



### Editors' Desk

After almost 5 years of direct involvement with RuTAG and being associated with rural technologies for more than 15 years, I could frankly share few of the happy initiatives we could start as a part of RuTAG IIT Delhi centre. The first one is "Innovative Product Delivery". It is an initiative through our FITT to make our working prototypes available on payment basis. Within few months of its launch we could deliver 3 Tulsi Mala Making Devices, one Treadle Pump, One BDT (all worth about Rs. 75000), whereas one ADPM was sold directly by the manufacturer. As a result of above deliveries, we could find a way of self-sustenance of these products till a genuine entrepreneur takes them forward to commercialize.

The second initiative was the networking with IIT Kharagpur (Rajendra Mishra School of Engineering Entrepreneurship), and IEST Shibpur to fabricate five Treadle Pumps for distributions in Sunderban, West Bengal. IIT Delhi has already installed two pumps there for fetching water from ponds. The pumps made the task safe and convenient.

The third one is more of inward looking. It was realized by many of us that without updating our core technical knowledge, it would be extremely difficult to know how to apply technical knowledge to the RuTAG problems. Hence, what we call WeLD-R, i.e., We Learn through Discussion in RuTAG. The abbreviation sounds like "Welder". To us it means that we the people at RuTAG "Weld" technologies to the society. Our first WeLD-R was held on November 28, 2018 where each RuTAG staff made about 5 minutes .ppt presentation each on some fundamental subject relevant to his/her work. For example, one presented on Engineering Materials, while the other one talked about Metal Cutting. We plan to conduct WeLD-R every month to keep ourselves abreast with engineering knowledge.

Finally, I must thank Ms. Rama Saxena in the Dept. of Mech. Engg. who designed the beautiful logo of RuTAG IIT Delhi. The logo was applied for its trademark registration. Happy New Year to all readers!

**Prof. Subir Kumar Saha**

### Chairman's Column

#### Working seriously towards 'Appropriate' Technology- Shall We Make it our New Year Resolve?

Friends, while wishing you a very Happy New Year, let me venture to urge upon all our colleagues engaged in teaching, research, and promotion of technology in various domains to resolve to work seriously towards understanding, developing, and proliferating 'appropriate' technology. As such, who would disagree with the notion that whatever we do ought to be appropriate to the need and the situation. Nobody will like to accept something which is 'inappropriate'. The same naturally applies to our own domain of working, i.e., in the domain of technology development. But then, the questions are;

- Do we understand the salient criteria to evaluate whether a technology is appropriate or not?
- Do we try to evaluate the appropriateness of technologies that we deal with in context with our teaching and research?
- Are we seriously cognizant of undesirable impact because of the 'inappropriateness' of prevailing technologies which we ourselves have also been supporting and promoting through our professional endeavour?
- Do we realize the urgency of the above need in context with human welfare?

As a food for thought, in this context, let us ruminant over the following points:

- An appropriate technology is that which caters to genuine human needs and not to the camouflaged human 'greed'.
- An appropriate technology is that which is conducive to good of all, i.e., Bahujan Hitay, Bahujan Sukhay, and not pampering the whims and fancies of a chosen few.
- An appropriate technology is that which is region-specific, decentralized, and compatible with the diversity in Nature or, in other words 'Swadeshi'.
- An appropriate technology is that which does not replace the human and the animal resource which are the holistic gifts of nature, but helps to augment their capabilities.
- An appropriate technology is that which is compatible with the cycles of Nature and promotes renewability to the maximum extent.
- An appropriate technology is that which promotes a healthy lifestyle and a harmonious social set-up.

Needless to emphasize that to gain a correct understanding about appropriate technology, the prerequisite is to have a holistic perception about life goals, about happiness and prosperity about real human needs, and about the interconnectedness and co-existential order of Nature. Let us strive to work in this direction and thus contribute towards making this New Year and all the rest further on - really happy!

**Prof. R. R. Gaur**

### Purdue's EPICS and RuTAG IITD collaboration

We are the sub-group of Purdue University's EPICS India Team that has been working with the RuTAG IIT-Delhi team since September, 2018. We were given the project of improving RuTAG's current design of a treadle pump. Our goals were to reduce the weight of the current model (50 kilograms), and if possible, reduce the cost of the pump. Throughout the semester, we toyed with different ideas for a new design, trying to implement simple ideas that might make the pump more ergonomic and reduce its weight. The four different designs that we were considering used the following concepts: adding more counterweights, a two-person seesaw pump, a pivot board (only one treadle instead of two placed so both feet can fit on it, and it would operate like a pivot board), and a pulley. These designs were conceptualized with the goal of increasing the ergonomics and reducing the weight of the pump. After discussing our

ideas with superiors and Suraj Bhat (point of contact for RuTAG IIT-Delhi), we realized that these designs were not practical considering the availability of materials to the farmers, as well as the logistics of the designs themselves. So we decided that it would be best to try to modify parts of the original model and change the material of some parts of the pump to reduce the weight. We 3-D printed the original model using CAD files sent to us by Suraj. This helped us to see which parts of the pump we might be able to modify and parts that we could change so that it wouldn't reduce the functionality of the pump.

