



Tata Centre Newsletter, November 2018, Issue No.19

Way forward

The project Cervical cancer screening has successfully ticked every box in its checklist of collaborations

Healthcare

he project team working on Cervical cancer screening, headed by Prof. Santosh Noronha, Dept. of Chemical Engineering, recently collaborated with Phoenix Medical Systems to design and manufacture copies of its developed product, Gynaecam. This entity will also be licensed the technology intervention to do the required outreach in the social space.

In addition, a large CSR grant has been received to make and give away multiple copies to hospitals across India. This arrangement will help primarily to execute a major clinical rollout of cervical cancer screening in West Bengal and later in Assam, using Tata Memorial Hospital as the coordinating hospital. The screening of 20,000 women in April 2019 in West Bengal is the intent and this exercise will be adequately funded by the Tata Trusts. The policy statement of a state to do









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The standard model: tripod mounted bright light source, 3x-8x zoom, stores images+videos, supports an SD card.

The pro model: auto focus server connectivity, attaches to Android phone.

The GynaeCam app: manages image database.

such large-scale screening will give a better picture of the costs involved and hence be convincing enough for other states to adopt the technology intervention. National Institutes of Health, USA, and King's College, London, are teaming up with the project to ensure machine learning that will work towards offering on-the-spot diagnosis without any reliance on expert guidance. While their work will be tested in the trials in West Bengal, the likely outcome is that an automated diagnosis using Gynaecam will be the preferred way worldwide.

The project team is going to be responsible for integrating the low-cost hardware with the open source machine learning layer and then fine-tuning the module for paramedics.

It is hoped that this will establish the efficacy of the relevant study, evaluate the challenges and integrate other projects in the same system.

> Gayathri Thakoor, General Manager - Programs

he project - Translation to Pre-clinical and Clinical Trials of Low-Cost Bone and Near Net Shape Graft for Dental and Orthopaedic Bone Reconstruction - has a few achievements to its credit. Prof Jayesh Bellare, Dept. of Chemical Engineering, and his team have started producing the product under Good Manufacturing Practices (GMP) conditions which are required for the clinical trials. Based on the data generated through the production, a regulatory dossier has been made which is undergoing review at the Drug Controller General of India's (DCGI) office.

have reached the clinical trials stage this far.

The immediate goal of the project team is to target patient customization with the low-cost bone that will be undergoing clinical trials.

One of the extensions to this project could be to move on to the other organs which also need replacement and regeneration such as kidney, liver, and pancreas. The team foresees techno-commercial challenges

Through clinical trials

Translating trials from animals to humans is always a big jump and involves various challenges



3D bone repair devices for maxillofacial, periodontal and orthopaedics

The All India Institute of Medical Sciences has agreed to do clinical trials in collaboration with the team and are waiting for the DCGI's clearance. While some research groups are exploring this idea, there are no competitors who

Healthcare

going forward. Chances of adverse reaction of this product in case of humans and scalability of this product are two such challenges.

Translating trials from animals to humans is always a big jump and involves various challenges. The pre-clinical or the clinical trials that are presently in place will validate the research but will not help in the establishment of a commercial entity. Thus, the aim is to translate this research into a commercial model and simultaneously maintain its frugal engineering aspects intact.

> Rohan Ohri, Tata Fellow 2017-19

More appreciation



From growing up in a tribal region with roofless classrooms and no teachers, to working as a research engineer with Tata Centre, Akshay Khobragade's journey has been interesting. At Tata Centre, he had been a part of the Product Realisation Lab and subsequently worked on the project – Design and development of seed storage system for community level seed banks and marginal farmers.

Akshay was recently felicitated as Younger Research Scholar by Shri Nitin Gadkari, Union Minister, at an event organized by his almamater - the Central India Group of Institutions (CIGI), in Nagpur. Again, in Shirdi, Akshay interacted with Padmashri Subhash Palekar, a pioneer in zero budget natural farming and officials from Niti Aayog, when the seed storage units project was appreciated.

> Shraddha Vekhande, Tata Fellow 2017-19

To zero waste

An enthusiastic team promoted by TCTD has come up with a target of developing IIT Bombay as a "zero-waste-to-landfill" institution

Waste Management

urveys and studies have provided insights into the existing provisions for waste management at IIT Bombay. Currently, 6.2 tons of daily waste comprising of dry and wet waste is generated within the campus. More than 3 tons of garden waste needs disposal per day. Only 0.3 tons/day of dry waste is recycled with the help of an NGO, while the rest goes into a compaction unit and is collected for landfilling. In case of wet waste, 0.35 tons/day goes into composting units in the campus and 0.5 tons/day goes for bio-methanation process at the Nisargruna biogas plant, installed by BARC. A total of 5.05 tons of the remaining waste is taken daily to the landfills by Brihanmumbai Municipal Corporation.

