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TURNING POINT

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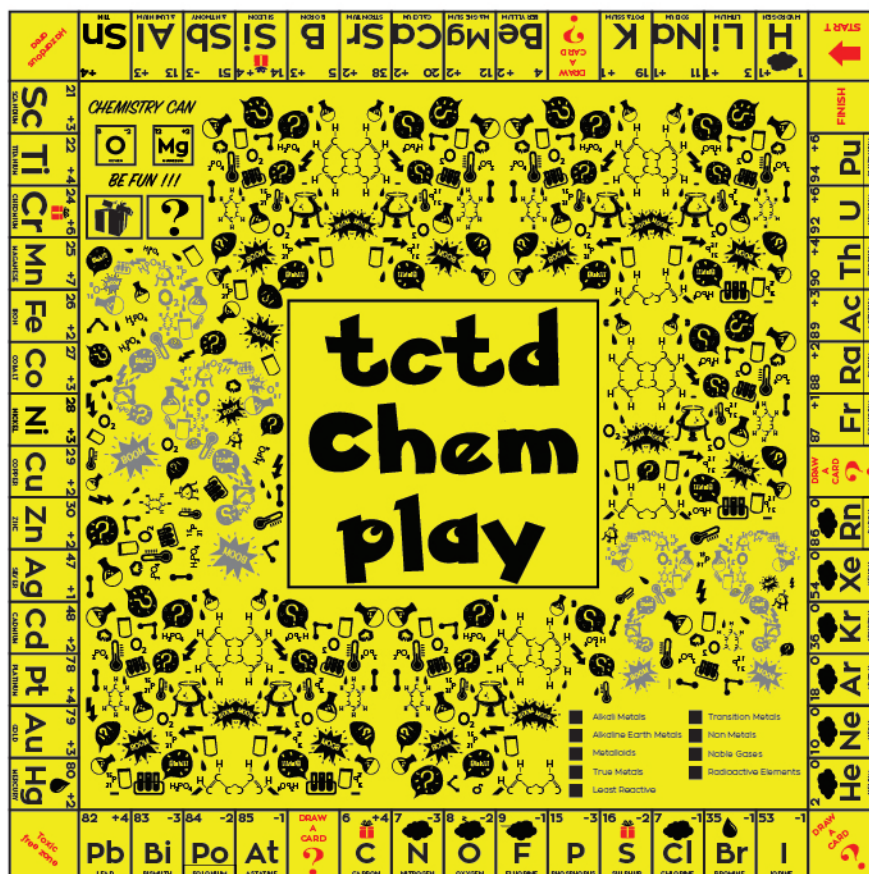
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Social Alpha interacts with TCTD

Social Alpha, an ecosystem architecture created by the Foundation for Innovation and Social Entrepreneurship and an initiative supported by the Tata Trusts, focuses on creating an impact for socially relevant innovations.

In early September, Social Alpha visited TCTD, IIT Bombay, to nurture start-up teams through their lab to market journey. During this visit, Manoj Kumar - Founder Director & CEO, Social Alpha - gave an engaging talk on Social Entrepreneurship and how venture philanthropy, technology innovation and social entrepreneurship went hand in hand. The team from Social Alpha also interacted with a number of the project teams at Tata Centre.



TCTD Chemplay published under CC

EDUCATION

TCTD CHEMPLAY, a kit designed to teach important concepts in Chemistry in a play-way manner, is now published under a CC BY-NC-ND license. Conceptualized by Dr Nitin Bhate and team, and designed and fabricated by the team at Tata Centre for Technology and Design, this set of educational games includes customised card games, models and board games to help students from Class VII and VIII to understand Chemistry in an interactive manner.

The kit attempts to drive home principles about elements, compounds and properties of the periodic table elements. This is an attempt to make the teaching-learning process of chemistry meaningful, well connected and fascinating, and to complement the teaching pedagogies in Chemistry across secondary schools. The card games were tried in a few schools and the feedback obtained from the students and the teachers has been positive. Over the past three months, it has been earning solid ground at students' and teachers' workshops in Mumbai, Pune and Vadodara.

TCTD recognizes the contribution of Dr. Nitin Bhate and team, and their initiative towards simplifying the teaching-learning process.