*Prof. William Oakes and his team, (a) Juliana Brustolin, (b) Nicholas Lucot, (c) Serena Mackenzie, (d) Ryan Tao and (e) Zack Zhang, Purdue University, USA*

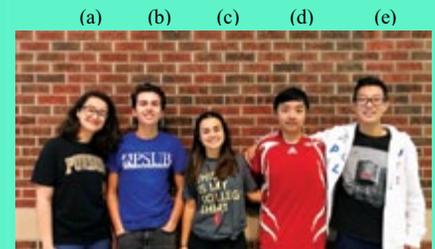




Figure 1: Two electronic jacquard handlooms commissioned in Pathamadai CFC, October 2018



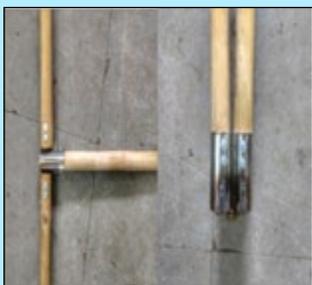
Figure 2: RuTAG stall with air quality display system in HumanArch event, Green Rameswaram



Figure 3: Protective dress for honey harvesters



(a)



(b)

Figures 4 (a) and (b): Various designs of joineries

**1. Dissemination of Electronic jacquard handloom technology of RuTAG IIT Madras**

**P.I. – Dr. S. Ganesan, RuTAG IIT Madras, Prof. K. Badari Nath, R. V. College of Engineering, Bengaluru.**

**Collaborating NGO – *The Tamilnadu Handicrafts Development Corporation Ltd. (TNHDC)***

The Tamilnadu Handicrafts Development Corporation Ltd. (TNHDC-Poompuhar) has sanctioned establishment of Common Facility Center (CFC) in Pathamadai, Tirunelveli district, TN for duration of 1 year with a budget of Rs. 47 lakhs to be implemented by RuTAG and Centre for Social Innovation and Entrepreneurship (CSIE), IITM. This project focuses on infrastructure development in premises of The Pattamadai Lebbai Fine Mat Weavers Co-operative Production and Sales Society Limited by commissioning of four Electronic jacquard handlooms (Figure 1) developed by RuTAG. Technology development of this was completed by Dr. S. Ganesan, Project Advisor, RuTAG and Prof. K. Badari Nath, R. V. College of Engineering, Bengaluru. RuTAG has collaborated with CSIE for initiatives to bring markets closer to the artisans through social media strategies, providing stall spaces and e-commerce transactions.

**2. Installation of air quality measurement system in Rameswaram**

**P.I. – Prof. S. M. Shiva Nagendra, Department of Civil Engineering, IIT Madras**

**Collaborating NGO – *Vivekanand Kendra, Kanyakumari, Tamil Nadu***

The air quality system using low cost semiconductor sensors, completed by Prof. S. M. Shiva Nagendra, Department of Civil Engineering, IIT Madras, was inaugurated by the Mr. Veera Raghava Rao, Collector, Ramanathapuram district and State Minister for Information Technology Dr. M Manikandan during the HumanArch event of Green Rameswaram initiative on 14<sup>th</sup> October, 2018. The display of air quality parameters (Figure 2) of CO<sub>2</sub>, CO, particulates, temperature and humidity is expected to increase public awareness about air quality. The data from the system is being monitored for the next 3 months by IIT Madras.

**3. Designing protective dress to be worn while harvesting honey from Beehive in wilder**

**P.I. – Prof. R. Sandesh (Industrial Design Centre), IIT Bombay**

**Collaborating NGO – *Centre for Bee Development (CBD), Wardha***

This project focuses on designing a dress for protecting people who harvest honey from beehives in wilder. Center for Bee Development (CBD), an NGO based in Wardha is working exclusively for protection and conservation of wild bees. They are promoting collection and harvesting of honey from beehives in jungles. The wild bees especially ‘Apis Dorsata’ (one of the most ferocious wild bee species) can attack the harvester and injure him/her quite badly. The protective dresses currently available in market are designed for use during harvesting of honey from apiculture. The species of bees used in apiculture are less ferocious and hence this dress is not useful for harvesting of honey from beehives in jungles. At present, CBD has designed a protective dress (Figure 3) made of cotton but it has some problems like; 1. Being made of cotton it wears out early and is susceptible to attacks by rodents etc., and 2. The cap (Helmet like structure) and the face net need an improved design. The main objective of this project is to design an easy to wear and breathable protective dress that will overcome the above mentioned limitations.