Inspite of these facilities, it is surprising that over 80 per cent of the total daily waste still cannot be treated efficiently within the Institute. Many problems associated with the current waste management system in the campus have been identified such as improper functioning of

the bio-methanation unit due to factors such as leakage, clogging, pH and temperature imbalance which have led to its inability to function up to its full capacity; limitations associated with composting units such as improper agitation and aeration. The issue of primary concern is waste segregation which plays a pivotal role in efficient waste treatment.

TCTD has supported five different projects to work on several aspects of waste management. In addition, an enthusiastic team of researchers including undergraduates, post graduates and PhD students





Team Zero Waste

problems with better methods of segregation and pre-treatment of waste, and introducing techniques which could be utilized to control and optimize the physico-chemical and biological conditions in the current bio-methanation and composting processes. New designs for a pilot scale plant for composting and methods for waste pre-treatment such as shredding, liming etc. are also in the developmental stages.

Collaborative plans with more NGOs and start-ups to increase the economic value of waste by the process of recycling are taking shape. This is expected to generate additional employment. The team is planning to create awareness and encourage better handling and minimization of waste for bringing in a decentralized, sustainable and integrated waste management model.

Team Zero Waste For further details, please contact (dhrumil303@gmail.com)

Striking a chord at MIT

The week-long trip to MIT, Boston left the IITB Tata Fellows with thoughts, inspiration and plenty of memories



Visiting the Plasma Science and Fusion Center

The Tata Fellows' Batch of 2017-19, some faculty members and a project manager from Tata Centre for Technology and Design, IIT Bombay, had an eventful visit to MIT in Boston, USA. The week-long trip comprised of a two-day symposium hosted by MIT-Tata Center and a threeday orientation for the IITB Tata Fellows.

At the symposium, the theme -Translating Research into Impact at the Tata Center – had speakers invited to deliver keynote addresses and discuss relevant issues across teams. In the panel discussions, the speakers brainstormed from the scaling up of social enterprises to views on funding social innovations. The Tata Fellows

from MIT-Tata Center had showcased their work through a posters exhibition during the reception. The agenda this time

included parallel workshops on different domains - Health, Housing, Education, Water, Energy, Environment, and Agriculture which made the proceedings more interactive since people from the industry and academia were made

to sit together and expected to solve problems.

After a weekend full of study tours and sights to orient the visiting group

from Tata Center to the beautiful city of Boston, it was time to get oriented with the projects at MIT-Tata Center. The orientation involved presentations from experienced faculty members



Tata Fellows at the Wind Technology Testing Center

and post-doctoral Fellows on their research projects. These were usually followed by visits to labs - to witness some great work happening at Media Lab, D-Lab, Wind Testing Center, Hobby Shop, Martin Trust Center for MIT Entrepreneurship, Plasma Science and Fusion Center, and Cambridge Innovation Center. During these three days, the Tata fellows and IIT Bombay faculty members got a chance to network with the MIT Tata Fellows and faculty members.

The best moments were the de-briefing sessions that used to happen at the end of each day's schedule. The one-hour session always used to get extended because of the build-up of interesting discussion among the students and faculty. The insights



At the MIT-Tata Center Symposium

shared during these sessions were a huge takeaway. The day always ended with the big group having a gala time, at a nice place, with good food and the best people around.

The week-long trip to MIT Boston was able to strike the right chord with the IITB Tata Fellows, leaving them with curious thoughts and plenty of inspiration to take back home along with many wonderful memories.

> Rohan Ohri, Tata Fellow 2017-19 Turning Point | November 2018

Newer patent applications

6 new applications and one project published on Creative Commons have joined the existing list of patent disclosures at TCTD, IIT Bombay

 Project: Feasibility study of Jaggery making and related products
 Faculty: Prof Sanjay Mahajani, Dept of Chemical Engineering
 Domain: Food & Agriculture
 Patent applied for An apparatus for moulding deformable materials



2. Project: Feasibility study of Jaggery making and related products

Faculty: Prof Sanjay Mahajani, Dept of Chemical Engineering

Domain: Food & Agriculture

Patent applied for An Apparatus for Crystallizing Sucrose Present in Jaggery Syrup



3. Project: Design of puncture proof tires and tubes **Faculty:** Prof Mahesh Tirumkudulu, Dept of
Chemical Engineering **Domain:** Energy
Patent applied for A Thermally Stable Tire Sealant

4. Project: Development of household or community composting system for food waste recycling
Faculty: Prof Anurag Garg, Centre for Environmental Science & Engineering
Domain: Waste Management
Patent applied for Rotary Drum Composting System for Household Wet Biodegradable Waste Stabilization

5. Project: Evaluation of the performance of traditional seed storages and design and development of seed storage system for community level seed banks and marginal farmers
Faculty: Prof Narendra Shah, CTARA; Prof Upendra Bhandarkar, Dept of Mechanical Engineering
Domain: Agriculture & Food
Patent applied for Design
and Development of a decentralized seed storage unit