- Gayathri Thakoor
Project Manager

Optimizing on Waste Sand

Use of reclaimed sand within the foundry would improve the economics and efficiency of the process, and reduce the environmental impact.

WASTE MANAGEMENT



In conversation with
Prof Gajananrao Jadhav,
Department of Earth
Sciences

Q.1. What was the motivation behind this project?

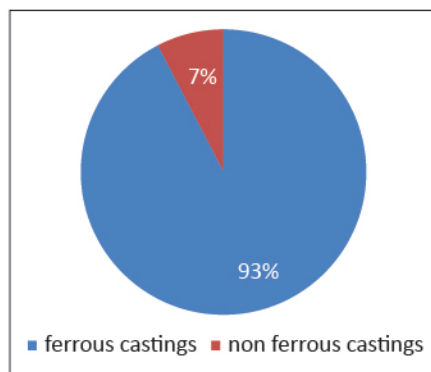
A. Disposal of Waste Foundry Sand (WFS) remains one of the major challenges faced by the foundry industry today. India's annual casting production is around 9.3 million tons which is the third highest in the world. WFS contains toxic heavy metals and particulate matter which makes dumping of waste sand an environmental and health hazard. More than 80% of Indian foundries (i.e. more than 3600) are medium and small scale foundries which cannot afford costs associated with the dumping and treatment of waste foundry sand. Stringent regulations from the Pollution Control Board and the government regarding waste disposal and sand mining have brought many of these small scale foundries on the verge of closure. A lot of research has been done to use WFS in other industries like construction and ceramics, but not much has been done to reclaim and use the waste sand within the foundry itself. Some large scale solutions are available in the market but none of these are suitable or economical for small and medium scale foundries, which generally require a reclamation capacity as low as 100 kg/hour.



We, in collaboration with the Government Polytechnic, Kolhapur, conducted a field survey of more than 130 foundries, to study the need of reclamation of sand.

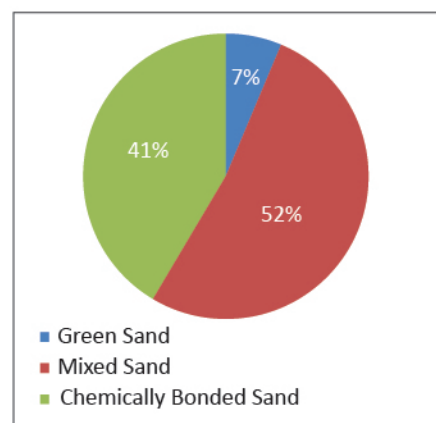
1. Total castings production (tons per month)

Ferrous castings: 15071 TPM
Non-Ferrous: 1207 TPM



2. Dumped sand

Type of Sand	No. of Foundries	Amount (TPM)
Green sand only	19	282.6
Chemically bonded only	20	1810
Green + Chem. bonded	70	2275.95
Total	109	4368.55



Amount of dumped sand per month in Kolhapur alone is around 4,500 tonnes. The total daily sand dumping across India is estimated to around 15,000 tonnes per day which is alarming.

Q.2. What is the novelty of this approach towards waste management?

A. We are developing the process with minimal use of thermal energy, better heat integration between the hot flue gases and the cold feed of WFS. In another approach using mechanical attrition principles, we have altogether eliminated the use of heat treatment. We have achieved satisfactory results but still a lot needs to be done regarding the optimization of operating variables.

We are also trying to develop a theoretical model that would predict



the amount of attrition force required to reclaim the sand. This model, once developed, will ensure the judicious use of energy.

Q.3. What is the current status of your project?

A. We have developed 2 prototypes, one being a vertical fluidized bed and other being a horizontal attrition bed. We have successfully reduced the clay content from a whopping 12% to 4% by using a vertical bed. This provides better heat integration between hot flue gases and cold feed of waste sand, as evident from Figure 1.

The horizontal bed does not require any heat treatment and is purely based on the principles of mechanical attrition (Figure 2). Using the horizontal bed, we have brought down the clay content to less than 3% but at the expense of higher operating costs. However, if we mix the reclaimed product with fresh sand, the whole process can be made economically feasible. This is evident from Table 1.