**5. Livelihood augmentation and value creation for bamboo-based furniture making community through work, process, and design optimization**

**P.I. – Prof. R. Sandesh (Industrial Design Centre), IIT Bombay**

**Collaborating NGO – *Kalasangam Gram Vikas Sanstha (KGVs), Gadchiroli, Maharashtra.***

India has vast growth of bamboo across its geography and is among the top producers of bamboo in the world. Bamboo communities are majorly involved in weaving, furniture/product making, and trading of ready products as well as bamboo as a raw material. But the communities face several problems in pursuit of this trade. Few of the problems are; 1. Lack of new design inputs, 2. Ergonomic considerations, and other modern features as required in the contemporary furniture market. Industrial Design Centre (IDC) of IIT Bombay has been involved with artisans from villages in Kudal in Konkan and Wadsa in Gadchiroli to improve bamboo product making as well as to design and develop new and contemporary products [Figures 4 (a) and (b)]. Faculty members, as well as many students in IDC, have been working in this sector. The main objective of this project is optimizing value added furniture designs for these Bamboo communities along with capacity building for livelihood generation.



Figure 5: Metallic Loom for Carpet Weaving of 4'x6'



Figure 6: Sizing of Warp Sheet



Figure 7: Hexagonal design of the street sizing process

### 5. Metallic Loom for Carpet Weaving

**P.I. – Prof. S. K. Saha, Dept. of Mechanical Engineering, IIT Delhi**

**Collaborating NGO – *Rajasthan Carpet and Woolen Products Development Society (R.C.W.P.D.S), Jaipur, Rajasthan.***

Carpet looms are used for weaving woolen and silk carpets. During weaving different operations are carried out, such as tensioning of warp, shedding, knotting, cutting, and beating. For these operations, some arrangements should be provided. While designing the loom structure, its strength, ease of operation, high productivity, ergonomics, and cost should be considered so that they add maximum value for money. Carpet weaving is the process of interlacement of warp and weft in a fabric according to the graphic design. IIT Delhi had developed metallic carpet loom (Figure 5) for woolen and silk carpet users at several states of India. Field trials indicate that the designed metallic looms in which one person can easily give tension in about 8-10 min. are very much acceptable to the users. Moreover, beam bending is also very small, providing uniform tension that improves the quality of carpets. RCWPDS has decided to test their looms in their area for proliferation of the new loom.

### 6. Development of More Ergonomic and Efficient Street Sizing System for Chirala Handloom Cluster

**P.I. – Prof. Samrat Mukhopadhyay, Dept. of Textile Technology, IIT Delhi**

**Collaborating NGO – *Rastra Chenetha Jana Samakhya (RCJS), Chirala, Prakasam, Andhra Pradesh.***

The process of sizing is done to give temporary strength to single count cotton yarn to withstand the rigor of weaving while keeping the characteristics and properties of cotton yarn intact. It directly affects the production rate and number of breakages and faults in fabric. The weavers in Chirala, spray the sizing liquid on around 10-15 m of yarn sheet (Figure 6), and subsequently carry a heavy brush/comb to evenly spread the sprayed liquid onto yarn surface and leave it to dry. This process is repeated for 3-4 hours on both sides of fabric. This is a painful as well as heavily time consuming. Sizing is crucial as it directly affects production rate and number of breakages. We proposed four different mechanical designs to aid in the street sizing process, namely, helical, circular, hexagonal (Figure 7) and hexagonal with off brush mechanisms. The final model contains improved brushing action. Instead of moving the brush, the warp was lifted off the polygon and stretched between two rotating pipes. Brush is located in the middle of these two pipes, so that warp always remains in contact with it. Several prototypes were made and a scaled model was installed at Chirala, where the local sizers are doing trials. Several iterations have been made to our initial design as per sizers' feedback and the process of product development is still going on.

### Delivery of RuTAG-IIT Delhi technologies through FITT, IIT Delhi

RuTAG IIT Delhi has introduced a scheme for dissemination of its technologies through FITT IIT Delhi by which anyone directly place an order for the purchase of the RuTAG technology. RuTAG IIT Delhi has successfully delivered its first set of products in the month of August 2018 to Mr. Amit Jain from Shantidhara Dughd Yojna and Sharmdaan. Mr. Jain has taken the device for his workshop/plant for educational purpose. Anyone may visit the official website of RuTAG IIT Delhi (<http://rutag.iitd.ac.in/rutag/?q=innovative-products-delivery-0>) and find the list of technologies available to be delivered under "Innovative Product Delivery" tab. The estimated price, details of a technology/device, and the estimated time of delivery are also mentioned on the website.

