rope weaved tightly in various geometrical shapes. The weaving and tightening process are done manually. The physical drudgery is enormously deplorable. An innovative machine developed that makes the tighten process easy and comfortable. It is less time consuming and involves less drudgery.

Field trial of Coir Rope Door Mat (*Papose*)

8. Pedal Operated Silk Reeling Machine:

In traditional method substantial amount of working time is lost due to breakage of thread, exhausting physical labor and resulting in low productivity of 4-8 cocoons per hour. In pedal operated silk reeling machine, a leg driven angular pedal is used to improve the above process. Reeling thread from the cocoon is fed through a series of guides and travelers and finally onto the bobbin. With the amount of force required in the previous design having four spindles, six spindles can now be reeled, increasing the productivity of the workers substantially. This reduces the menial work involved and provides good working conditions. The working environment is ergonomically safer than the traditional one, resulting in higher level of productivity. The output of the daily worker is increased by about six times and also added to the personal comfort.



Pedal operated silk reeling machine