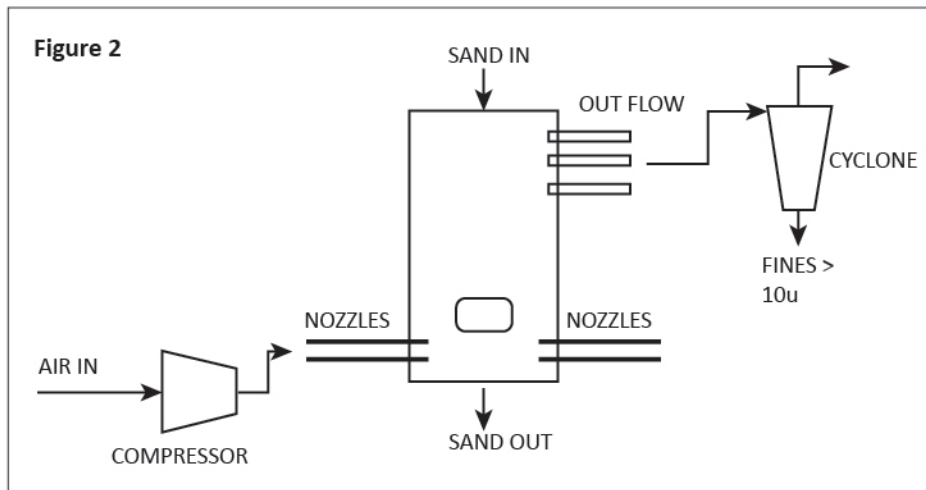
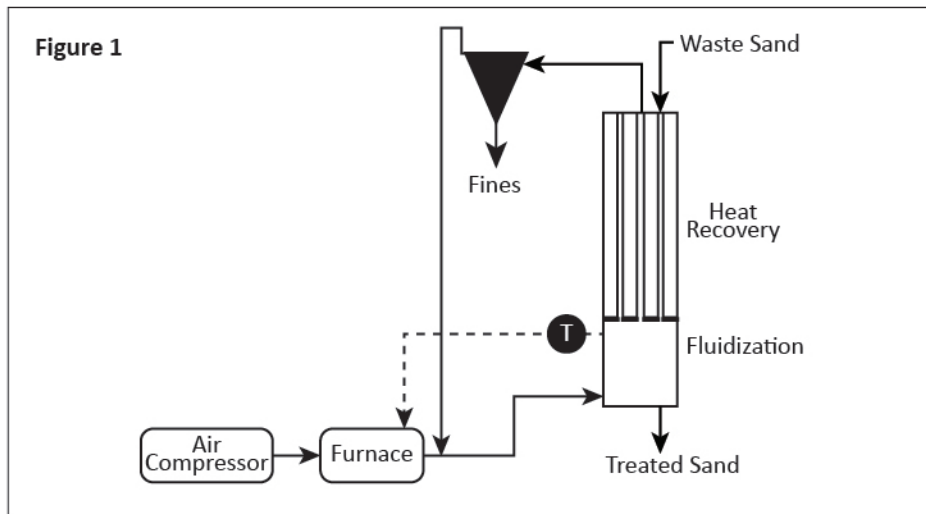


Table 1

10 Kg sand foundry sand with 1.5% clay content considering 10% product loss						
Target						
Operating Pressure (bar)	Time (min)	Total Clay (%)	Fresh sand addition (Kg)	Cost before mixing (Rs)	Cost after mixing (Rs)	Savings (%)
1	30	5.4	7.2	25	20.3	18.8
1.5	30	4.8	6.9	25	20.9	16.4
2	30	4	6.2	25	22.3	10.8
2.5	30	3	5	25	24.5	2

Q.4. What challenges are you facing and how would you deal with that in future?

A. Although it may seem like we have made the process economically feasible by reclaiming around 50% of the waste sand, we still need to dump around 50% of the sand. Our constant efforts are in the direction to reclaim as high as 80% of waste sand. We are working towards the optimization of operating conditions like nozzle type, nozzle diameter, operating pressure, effect of temperature etc. Development of a theoretical model also remains one of the major challenges as such a type of research has not been conducted previously. We are taking the help of solid – fluid CFD analysis to understand the process better.