### Events, Exhibitions, and News

1. RuTAG IIT Delhi Club participated in Mentorship Review Committee (MRC) during July 20-22, 2018. The main objective was to create awareness among new students about rural problems and the technological interventions being contrived by RuTAG IIT Delhi.
2. RuTAG club orientation and felicitation programme (Figure 8) was held at LHC IIT Delhi on August 28, 2018. (Read report on page 8).
3. RuTAG IIT Delhi presented posters of its technologies at Industry Day on September 22, 2018 held in the IIT Delhi campus.
4. One day NGO workshop was organized by RuTAG IIT Bombay on September 25, 2018 at campus of Maharashtra Institute of technology, Aurangabad.
5. One day regional workshop (Figures 9 and 10) of RuTAG IIT Delhi was held on December 4, 2018 at Sagar, Madhya Pradesh in collaboration with Madhya Pradesh Vigyan Sabha and Shantidhara Dughd Yojna, Sagar, M.P. (Read report on page 5)
6. Mr. Davinder Pal Singh and Mr. Suraj Bhat exhibited the RuTAG technologies in the 19<sup>th</sup> ISME Conference held at NIT Jalandhar during December 20-21, 2018.



Figure 8: Prof. S. K. Saha addressing the RuTAG Felicitation program



Figure 9: Session Chairs at RuTAG Regional Workshop, Sagar



Figure 10: Prof. S. K. Saha presenting RuTAG technologies at Sagar Workshop



Figure 11: Mr. Davinder Pal Singh during testing of Sheep Shearing device

### Visits

1. Prof. Debabrata Dasgupta, Mr. Raj Kumar Gupta, and Mr. Suraj Bhat visited Bharatpur to study the air quality parameters for stone carvers on July 16, 2018.
2. Mr. Suraj Bhat presented a paper on 'Flexible Modelling of Treadle Pumps' at the 9<sup>th</sup> Asian Conference on Multibody Dynamics held during August 19-23, 2018 at Xi'an, China. The paper was co-authored by Ms. Airin Dutta, and Prof. S.K. Saha.
3. Mr. Davinder Pal Singh and Mr. Ashish from RuTAG IIT Delhi visited Palampur, H.P. for testing of indigenous sheep shearing device (Figure 11) with combs and cutters developed by IIT Delhi during November 14-23, 2018.
4. Prof. S. P. Singh, Mr. Davinder Pal Singh, and Dr. Susha Lekshmi visited Palakkad for demonstration of Tree Climber developed at IIT Delhi, and to explore the technology flaws associated with the existing device during December 13-14, 2018.
5. Mr. Davinder Pal Singh and Mr. Mangal Sharma visited Rajpura, Punjab for the demonstration, training and awareness of Tulsi Mala Making Device during December 16-17, 2018.

### Logo of Rural Technology Action Group (RuTAG) IIT Delhi

Recently, the logo of RuTAG IIT Delhi (Figure 12) was designed by Ms. Rama Saxena of the Department of Mechanical Engineering at IIT Delhi. The logo has following symbols: 1. Welding gun; 2. Wheat panicle; 3. Glow from the welding gun; 4. Plier; 5. Adjustable Spanner; and 6. Gear.

The logo relates to the concept of technology inputs and actions for the advancement of rural livelihoods. The symbols of Welding gun, Gear, Plier, etc., represent technology inputs while glow represents the action from the technologies, and panicle symbolises the rural livelihoods.

*Dr. Susha Lekshmi S. U., Project Consultant, RuTAG IIT Delhi*



Figure 12: RuTAG IIT Delhi Logo

### A conference on “Anchoring innovation in handloom weaving in India: Rethinking Indian industrialization of crafts” held during November 11-18, 2018, in Chirala, AP, India

