



TCE**xpression**

TATA CONSULTING ENGINEERS LIMITED

Volume 54, Issue 2 - December 2016



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Editor's Note

Year 2016 was indeed a year of changes and TCEXpression has also been spruced up. Our readers are more digitally inclined and keeping this in mind, we have gone 100% digital. This issue of TCEXpression is available in a flipbook format that supports multimedia. Enjoy this dynamic edition of TCEXpression with videos on select features.

Feel free to write-in with your feedback to corpaffairs@tce.co.in

Mallika Sriraman

TCEXpression

Volume 54, Issue 2 - December 2016

Reflections

In the Pursuit of Excellence.

This is an era characterized by 'all things digital'. Over the years Tata Consulting Engineers has steadily transitioned to digital delivery of solutions. We have now transitioned to 100% digital delivery systems. Things do not stop here though. We have been listening hard to our customers' requirements and are adapting to changing needs. Year 2016 saw the ushering in of Industry 4.0 readiness for TCE. We are still on the journey and our young engineers are part of this exciting trip. The cover feature, WoW Factor – The Pursuit of Excellence is the story of our transformation process Rhythm 2.0, ideated by TCE teams for process re-thinking. Going forward, this will be a continuous exercise as our Way of Working (WOW) will define how we deliver services to our clients and delight them. The involvement and passion of our teams is unmatched in the history of TCE. With such support, I am extremely confident that TCE is well on its path to achieving its mission and goals.

We pride ourselves in the value engineering services we offer to our clients. This is evident in the work we are doing towards responsible and sustainable consulting in some landmark projects especially in the area of waste to energy. This edition of Technovation details the waste management initiatives globally and TCE's role in providing responsible consultation to such projects that help raise the bar on Indian waste management standards to international levels.

We have upheld the ethos and values that we stand for and we continue on our path to business excellence, sustainable practices and community engagement. Through the course of our business solutions, community and stakeholder engagements, we are aligned to at least seven of the Sustainable Development Goals. This is what continues to drive us and challenge us.

Enjoy the completely digital and multimedia enriched version of this edition of TCExpression. I take this opportunity to wish you all the best for the festive season and let us welcome a sustainable, new 2017!

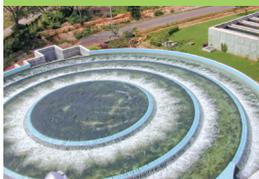
Sincerely yours,

Amit Sharma
Managing Director

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Technovation



TCEndeavour



Smart Cities



Customer Connect



WOW Factor-The Pursuit of Excellence



TCE Day



WOW!



FACTOR

and the Pursuit of **Excellence**



The world is agog with design thinking and rightfully so. Enterprises today are in swift motion with technologies getting redundant in the blink of an eye and new upgrades in place continuously. Nimble feet are gaining ground and five-year strategy roadmaps are fast getting shelved as market demands keep changing. Convergence of products, services and engagement of people seamlessly across geographies, across devices, is a reality today. Suddenly, man, machine, processes and systems are conversing. This is an experiential world we live in and humaneness is the core around which strategy and design are centred. Customer experience, brand experience, product experience, user experience... Enhancing these experiences is the breaking ground that enterprises adopt as differentiators. This is the world where product quality, technology upgrades are given and taken for granted – there is no room for anything less! Big data analytics and algorithms enable a human angle to insights drawing up a profile of the human experiences right at the product or service touch-points. The complexities have increased in the business world and there is now a tremendous need to shift to the way of collaborative thinking in every aspect of business.



In this scenario, several organisations are adopting design thinking principles to arrive at unique solutions through unique interventions, with the prime focus on collaborative ideation. The current trends indicate creative collaboration and ideation to arrive at out-of-the-box solutions for creating strategy, problem solving, product management, innovation etc. Design thinking is indeed a corporate culture now.

What is design thinking?

The typical mindset is to associate design to product design. But design may mean different things to different people. Ideas of large teams are converged and through a continuous process of iteration and prototyping, a product or service is born and improved upon to create unsurpassed user experiences. Here, it is not about increasing sales by designing a breakthrough product, but creating a user experience and engaging continuously to get the right product. The definition of the 'right' product keeps changing based on the user experience. Iteration and prototyping is the key and the 'experience' is the core. Mauro Porcini PepsiCo's Chief Design Officer said, "It's a

So is design thinking product innovation? Is it process innovation? Is design thinking a culture, a way of life to meet organizational goals? Is design thinking a strategy? It is all of these and an innovative way to engage while considering all complexities present.

strategic function that focusses on what people want and need and dream of, then crafts experiences across the full brand ecosystem that are meaningful and relevant for customers." (HBR, Aug 2015). Design thinking is a process of innovation, by innovation.

So is design thinking product innovation? Is it process innovation? Is design thinking a culture, a way of life to meet organizational goals? Is design thinking a strategy? It is all of these and an innovative way to engage while considering all complexities present. Design thinking is a process of collective ideation and experimenting the way to success. It is a continuous process of improvement. While the business

goals remain, the way these goals are achieved are transformed dramatically with design thinking. This is a marked shift from product or service design to designing for the entire organization. Today organizations are increasingly applying design thinking principles for innovative process, building a culture of innovation and for collaborative problem solving.