6. Project: Translation to pre-clinical and clinical trials of low cost bone and near net shape graft for Dental and orthopedic bone reconstruction
Faculty: Prof Jayesh Bellare, Deepak Gupta and Atul Kumar Singh, Dept. of Chemical Engineering
Domain: Healthcare
Patent applied for 3D-Printing of scaffold constructs for patient-specific regenerative medicine and in vitro disease models

7. Project: LETS Learn English Through Stories **Faculty:** Prof. Alka Hingorani, IDC School of Design **Domain:** Education

A series of books that facilitate English language learning (LETS) using stories and illustrations that emphasize self-learning and co-creation, is published under a CC BY- NC-ND license.



Simulating circuits actively

Using active learning through students' participation in a class activity, the project tries an effective approach route over the conventional one, through the SequelApp

Education

n the project, Active Learning in Electronics and Power Electronics with Simulation App, a mobile app has been developed to promote active learning in the areas of electronics and power electronics.

and Prof. S. Doolla, Department of Energy Science and Engineering - are working at an effective route over the conventional one, through the SequelApp. With a few similar apps developed for circuit simulation, what makes this one

special is its focus on classroom teaching.

The SequelApp is based on the circuit simulator SEQUEL developed at IIT Bombay and is meant for engineering and BSc students.

It allows the user to simulate specific pre-loaded circuits and also to change circuit parameters and view their effect on circuit performance. The ability to validate their analytic results using an app makes the learning process exciting and interesting for the students.

Using active learning through students' participation in a class activity, the PIs - Prof. M. B. Patil, Dept. of Electrical Engineering



A diode clamper circuit

In a classroom setting, the teacher first solves a representative problem related to the topic and then



Waveforms

asks the students: How will things change if we change this resistance (for example)? The students work out the solution for the revised scenario and then use SequelApp to verify if their answers are correct. SequelApp is accompanied by several supporting documents, making it a valuable aid for teaching topics in electronics and power electronics. Apart from providing DC voltages and currents, the app also make graphs available. These visual inputs help the student to learn and retain the subject matter easily, making the app all the more effective. SequelApp is freely available to students and teachers across the country.

To increase awareness about this app, the PIs have visited several engineering colleges to conduct teacher training programmes. It is expected that some of the participating teachers would use the app in their own classes and provide valuable feedback, leading to future improvements in the product.

The project has completed its first phase of design and implementation of the basic platform. About 30 circuit examples have been uploaded during this phase to cover different topics. In the second phase of the project, certain improvements in displaying graphs, a facility for teachers other than the investigators to upload their own circuits and teacher training workshops are planned, along with efforts for collaborations.

> Shraddha Vekhande, Tata Fellow 2017-19

Winning accolades

A part of this project team was credited with the best paper award at an International conference and selected amongst the 12 best young researchers in the World Foundry congress

he project Process design for the reclamation of waste sand from small foundries led by Prof. Gajananrao Jadhav, Dept. of Earth Sciences, Prof. Sanjay Mahajani, Professor-in-charge, Tata Centre & Professor, Dept. of Chemical Engineering and Prof. Dasaka Murthy, Dept. of Civil Engineering reported some commendable achievements from its research team.

Best paper award in the International conference

The team's Associate Tata Fellow and PhD student, Mohd Moiz Khan, and Project research associate, Rohit Vishwakarma, won the Best paper award in the XVII International conference on mineral processing and technology (MPT) 2018, held at IIT (ISM) Dhanbad, in October. The duo developed a two-stage attrition device (based on mechanical principle) for reclaiming used green sand, in this Centre-funded project. While this was fabricated in campus, it was shifted later to Kolhapur for field trials to meet the requirement of the foundries. This work was credited with the





Reclaiming waste sand from foundries

best paper award at this conference organised by the Indian Institute of Mineral Engineers (IIME), Dhanbad chapter in association with Department of Fuel and Mineral Engineering, IIT (ISM) Dhanbad.

Selected amongst the 12 best young researchers in the World Foundry congress, Poland



Moiz was also selected amongst the 12 best young researchers in The 73rd World Foundry Congress held at Krakow, Poland, in September. The congress was organised by World Foundry Organisation (WFO) in association with Polish foundry's men association (PFI). Researchers, academician and industrialists from 41 countries participated in the congress. The research article titled Comparative study of waste foundry sand reclamation techniques was presented to show different ways to reclaim any kind of waste foundry sand at an economical rate, where the reclaimed sand met with the requirements of the foundries. This project focusses on the smallscale foundries (typical production capacity around 80-100 TPM).



TCTD **SYMPOSIUM** 2019 Translate for Impact

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IITB Faculty and Tata Fellows

10th & 11th January 2019, **VMCC, IIT Bombay**

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