Prof. S. Mukhopadhyay, Dept. of Textile Technology, IIT Delhi delivered two talks on November 11, 2018 on “Technology intervention for Chirala weavers” and “RuTAG – technologies for the rural population”. The presentations were very well received. Many people came to know about RuTAG for the first time. The newsletter of RuTAG was distributed. The evening had a very innovating introduction and discussion session (Figure 13) where people got to know each other and of the different crafts. It was a very different conference as several workshops were organized (Figure 14) around topics worth being discussed by artisan groups (in three parallel locations) and techniques that artisan groups demonstrated. There were demonstration of twelve different handlooms from various states of India including the North-Eastern states like Manipur and Mizoram. People demonstrated the intricacies of handloom weaving. A group from Bengal (Figure 15) who are reviving the Muslin demonstrated participants the lost art of spinning fine counts. They demonstrated how to spin fine counts upto English 300<sup>s</sup>. The crafts of India are diverse, rich in history, culture and religion. The craft of each state in India reflect the history of the individual state. Throughout centuries, crafts have been implanted as a culture and tradition within rural communities. The Chirala experience was a wonderful showcase of our cultural diversity and richness of crafts. It also initiated dialogues between different stakeholders as to how things should improve or can be taken forward.

*Prof. S. Mukhopadhyay, Dept. of Textile Technology, IIT Delhi*



Figure 13: Discussion during the Conference



Figure 14: Workshop to show hand spinning of cotton



(a)



(b)

Figure 15 (a) and (b): Prof. Samrat interacting with participants

## One day training program of Tulsi Mala making device at L&T NPL Rajpura, Punjab

L&T Nabha Power Limited Rajpura Punjab purchased two Tulsi Mala making devices from RuTAG IIT Delhi for skill building and income generation of women by introducing it various SHGs at two villages Uppalheri and Bhatari in Rajpura district. One day training program (Figure 16) was attended by nearly 60 women in Uppalheri and 35 women in Bhatari on December 17, 2018. Mr. Davinder Pal Singh and Mr. Mangal Sharma from RuTAG IIT Delhi and Mr. Amarpal Singh and his (CSR) team from L&T conducted the training program. Each woman were given hands on experience of the device and they acknowledged and appreciated the device which can enhance their skill and open new avenues for the future.

**Mr. Davinder Pal Singh, Project Associate, RuTAG IIT Delhi**



Figure 16 (a) Women interacting during the training at L&T Rajpura, Punjab; (b) Tulsi Mala Making Device

*"The device is simple and easy to use, it can be used to make things other than Tulsi beads such as Shirt buttons, etc. which will help us a lot."*

*Comments from a participant*

## Regional Workshop of RuTAG IIT Delhi at Sagar, M. P.

RuTAG IIT Delhi organised a one-day Regional Workshop at Sagar, Madhya Pradesh on December 4, 2018 in collaboration with Madhya Pradesh Vighyan Sabha and Shantidhara Duggd Yojna. Four faculty from RuTAG IIT Delhi's Core Group, Prof. R. R. Gaur, Prof. S. K. Saha, Prof. S. Kohli, and Prof. M. R. Ravi, three project staff, Mr. Davinder Pal Singh, Mr. Raj Kumar Gupta, Mr. Ashish, two persons from Shantidhara Duggd Yojna, Mr. Amit Jain, and Mr. Manish Kumar, and Mr. R. R. Rahi from Madhya Pradesh Vigyan Sabha (MPVS) along with 25 other delegates from various NGOs, institutions, and other organizations have attended the workshop. Prof. S. K. Saha welcomed all the participants with his warmth gratitude and explained the RuTAG concepts and work, followed by the introduction of the participants. Prof. Saha presented the RuTAG technologies and interventions such as Bullock Driven Tractor, Treadle Pump, Ground Water Measurement Device, Sheep Shearing Device, Tulsi Mala Making Device, etc. Prof. Ravi presented the furnace related technologies such as Improvement of Bangle making furnace at Bharatpur, Rajasthan, updraft potter's kiln with the use of rat-trap technology, and bell metal furnace. Mr. Amit Jain and Mr. Manish Kumar presented [Figure 19 (a)] the type of their work in Sharamdaan and Shantidhara Dughd Yojna. He gave his sincere thanks to every participant and invited them to Shantidhara Dughd Yojna's milk plant and Sharamdaan Hathkardha Training Centre. Mr. Rahi from MPVS presented the performance of the RuTAG technology, i.e., Bullock Driven Tractor, installed at MPVS. After having a discussion on RuTAG technologies, NGOs and other delegates presented their work and the technological interventions that they require. Prof. Gaur, along with session chairs, had conducted the Conclusion session in which he stated the steps to be taken for resolving of the technical problems that were proposed by the participants. At the end, Prof. Saha and Prof. Gaur thanked the participants and invited them to join the field visit to Shantidhara Dughd Yojna the next day.