The Wow Factor in the Pursuit of Design Thinking

Design thinking is gaining in popularity among large organizations as well as nimble start-ups. The culture of design seemingly a start-up culture, has turned out to be a success for large organizations - despite the fact that one cannot look around for quantitative ROI with design thinking. A company can cut costs, optimize productions and improve the top-line and bottom line with the same set of products or services. However, when the same company relooks the way its products help create a unique customer experience and aligns its organization-wide processes to this experience, there surely is an impact on the top line and bottom line over a period. Design helps to relook and understand the way an organisation

interacts with the customer and enhance his experience. Optimisation and enhancements only go so far. A radical re-look at the product or service through design thinking results in innovation. For instance, no customer insight told Samsung that customers were looking for a smart phone. Design thinking radically changed the way phones are being used and the large phablets and tablets came into being.

In today's world, companies are dealing with extraordinary levels of complexities and design thinking helps look at the problem in totality. When customer or market needs change, and changes happen very quickly, a new(user) customer experience has to be created in tandem. More importantly, in a technology-enabled, convergent world there is a call for a global focus that makes it important to revisit existing processes and align to new cultural mindset.

Today organizations are increasingly applying design thinking principles for innovative process, building a culture of innovation and for collaborative problem solving.



Play Video



TCE's WOW! Factor

TCE's young engineers are an extremely busy lot these days. Many young engineers, fresh out of TCE's training workshops have joined the veteran teams that are engaged in the Way of Working workshop. WoW or the Way of Working is a collective and iterative engagement where the entire service cycle is being mapped for further deliberations and ideations.

Where did all this begin?

The rationale behind WoW at TCE is driven by customer and market demands and the need to stay competitive in today's changing circumstances. TCE's turning point came when it turned 50 years of age. Where do we go from - was the collective question. Markets have changed, customer needs have changed and the way engineering services are being delivered has to change, and change fast. In 2012, the company set in motion, Rhythm 1.0, a complete business re-engineering process, marked by process automation, IT-systems and digital delivery of services. Presently, almost 95% of the services delivered by TCE are on digital platforms.



Processes established over 54 years require a rethink given the technology tools available in present times. The complexity of our business and our existing delivery mechanisms are putting pressure on us to stay competitive. The cyclical nature of business dependent on capital expenditure by large organisations or government bodies, makes the company vulnerable to market dynamics. This had to be countered with the introduction of innovative service streams. We also realized, things are changing dramatically at the customer's end. Customers are in a hurry to book profits. The solution calls for out-of-



WOW (Way of Working) is a collective and iterative engagement where the entire service cycle is being mapped for further deliberations and improvements.

Branded as 'Way of Working (WoW)', cross sections of employees met and deliberated, bringing to the table all the possibilities. From this emerged the key focus areas. Employees and the leadership came together to 'Post-it' ideas and issues on a large WoW wall.

WoW Transformation

The Problem Phase mapped the end-to-end operational processes in all its dimension on the WoW wall. Varied groups comprising employees across hierarchies brainstormed and threw in ideas, problems, bottlenecks, concerns and impediments to the larger corporate goal. The process of problem identification with all its complexities was mapped on the AS-IT-IS wall. This exercise was replicated across locations.

The Solution's Phase

The problem once identified, the next step is to move to the solution designing phase. This is the game-changing phase when teams sound out their ideas on the TO-BE WoW Wall. Across TCE's locations, teams brainstorm to arrive at a new Way of Working. Adopting principles of design thinking, the exercise is expected to create a workable format which will be implemented. Based on the initial run, feedback will be collected and new groups of teams will ideate and iterate to arrive at a more improvised solution. Thus the process is a continuous one with testing and iterations that will ultimately enhance user experience.

WoW & Where it will lead to

The WoW transformation path is being worked upon for TCE to re-invent itself given the changing dynamics in the engineering services industry. This iterative exercise aligns disparate teams that are multi-disciplinary in nature to work towards defined goals. The Way of Working will also set in motion innovative new process that addresses the key issues for customers and the optimal way for TCE to stay competitive.

With TCE's goal to establish itself as a top-notch international engineering consultant. This transformation is especially relevant to TCE and it's talented engineers because in these times, the role on engineer has changed; the customer's requirements of services from an engineer has changed; automation and artificial intelligence are slowly creeping into everyday life. The engineer of tomorrow is one who changes and puts his skills to new uses with new processes in the changing order. TCE, is focussed on creating a better tomorrow for its customers and the task on hand is to create a better TCE today!

WoW sets the context for:



WoW Advocates



"We want to bring more tools that are relevant in today's markets as an ambassador, I would like to bring in more people into this process".

Garima Bansal,
Infrastructure Business Unit, Mumbai



"This is a transition from our conventional engineering. Implementing this changes the Way of Working".

