



Orienting the new project teams

The orientation session addressed the ways to take on challenges as the new project teams embarked on their ideas



Interacting with the PIs of 18 new projects



An orientation to Tata Centre’s activities was conducted for the benefit of the PIs and Co-PIs of the newly approved projects, in June. The focus was to highlight the various aspects in the innovation cycle as the IIT Bombay faculty members and project teams started with the development of their research ideas, at the Centre.

As part of this afternoon session, Prof. Sanjay Mahajani, the Professor-in-charge, addressed the need for assessing the challenges faced by the communities, field-testing in phases and also identifying potential collaborators at an early stage, for better outreach of the project ideas. Introducing the solution readiness level (SRL) chart as the Centre’s parameter that measured the project progress, Prof. Mahajani elaborated on the need to ensure a time-bound plan to move up the SRL chart.

Prof. Arti Kalro, Shailesh J Mehta School of Management, continued the session with a talk on the Centre’s academic component and the ProSeminar, and brought out the relevance of need validation and stakeholders’ analysis. The Tata Fellows working on the various projects could contribute ably with such inputs to the project teams, she added.

With the aim of outlining the entire developmental cycle of a Centre’s project, Prof. Santosh Noronha, Department of Chemical Engineering, spoke on the route map taken by his project - Cervical cancer screening. The formula that the project used in the end to end innovation process was appreciated by the PIs and Co-PIs.

A Tata Fellow also presented a case study to show how his project at the Centre had decided upon action

points based on the stakeholders’ analysis. The interactive session was well-attended, and this was an opportunity for the faculty members to also meet the team at the Centre.

- **Gayathri Thakoor,**
General Manager - Programs

Index

- Orienting the new project teams
- A new paradigm in early cancer screening
- Workshops at TCTD
- Reducing cook stove emissions: Twisted tapes
- Affordable and effective biogas scrubber
- Sensing system testing grey water bacteria also detects heart attack



A new paradigm in early cancer screening

This healthcare intervention from Tata Centre is currently being rolled out in North East India, with support from the Tata Trusts

Healthcare



This is an interview with Prof. Santosh Noronha, Dept. of Chemical Engineering, and the PI of the Tata Centre project - Cervical cancer screening

Q. Please give us an overview of the Cervical cancer screening project.

A. Cervical cancer is the second leading cancer in women's death rates accounting for 27% of the cases globally. It is a slow disease with a viral origin which makes it perfectly curable if the viral infection is detected at a very early stage. But only 4% of Indian women are screened regularly due to lack of reliable screening programmes and awareness amongst women. One of the chief problems of addressing the disease is the absence of a community-level screening system. Thus, we felt there was a need for a technology that could be taken into the field for early screening. Our project team attempted to move the infrastructure currently available in tertiary care hospitals for cervical cancer screening into the field and tried to create a paradigm where

paramedics in the field are capable of conducting the whole screening programme.

Q. Could you please define how the project has panned out?

A. The project has two elements to it. The first is to design the technology – the inspection device while the second is to work on the training module that can help the paramedics and operators to operate the device on field.

Q. How does the technology work?

A. The technology, Gynaecam, is a gynaecology camera. It is a screening device that captures a printable/electronically transferable high-resolution image of the cervix, and provides light for better visualization during a routine gynaecology examination. It provides a 3x - 12x magnification and can store images on a SD card, to also maintain records for reference. The screening device is deployed by a paramedic in the field, to illuminate, image and record the lesions that are observed on the cervix. Currently, the project team has assembled a small batch of devices for field-testing. Further, various vendors are being contacted for large scale manufacturing and scale up of production capacities.

Q. What work has gone in the development of the training module?

A. The training of the device operator is very important as the procedure involves getting good

quality images by proper handling of the device. Video tutorials around the final product have been developed to facilitate training to technicians to interpret pap-smear slides accurately. These are expected to be used by village level health workers to screen, and advise women at the community level.

Q. How have the field trials been?

A. The field trial have been underway for over six months in Agada Hospital, in Chennai. We are screening the local community for the existence of cervical cancer. The question being asked is whether the patient gets the same degree of accurate diagnosis when screened either by gynaecologist live, or else by a paramedic who uses our technology to generate data and sends it to a remotely located gynaecologist. If the two gynaecologists end up with the same diagnosis, it will imply that the



The Gynaecam, the screening intervention



process of getting a diagnosis can start with a paramedic locally. The process will consider benchmarking it as per the response.