Next day, RuTAG IIT Delhi team along with 7 NGOs/Workshop participants visited Shantidhara Dughd Yojna (Gaushala) under the guidance of Mr. Amit Jain. Mr. Jain gave a brief speech on the foundation of Shantidhara [Figure 17 (b)]. He stated that it has 121 acres of land and 450 cows. He explained how they utilise the cow dung by making vermi-compost fertiliser and bio-gas. He also asserted the use of cow urine to make medicines. They have a sales portal in M.P. only till now but he said they will be opening other outlets outside M.P. too. All the participants then visited Hathkardha Training Centre [Figure 17 (c)] where Mr. Jain and his colleagues train weavers, providing them a good stipend and a better lifestyle. He mentioned that they have 4-5 training centres in M. P. Various products have been manufactured and sold at these centres including handlooms, towels, kurtas, sarees, etc. RuTAG IIT Delhi team and the NGOs interacted with the workers [Figure 17 (d)] of Sharamdaan (Hathkardha) and listened to their experiences at the training centre. Before leaving, all visited nearby Digambar Jain Temple to seek blessings from the God.

**Mr. Ashish, Project Assistant, RuTAG IIT Delhi**



Figure 17 (a) Mr. Amit Jain and Mr. Manish Kumar presenting at Sagar Workshop; (b) Left to right: Mr. Manish Kumar, Prof. Saha, Prof. Gaur, and Mr. Amit at Shantidhara Dughd Yojna; (c) Handloom at Hathkardha Training Centre; (d) Participants interacting at Hathkardha Training centre

## Student's perspective and Feedback

“In the globalized world, high-end technological innovations are focusing to modernize the mode of working both in developing and developed countries. But on the contrary, there exists a technological crevice in some rural and marginalized areas as the technologies are not designed and developed which will be appropriate to their real needs and demands. Developing and making technologies work for rural masses is the real challenge that we face at present times in our country. RuTAG at IIT Delhi is indeed doing a significant work in bridging this crevice by developing user-friendly solutions for the marginalized communities and improving their livelihood towards a sustainable future. I had the opportunity to visit RuTAG IIT Delhi as a part of my research work in October, 2018. I had quite a learning experience to witness how real-life rural problems faced at the grassroots are researched, addressed, and solved effectively by motivated students and faculty from this premiere institute. I also observed how the improvisation of rural technologies is made and how they are disseminated. The concept of open source designs by RuTAG has even made it easier for everyone to adopt, access or develop technologies of their own. RuTAG has entered in ninth year of its operation and it has successfully disseminated technologies that have been seamlessly integrated into the lives of rural and marginalized communities. I am grateful to RuTAG, IIT Delhi and Prof. Subir Kumar Saha for giving me this opportunity to witness how appropriate technologies are developed and disseminated to cater the real needs of the people”.

*Jayshree Patnaik, Research Scholar, Rajendra Mishra School of Engineering Entrepreneurship, Indian Institute of Technology Kharagpur (IIT KGP)*

“I am very thankful that RuTAG IIT Delhi team selected my village (Ramachhapra in Siwan, Bihar) for field testing of treadle pump. The ground water level is about 40 feet. The villagers appreciate this initiative by RuTAG IIT Delhi team. It is a sustainable way for irrigating the crops. It can be used in a place where the ground water level is high. It can also be used to pump the water from pond or river to the fields. Its water can also be used for drinking purpose. It is much cheaper. It can efficiently irrigate plot up to 5 acres. For vegetables, it is an effective way for watering. It slowly irrigates the field. So there is no soil erosion problem. It is a human-driven pump. Hence, it provides a medium to exercise and being healthy. It saves a considerable amount of diesel used to run the diesel pump set. It avoids the harmful emission caused due to running the diesel pump set. It can be manufactured locally”.

*Mr. Krishna, Research Scholar, Centre for Energy Studies, IIT Delhi*

“In 2018, I got chances to attend two conferences to present and talk about the research related to RuTAG projects. They are 1. 9th Asian Conference on Multibody Dynamics (ACMD) held in Xi'an, China (Figures 18 and 19), and 2. 19th ISME Conference on Advances in Mechanical Engineering held at NIT Jalandhar (Figures 20 and 21). In ACMD, I presented the work on ‘Flexible Modelling of Treadle Pump’ co-authored by Ms Airin Dutta, Prof. S. K. Saha and I. The work was about the dynamic analysis of the Treadle Pump considering one of its links as flexible which is typical if we want to make it light-weight. This work was unique in the sense that it could showcase how a problem of social relevance can be an interesting case study for a Multibody Dynamics conference. It was an excellent international experience for me, where I could meet and listen to some of the best researchers and professors working in the field of Multibody Dynamics. Also, I had a chance to get to know about some of the interesting work being done by the students and research scholars from countries like China, Japan, and South Korea. It was overall a great forum where I got a chance to experience a different culture, food and the beautiful city of Xi'an.