- Manvendra Singh, Tata Fellow(2015)

Survey to study impact of the IBT course

EDUCATION

The Education domain at TCTD and Prashant Gavande at JRD TATA School & Edulab, Akola, have entered a Work Agreement in early September, 2016. According to this agreement, JRD Tata School & Edulab will conduct a survey to study and document the current teaching methods and practices in various schools, and devising pedagogies that do justice to the IBT course. The IBT course is a subject in schools following the SSC Board of curriculum, since 1987. This course deals with developing hands-on training in the areas of engineering, energy, environment, agriculture and food processing. The planned survey aims to evaluate the impact of the course on the students and society. The results of the study will help TCTD design an advanced course with digital content for the students, in the near future.

Bringing Bhil art to light

EDUCATION

The team's movie, 'Hum Chitra Banate Hain' has won the grand prize — the 'Light of Asia' - at the Indie Anifest-2016, Seoul, Korea and the Jury's Special Mention Award at the SiGNS Festival, Ernakulam, Kerala

The goal for the project "Telling it Together" has been to bring Bhil Art of Madhya Pradesh to a global platform that would offer visibility and income enhancement. It involved interacting with the Bhil artists at the Manav Sangrahalaya in Bhopal. Thirty years ago, J. Swaminathan had encouraged the Bhils to take up painting commercially, on canvas and paper. But their stories were still not being shared.

This project team comprising Prof Nina Sabnani from IDC, Shyam Sundar Chatterjee, Piyush Verma, Suvodeep Saha, Anjana Mahakshmi, Rishabh Pandey, Kirti Rathod and Anita Raghav, went many steps further. The artists shared their stories and their art, inviting the project team generously, to share in their rituals and concerns. The team back at TCTD was intrigued— could this storytelling be merged with new media to provide new, fluid, organic ways for their art to flourish?



It was decided to use animated films as the perfect platform for their art, music and songs to merge together. But, the stories needed to be told with the craftsmen, not for them. Sher Singh Bhil, a local artist, worked with professional scriptwriters to recount an age-old story of how the Bhils had started to paint. Sher Singh painted key images for the film, which were then animated by trained animators.

The team's movie, 'Hum Chitra Banate Hain' — has won much critical acclaim, ever since. This year, it has been selected for many other film festivals: 4th Festival Cinema Libre, Hamburg; Cine Club Mal de Ojo, Ecuador; SiGNS Festival, Kerala; and the Edinburgh Short Film Festival, UK; and the Smile International Film Festival for Children and Youth(SIFFCY), New Delhi.





Working with Sher Singh, the next co-creation was the book — ‘A Bhil Story’. This was published by Tulika, and soon translated into 9 languages. Even as royalties from the book have started to come in, Sher Singh has been commissioned to make illustrations for the Aga Khan Foundation’s Seminar. His artwork can now be found in the publication, ‘Design to Sustain’. He was commissioned to create the artwork for the IAWRT for its International Seminar—The Biennale Conference, 2015.

From the previous experiences that the team had with the craft communities, economic benefits enthused the artists and was essential for them to concentrate and flourish their art. So options to promote all the artists were being explored. The bhilart.com website was born. Fourteen artists were showcased here. The website garnered attention from NDTV, who interviewed the team and the artists for their show, ‘Art Matters’. Currently, some networking solutions are being worked upon with partners such as HABBA to directly sell the art online.

The team here is still exploring more media to promote Bhil art. Tapan Kumar, Tata Fellow, has conceptualized a wonderful game based on a traditional Bhil festival, told through their art, in the very latest media- a gaming app for the mobile. The board games - ‘Aage Peeche’ and ‘Smaran’ are ready to be marketed. A new range of merchandise is being designed and how the artists will get royalties from this for their artwork, is being worked upon.

- Prof Nina Sabnani, IDC



Training and Tele-Consulting Pathologists

There is a need for a platform that can help facilitate the training of pathologists and serve as a means of obtaining a second opinion

HEALTHCARE

In the current system of pathology, a number of glass slides containing pathological samples get transferred between laboratories for a second opinion. This physical transport of slides adds to the time it takes for the pathological reports and delivery of care to reach the patients. Further, the number of pathologists in India is too small to cope with the increasing demand. The training of pathologists is currently done in the classroom style, coupled with lab sessions where the trainer can only accommodate a batch of 6 at a time, due to hardware limitations.