Q. How is the project being rolled onto to achieve larger impact?

A. The GynaeCam was showcased at the National Cancer Grid meeting at TATA Memorial Hospital, Parel, Mumbai. User feedback has been positive and 20 copies have been shared with stakeholders across India. The feedback suggests a possible redesign to make it more user-friendly, and have low cost/ high cost variants. In the redesign phase, 20 copies are expected to be tested in the north-east of India, in a trial sponsored by the Tata Trusts. The training module of a set of 10 videos to help set up a community health screening process has just completed a field trial with 50 nurses in Pune and Satara, Maharashtra, in association with the Tata Memorial Hospital. The content of this module is also expected to be rolled out in the north-east by the Tata Trusts, and shared nationally by the National Cancer Grid, a network of 140 cancer hospitals.

Q. Who are the external collaborators in this project?

A. Tata Memorial Hospital played a key role as they helped in defining the need, by bringing in experts. The collaboration subsequently happened with the Preventive Oncology department of the hospital, towards the creation and certification of training material. They also facilitated the dissemination of the content to a set of nurses who were then systematically trained to help execute cervical cancer screening in the rural parts.



Recording screened patients' details



Testing of screening

Q. How has the response been so far?

A. The project has received a lot of appreciation and interest from a number of research groups across India in getting it for their hospitals. Assembling this device in India, would also imply a cost-effective solution as compared to the other foreign alternatives, and has hence served as a big incentive for local hospitals.

News and updates @ TCTD, IIT Bombay

- Vivek Pawar and Soumya Pasumarty from the Tata Deshpande Centre, Hubballi, visited the Centre, in June. The Hubballi-based research centre would like to take on a few ready prototypes and projects at TCTD, IIT Bombay, to test on field.

- TCTD, IIT Bombay, is in talks with Centre for Social Entrepreneurship at Tata Institute of Social Sciences (TISS), Mumbai, in an effort to support the creation of a vibrant ecosystem to foster entrepreneurship, in the social enterprises space. The plan is to mentor students and researchers for potential ventures that can take TCTD ideas and projects to the social framework.

- Two courses on End to End Innovation are scheduled in August and September. This customised five-day course is a unique combination of lectures and hands-on fabrication, and is being offered as a part of the Continuing Education and Quality Improvement Programmes and the Technical Education Quality Improvement Programme of Government of India (TEQIP), by TCTD, IIT Bombay.

- The Product Realisation Lab had visitors from several engineering colleges and industries from Mumbai and across the country, keen on engaging with Tata Centre through the Centre's workshops and projects. More, there were students who approached for mentoring in fabrication, making use of the various equipment in ship shape.



Workshops at TCTD

End to End Innovation – for TEQIP colleges

June 4th to 8th; 2018
June 11th to 15th, 2018

Tata Centre had the opportunity of showcasing its philosophy on social innovation and research in its different domains through sessions on End to End Innovation, for faculty from the quality circle institutes of IIT Bombay. Conducted by TEQIP (Technical Education Quality Improvement Programme) of the Government of India, these four sessions over two weeks were open to about 600 participants from engineering colleges across India.

The faculty members who attended the workshops were from government engineering colleges in Rajasthan, Odisha, Bihar, Jammu & Kashmir, Mizoram, Nagaland, Madhya Pradesh and Jharkhand. The Centre's aim is was to give a glimpse of the entire process of innovation through lecture-demonstrations and case studies, out of its own projects. The speakers were faculty members with projects supported by the Centre, and who have had an active role as



The well-attended faculty workshops on End to End Innovation

mentors of the course Prof. Parag Bhargava, Dept. of Metallurgical Engineering & Materials Science brought in the fact that in order to set the driving wheels in motion for a culture of innovation, the educational institutions had a big role in building in teamwork, identification of the right needs, and encouraging passion for one's work.

Prof. Soumyo Mukherji, Dept. of Biosciences and Bioengineering, and his project team presented their innovations in sensing platforms to detect heavy metal ions in water, and those for neonatal jaundice

and heart-attack, so as to fulfil the sustainable development goals.

In his talk on engineering solutions for socially relevant problems, Prof. Sanjay Mahajani, Professor-in-Charge, Tata Centre, emphasized on the process intervention of transforming the batch production of jaggery to continuous production involving several innovations. He also spoke about the Centre's effort to make IIT Bombay a zero waste campus with the engineering mind coming up with technologically designed solutions.