The ISME (Indian Society of Mechanical Engineers) conference was held during December 20-22, 2018 at the NIT Jalandhar campus. Mr Davinder Pal Singh and I attended the conference. We had set up a RuTAG exhibition stall at the conference venue, where we showcased a few of the RuTAG IIT Delhi technologies and also the research output (technical publications) of those technologies. Mr Davinder Pal Singh was one of the Keynote speakers for the conference where he delivered a talk about the working of RuTAG and the importance of bridging the gap between society and the engineering minds. The researchers were intrigued by the technologies displayed and some also shared about their experiences and willingness to contribute to the society through such interventions”.

*Mr. Suraj Bhat, Research Scholar, RuTAG IIT Delhi*



Figure 18: Dr. Rajeev Lochana and Mr. Suraj Bhat interacting with participants of ACMD conference

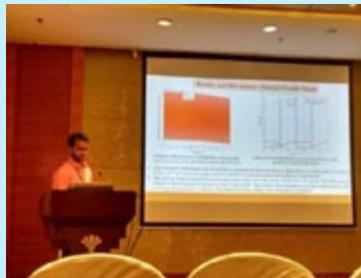


Figure 19: Mr. Suraj Bhat presenting his paper on Treadle pump in ACMD conference



Figure 20: Mr. Suraj Bhat exhibiting RuTAG IIT Delhi technologies at NIT Jalandhar



Figure 21: Mr. Davinder Pal Singh presenting RuTAG technologies at NIT Jalandhar

## Rural Innovative Technohunt

*A Technical Challenge to identify rural problems and suggest solutions*

Organised by RuTAG IIT Delhi

### Background

Rural Technology Action Group (RuTAG) is an initiative of the Office of Principal Scientific Advisor (PSA) to the Government of India. RuTAG was conceived as a mechanism to provide a higher level of S&T intervention and support to address rural problems. It has a presence in several IITs leading to many innovations which aim to technologically support rural India. It has been an endeavour of RuTAG IIT Delhi to involve students in its activities by starting RuTAG club. As part of the club activities, RuTAG is initiating a competition as a Technical Challenge linked to rural problems.



Screenshot from www.iitd.ac.in

### About the Competition

The competition would be in three stages:

Stage 1: Identification of a rural problem and conceptualizing a solution.

Stage 2: The short-listed concepts will be taken forward to detailed design of the proposed solution.

Stage 3: The selected designs will be funded for prototype development.

**Themes:** Participants in STAGE 1 are required to identify a real-life problem faced in rural India pertaining to any of the following areas:

1. Agriculture and Animal Husbandry
2. Village industries
3. Education
4. Health
5. Energy resources
6. Water & sanitation
7. Any other relevant areas



Figure 22: Hindustan newspaper article on RuTAG Competition

### Rules

1. This competition is open to only students, faculty and staff (including contractual and out-sourced) of IIT Delhi.
2. Those interested can participate individually or in teams of up to 4 participants, with AT LEAST one student (of any programme) in the team.
3. The idea presented by a team should be original (not protected by means of patent/copyright/technical publication by anyone else).
4. The problem identified should be specific enough so that the proposed solution can involve the development of a product either as hardware or as software.

### Expected Outcome

**Stage 1:** Every participating team would be required to submit a 3-4 page concept note in the following format

1. A clear description of the problem being addressed including the existing solutions (if any) in not more than 2000 words with at most four pictures.
2. Proposed methodology to solve the identified problem and how it is better than the existing solutions.
3. Conceptual description of the product (hardware or software) which will be part of the proposed solution. If the proposed product is hardware, simple sketches must be included to explain the concept.

**Stage 2:** The teams whose concepts are shortlisted for stage 2 will need to submit the following:

1. If the product involves hardware, the team will need to submit a technical report including the following:
  - a. Description of technical concepts/theories involved in the proposed solution
  - b. Detailed technical specifications and detailed design of the product with all the necessary design calculations.
  - c. Engineering drawings in any CAD software of components, sub-assemblies and assembly along with Bill of Materials.
  - d. An estimate of the cost of fabrication of the prototype
2. If the proposed product is in the form of software, the detailed algorithm for the software must be provided with a clear description of how it will be implemented to solve the problem.

**Stage 3:** The teams selected for stage 3 will be provided funding of up to Rs. 50,000 for prototype development in case the product is hardware. For software, no funding will be provided.