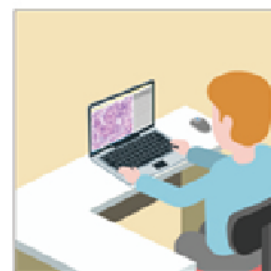
In search of a solution, a project team headed by Prof Santosh Noronha, Department of Chemical Engineering, is developing an ecosystem for training pathologists in remote locations and for facilitating communication between rural and urban laboratories. This web-based application lets a senior pathologist hold a training session without gathering all students in one place. Sample cases used in training sessions are usually in the form of slides scanned by a senior pathologist. He can now upload multiple sample cases and assignments online onto a web application, letting the students read and solve the questionnaire, at their convenience of space and time. The unique feature of being able to zoom in and out, and annotate the image files at maximum resolution, gives a better learning experience for the student as compared to the traditional multi-eyepiece microscope training sessions.

Platform for Collaboration amongst Pathologists

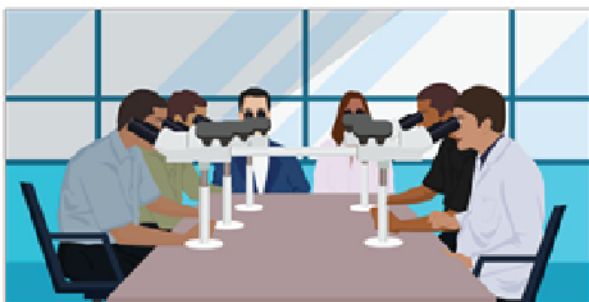
- Pathologist seeks remote assistance for a unique case by sharing the high resolution image of sample with an expert



TELE - CONSULTING



- Training session for pathologists can be more comprehensive and interactive



Current pathology training sessions



Pathology training sessions with digital aid



Further the web-based application can be used to share and discuss complicated cases between different pathologists for second opinion. Currently, slides are being transferred physically, adding time and causing some level of physical damage of the sample. Henceforth, a scanned image of the sample can be uploaded on the server using the web application. This will enable the pathologist to share it with multiple pathologists at the same time, have more comprehensive discussion on the case in hand and ensure faster diagnosis for patient.

- Hina Shah, Project Staff

Brick-making to get more efficient and ergonomic

New ergonomic prototypes have been made and tested in the field

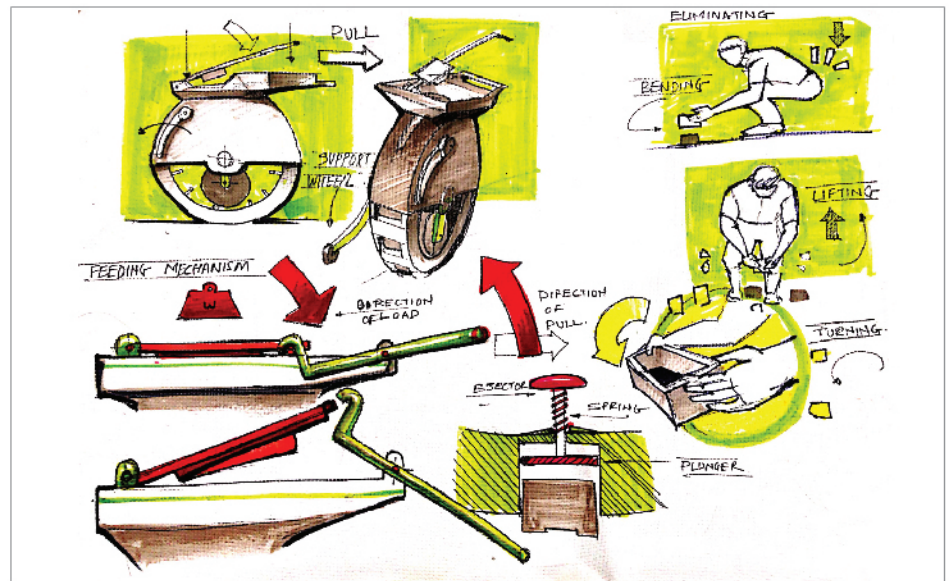
HEALTHCARE

Brick manufacturing in India is a traditional and unorganized industry. Of late, due to rapid urbanization, high rise metropolises and a spurt in real estate development, brick making has become one of the most flourishing and booming industries. There are more than 22,000 brick kilns in India engaging more than 3 million (30 lakhs) workers. The brick kiln industry is an unorganized sector in India where most of the jobs are performed manually. The process of brick making involves six major activities like mud preparation, moulding, carrying raw bricks to brick kilns, arranging raw bricks inside kilns for firing, firing of raw bricks and carrying out fired red bricks from brick kilns.