Prof. Santosh Noronha, Dept. of Chemical Engineering, talked about the importance of need finding and validation in the end-to-end innovation process. He presented the example of Gynaecam, a cervical cancer screening device – a Centre-supported project - to explain the key concepts of problem assessment, right need, stakeholder analysis, and market assessment.

Prof. S. Srinivas, Dept. of Energy Science and Engineering showcased how pyrolysis of plastic could be an effective solution for managing plastic waste. Prof. Narendra Shah, CTARA, focused his talk on the challenges faced by resource-constrained communities, by presenting case studies from the Centre’s work in the Mogra, jaggery and the decentralized small-scale seed storage projects.

Dr Sonal Thengane, the Centre’s Postdoctoral Fellow, relayed to the participants the process of developing the gasifier technology intervention and how it was now being tested in campus, proving to be an asset to the waste management effort at IIT Bombay.

The faculty members participating in the workshops were intrigued by the Centre’s ideology and are now waiting to ideate and innovate with Tata Centre.

**Tinkering in the Lab
- Vigyan Jyoti**

June 7th, 2018

As a part of Vigyan Jyoti - a basic science and engineering camp for high school girls and an initiative organized by the Department of Science and Technology, Government of India - 35 students



Students brainstorming with innovations at the Product Realisation Lab



worked through a day-long fabrication workshop at Tata Centre. The students from Kendriya Vidyalaya (KV) based in Nagpur, Nasik and other parts of Mumbai, explored the facilities in the Centre’s Product Realisation Lab.

The Centre’s lab staff introduced the relevance of the need-finding exercise and the importance of tinkering in the lab for making innovations in science. Soon, the students were divided into groups each of which was guided to different sections of the lab. The quick lab tours showcased the various equipment - 3-D printer, power tools, CNC, Laser Cutter and Shopbot. Laser cutting was a clear winner, with the students seeing it fabricating customised key chains at the end of the tour. In the hands-on session, the students were given a

problem to find alternative solutions to plastic bottles. The students brainstormed on all the possible choices and then narrowed down to the best option. This session got the students to ask thought-provoking questions to the Centre’s team.

Solutions to recycle plastic bottles at school-level, suggestions on clay or metal as alternative water carriers in place of plastic, and alternative methods of waste segregation in schools were some of the ideas that they came up with during the afternoon session.

On their last day of their 21-day camp at IIT Bombay, the 12th standard students went home with the message - Identifying the need and then putting the right amount of creativity helps create innovation.



Reducing cook stove emissions: Twisted tapes

The metallic solution improves the performance of the traditional cook stove, as assessed by participatory approaches

Energy



Successful trials in field

Cook stove emissions are the major contributor to the rising indoor-air pollution in India and other developing countries. Controlling these emissions is the only way to cede the growing health-related problems. Prof. Anish Modi and his team, from the Department of Energy Sciences and Engineering, have been currently working on the project - Assessment of dissemination of cook stoves through participatory and non-participatory approaches – in this regard.

The project has aimed to quantify and analyse the difference between the social acceptance levels of the various technological solutions, disbursed through participatory and the non-participatory approaches. The detailed field surveys and impact assessment studies are expected to reveal a number of learnings and guidelines that may be used by various improved-*chulha* dissemination programs, in order for them to significantly increase the probability of their success.



Testing kitchen performance and durability

Developed by a PhD researcher from the project group, the solution - Twisted Tape - comprises twisted metallic strips that hang over the cook stove. It significantly improves the performance of the traditional cook stove without actually changing its design and also not affecting the cooking lifestyle. The twisted metallic strips create a swirl in the flames thereby improving the heat transfer, and subsequently improving the thermal efficiency of the cook stove.

The solution has been distributed to over 300 households in the Ganeshpuri, Ambadi region, with the help of an NGO that the researcher operates. A qualitative survey consisting of 35 questions, which are participatory in nature, has been used to check the success of the cook stove. The project has also added different segments along the process - kitchen performance tests and measuring the durability of the Twisted Tape. As of now, 11 households have been covered under this test to measure the cooking efficiency in terms of cooking time and fuel saved. After successful trials at Ganeshpuri, the team wishes to target Yavatmal and Karjat next.