1. If the product is hardware, the team will be required to develop a working prototype of the same, test it and submit a report including the following:
  - a. Final drawings used for prototype development highlighting the changes from the stage 2 drawings if any.
  - b. Results of the tests and their analysis including uncertainty estimates.
  - c. Problems encountered during prototype development.
  - d. Conclusions
2. If the product is software, the team will be required to submit a functional software with required GUIs, test the software for realistic situations and submit a report including the following.
  - a. Final algorithm used, highlighting the changes from stage 2 if any.
  - b. Results of the tests and their analysis.
  - c. Problems encountered during software development.
  - d. Conclusions.

### Evaluation

Submissions at every stage will be judged by a panel of experts. Following are the major parameters of evaluation:

1. Creativity and Novelty
2. Originality
3. Appropriateness for rural application
4. Potential of Impact

### Prize

1. Winners of Stage 3 will be awarded a certificate of appreciation along with a plaque.
2. Interested winners of stage 3 may seek a seed grant up to Rs. 2 lakhs per project from the Design Innovation Centre of IIT Delhi to carry their idea forward.
3. RuTAG, IIT Delhi will also facilitate rural/social internship for Winners of Stage 3 in reputed organisations/Institutions/Universities/Companies in India and abroad.

More information about the competition and the registration link is given on the RuTAG IIT Delhi site: <http://rutag.iitd.ac.in/rutag/?q=rural-innovative-technohunt>. For any other inquiries contact: [rutagitdelhi@gmail.com](mailto:rutagitdelhi@gmail.com)

## RuTAG Club Orientation and Felicitation Programme

RuTAG club orientation and felicitation programme was held at LHC IIT Delhi on August 28, 2018. Around 80 students from different branches attended the orientation. There was also a felicitation programme to all the volunteers and faculty who helped us during the RTDD 2018 conference. Prof. S. K. Saha addressed the student community (Figure 23) and highlighted the importance of taking up social problems during student life. Srijan Prabhakar, President RuTAG club welcomed the gathering, followed by Suraj Bhat, and Davinder Pal Singh, who spoke about the club structure and RuTAG projects, respectively. Prof. Sangeeta Kohli and Prof. Kavya Dashora announced the upcoming RuTAG IITD Competition. In the end Kanika Prajapat proposed the vote of thanks.



Figure 23: Prof. S. K. Saha addressing the participants

## Testing of Sheep Shearing Device at Palampur, H.P.

In 2014, IIT Delhi has taken a project titled “Dissemination of Low-cost Sheep Hair Shearing Device developed by IIT Delhi” from Central Wool Development Board, Jodhpur, Rajasthan under the supervision of Prof. S. K. Saha. The main objective of the project was to develop a low cost mechanised device for the removal of woollen fleece of the sheep to get the maximum staple length of the extracted wool which will result in good quality yarn. Prof. S. K. Saha and his team studied the device and worked in this project diligently. An indigenous device set was finally developed and tested at several locations such as Barot, Bharmour, Palampur in H.P., Hisar in Haryana, and Bikaner in Rajasthan. The device was recently tested at Palampur, H. P. Two project staff (Mr. Davinder Pal Singh and Mr. Ashish) from RuTAG IIT Delhi visited Palampur (Figure 24) for the testing during November 15-21, 2018. The indigenous set tested included Handpiece, Combs, Cutters, Motor, and Flexible Drive. There, 18 sets of comb and cutter, along with one motor, one flexible shaft and 7 Handpieces, were tested. The testing was done with collaboration of Himachal Pradesh Wool Federation (HPWF) under the guidance of Mr. Deepak Saini (Office In-charge, HPWF at Palampur). He assigned Mr. Hans Raj (Wool Grader, HPWF Palampur) for the supervision of the shearing. Mr. Hans Raj managed everything for RuTAG IIT Delhi team such as identifying shearing locations, shearers, sheep flocks, place of stay, etc. Over 125 sheep were sheared by indigenous set at 5 different locations in Palampur region, named, Bodha, Sihol, Molichak, Bir, and Patti during 8 days as the per the availability of the flocks. The indigenously developed Comb, Cutter, Flexible Drive, Motor, and Handpiece performed at par with the imported device. The comparative data was recorded by the team. Four different shearers, named, Malbar, Ashok, DshRaj, and Nitesh worked with the indigenous device and acknowledged the good performance of the device during the testing. The shearers were happy to use the device developed by IIT Delhi, and Mr. Saini has commented that this low cost device will certainly boost the livelihood of the shepherds due to its nature of affordability

*Mr. Ashish, Project Assistant, RuTAG IIT Delhi*



Figure 24: From left to right: (a) Testing of the device at Bir, H.P.; (b) Testing at Molichak, Palampur, H.P.; (c) and (d) The shearer Mr. Malbar using the indigenous device developed by IIT Delhi.

## Fun @ RuTAG



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