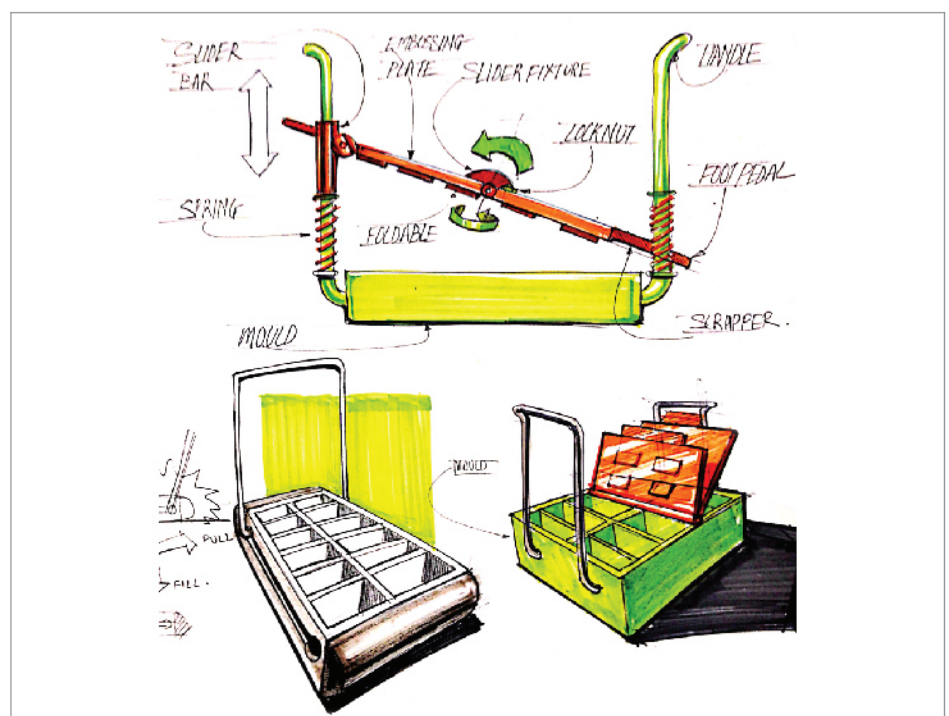
While performing the job, the workers suffer biomechanically, physiologically and psychophysically. The workers are also exposed to a high concentration of dust and temperature. The sustained awkward squatting posture adopted by the workers for more than 6 to 8 hours imposes severe musculoskeletal stress and is thereby likely to cause permanent musculoskeletal injury to the workers. The human body is not suited to this type of unnatural stress. As per our previous study, the average age of the brick kiln workers is 28 years and people beyond 40 years of age are seldom visible in these operations.

A project team headed by Prof. Gaur G. Ray, IDC, is designing a new brick making process to improvise on occupational health, safety and the removal of drudgery by the ergo-design approach, in the traditional brick making industry.



So far, different types of moulds and a workstation concept have been designed to provide better working conditions and the ability to mould bricks in the standing position rather than sitting in a squatting position, which is not advisable. However, the team is yet to mechanize the process and make it more ergonomic and efficient.

The design and development of new methods, tools and instruments has been initiated which can help reduce the rigorous bending and lifting action of the workers while performing tasks such as moulding and transfer of bricks for drying and stacking. An attempt is being made to reduce the number of actions performed by the workers. Instead of moulding the bricks at one place and then transferring it for drying, the bricks could be moulded in the drying area. This will reduce the transfer element of the bricks, hence increasing the efficiency of the process.