The project team works closely with Prof. Virendra Sethi, Dept. of CESE, and the aim now is to set up a state-of-the-art cook stove-testing lab at IIT Bombay for which various collaborators like Dr. Kirk Smith from UC Berkeley, and researchers from IIT Delhi have shown interest.

Affordable and effective biogas scrubber

The features of the project's biogas scrubber like modularity, no compressor requirement and high affordability, have attracted a lot of interest

Waste Management



The biogas scrubber intervention

Biogas is a boon for rural India but the presence of hydrogen sulfide and carbon dioxide in biogas is undesirable. Conventional techniques utilize compressors to increase the efficiency of scrubbing, but the compressor is expensive, and demands large power consumption and high maintenance costs. With the objective of scrubbing off the gases from biogas and also attempting to make the process affordable, Prof. Milind V. Rane and his team from the Dept. of Mechanical Engineering, developed a cost-effective, modular, and scalable rotating disk-based mass exchanging scrubber.

The scrubber uses rotating contacting devices that enable high surface densities, thereby ensuring good contact between gas and water. This technique also enables the gas to pass through the scrubbing section without any pressure drop. All these features have helped reduce the initial

costs significantly compared to conventional technologies.

This first prototype was sent to the bio-energy wing of Muni Seva Ashram, Vadodara (Gujarat), the collaborators, for field testing. A branch of Muni Seva, MSA Bioenergy, is into building and deploying biogas plants in the country and has shown commercial interest in this technology. Using the results obtained from there, the project team modified the prototype

and now have installed the revised unit in the IIT Bombay's biogas plant, using the biogas generated from food waste in one of the hostel kitchens.

The team is currently working on its objective to upgrade the 12 m³/hr mode of operation to 60 m³/hr. Features. After successful trials, the plans are to send one more unit back to Muni Seva Ashram so as to get the approval of the technology, in order to license it.

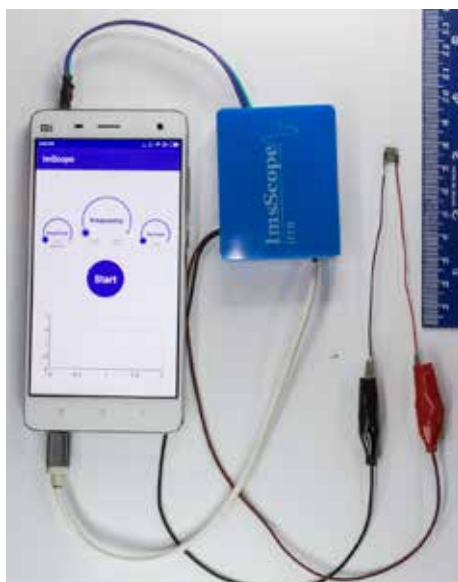


Increasing the efficiency of scrubbing

Sensing system testing grey water bacteria also detects heart attack

The Centre-supported EIS platform has lent itself to an offshoot application in detecting a heart attack

Water



Sensor and electronic system using Electrical Impedance Spectroscopy

This water project at Tata Centre - EIS platform for bacteriological monitoring of water - has a focused mandate. The team led by Prof. Soumyo Mukherji, Department of Biosciences and Bioengineering, developed a highly portable sensing system to quickly indicate the presence of bacteria and ascertain its quality in grey water. This affiliation resulted in the successful development of the sensor and electronic system for greywater bacteria testing, using Electrical Impedance Spectroscopy.

What if the same platform could spell the beginning for an affordable device that could detect a heart attack early? In reality, this sensor platform has now proved to be effective for wider applications. The project team has worked on sensors measuring cardiac markers – myoglobin and myeloperoxidase. The former is released at the early stages of myocardial infarction (heart attack) and the latter is an endothelial instability marker, the presence of which in blood indicates a higher risk for heart attacks. The team has come up with a device having three components. The sensor component measures the concentration of such chemicals released into the blood with the help of a smart electronic circuit. This is linked to a mobile phone, which does the majority of the computation, display and data storage.

This new researched application based on the platform that Tata Centre has supported, has won the team the Gandhi Young Technological Innovation Award 2018 in March, this year.

Most articles in this newsletter edition have been contributed by **Rohan Ohri, a Tata Fellow.**

Editor : Gayathri Thakoor
Design Team : Mrunal Phansalkar, Umesh Jambure
Photo Credits : Romit Patil
Content : Rohan Ohri