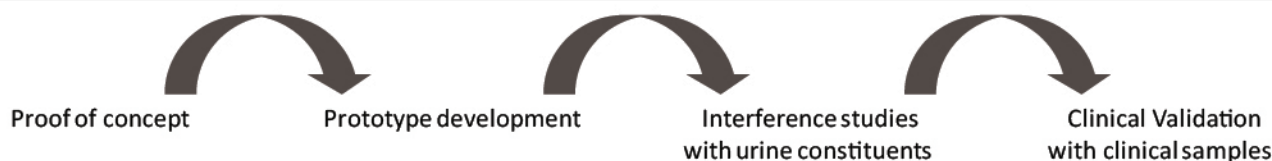


- Quashif Qureshi, Tata Fellow(2015)

Quick detection and diagnosis

A point-of-care test works mainly on six principles: Affordable, Sensitive with very few false negatives, Specific with very few false positives, User-friendly, Rapid & Robust and Delivered to the end-user.

HEALTHCARE



Urinary tract infection (UTI) is a known clinical problem around the world, affecting a large number of people. It has been estimated in a 2015 report that 150 million people got affected with UTI annually worldwide, which had cost around \$6 billion.

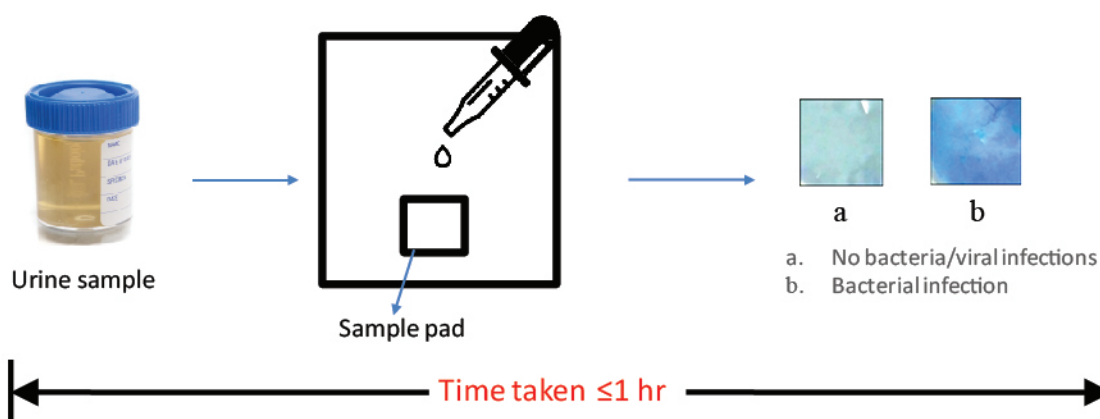
UTI is defined as significant bacteriuria with the presence of suggestive clinical symptoms. It affects mainly the kidneys, ureters, bladder and urethra. If the condition is ignored in the early stages, it can lead to a serious case of Pyelonephritis, Cystitis and Urethritis. These infections are most commonly experienced by women and elderly people. Diagnosis is done based on symptoms as the conventional method includes isolation of bacteria, culture and microscopy and staining methods, which take several days for the confirmation of the presence of a particular microorganism. Symptomatic treatment includes administration of broad-spectrum antibiotics by the physicians. This leads to the emergence of drug-resistant microorganisms, which in turn leads to an increase in the cost of therapy due to the higher price of the second line of therapy.

The limitations of the traditional method of detection of UTIs which are long detection time, high cost, requirement of sophisticated laboratory setup and trained personnel has led a

project team headed by Prof Rinti Banerjee to the need for a point-of-care test for UTI detection. Not only could the above shortcomings be looked into, the difficulty of carrying out the diagnosis in resource-constrained settings and the frequent visits required by the patients could also be eliminated by such a test.

The time of detection of UTIs by the traditional methods is normally 2-3 days with two hospital visits by the patients. The primary objective has been to develop a point of care detection device which can reduce the detection time, while maintaining the sensitivity in an instrument-free device. This can be used by personnel with minimal training and will thus be feasible for use in the rural and semi-urban areas. The technology being used to optimize the device consists of the use of smart materials to enhance bacterial adhesion, concentration and identification. All materials used are low-cost and are being developed as a plastic/paper device. The proof of concept of the tests are being optimized and the team is working on the sensitivity of the rest. This will be followed by clinical validation by different clinical samples.

- Ratika Agarwal, Tata Fellow(2015)



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Tata Centre Office, 2nd Floor, L2, Lecture Hall Complex(LHC),
Opp.KReSIT, IIT Bombay, Powai, Mumbai-400 076, India

www.tatacentre.iitb.ac.in