Atinendu Deb Roy,
Steel Metal & Mining, Jamshedpur



"The medium of digital engineering brings us an added advantage of producing error free deliveries that can be profitable to ourselves as well as our customers. We being young GETs, are grateful to the company for giving us such an exposure".

Mazhar Khan
Senior Engineer, Civil



"As a GET it gives me a great opportunity to learn and contribute to the change management process that the company is taking up."

Maneesh Avadhani
Infrastructure Business Unit, Mumbai



"It's the most open platform that I have come across. The objective - a standardised uniform process for all of TCE"

Sulipi Saha
Infrastructure Business Unit, Mumbai



"Way of Working workshop - This small step is a big leap for the future of our company".

Prashant Patil
Nuclear Power BU, Mumbai



"This workshop will help me to wow my customers internally and wow the clients externally, ultimately".

Divya Sonali Minz
HR, Bangalore



"The Way of Working workshop is giving me a chance to know about adhering to the project schedule, the expectation of the client! expectation of the vendor".

Pulkit Singh
Engineer, Process



"Great transformation process of TCE and this is definitely going to take TCE to a great height".

Prashant Wani
Senior Manager, Chemical



"It is a stable structure which will economically, environmentally and functionally satisfy all customers' needs."

Atul Sandhan,
Nuclear Business Unit, Mumbai



"It will be helpful to both clients and vendors to deliver and place their expectations according to newly formed work flow."

Prashant Patil
Engineer, Instrumentation and Control



"We will percolate this to the bottom-most level and be champions of this WoW process."

R. V. Sheshagiri
Power Business Unit, Bangalore

COLLABORATIVE CONSENSUS WITH Design Thinking



In the world of plant engineering, master plan is king and client consensus on the plan is the gateway to project progress. It is at this stage that bottlenecks due to review and iterations impact the cost and schedules. When a client assigned TCE with a project to have all its entities under one umbrella on 82 acres of land, the complexities and challenges were truly out-of-the-box. The proposal meant exclusive facilities, uniquely designed for each company and the wish list from all the business units of the client was indeed mind-boggling. The challenge for TCE as consultants for the project, from concept to commissioning was equally out-of-the-box. First was the unique requirement for individual entities of the client. Second was the terrain of the plot earmarked for the project. TCE had the challenge of planning facilities on undulated terrain with ground rise ranging from 15m to 39 m. The underlying principles for the entire facility were safety, sustainability and scalability within allotted budgets. Arriving at a consensus on the optimum solution required a revolutionary approach and the leadership at the client-side and TCE were quick to acknowledge this.

Design thinking as a way of viewing the problem in its entire dimension and arriving at the optimal solution was the way forward. TCE's technology interventions with terrain mapping applications, walkthroughs and construction simulations served as

the tools for enabling the process. Through the use of technology, TCE presented the feasibility of each of the wish list presented by the business entities. Design thinking workshop I dealt with the master plan requirements. Teams from both the sides brainstormed

"Masterplanning is a very subjective exercise and there is the danger of the end result turning vague. Thus to eliminate subjectivity, we prepared a series of iterations catering to different priorities from TACO BUs. The approach helped in building a consensus amongst the participants in selecting the most appropriate option during the workshop."

Jitesh Brahmshatriya,
Head-Master Planning

the various options and possibilities. Using a suite of engineering tools TCE came up with options considering the possibilities within the given constraints. The result of the first workshop was the evolution some master plan options. Workshop II convened again to deliberate on the shortlisted master plans. The teams from TCE & the client went back to the war-room to brainstorm and iterate the plans for an optimal solution. For the first time in the 54-year history of TCE and for the client as well, a fruitful client-consultant engagement took place to put the best brains to work for collaboration and consensus. The iterative workshop saw TCE present 37 iterations in a single instance to visually indicate to the client the various possible scenarios. Brainstorming on the digital scenarios, the optimal choices were made. With the participation of the senior management across various functions from both sides, the risk elements, the constructability challenges, the non-negotiable requirements, etc were thoroughly examined. Two critical out-of-the-box ideas were mooted and deliberated upon. Based on evaluations, course corrections were adopted and

This project, in the real sense, has revealed team work. For increasing usable ground area even in such different levels of terrain, 4-D construction simulations were developed. This project is unique as it serves as learning for developing project management strategies and use of advance technology.

Radheya B Joshi
Construction Manager - PMC

the blue print was finalised in just two days.

A process that would have taken months with time consuming iterations was managed by adopting the design thinking process for viewing the situation in all its complexity and collectively arriving at a consensus. A collaborative effort to problem solving provided the win-win option for both client and consultant.

The facility is designed to be a state-of-the-art facility benchmarked to the highest standards in design, safety and sustainability. Great things are possible when diverse minds funnel their ideas towards one goal. Architects, civil, mechanical, electrical engineers, digital engineering experts, people across hierarchies collaborated to plan the client's vision. This exercise stands out as a classic example of design thinking and collaboration.

"The project teams showed excellent co-ordination for exchange of ideas and as a participant I received first-hand experience on strategy and team work."

Abhijeet Vaidya,
Project Manager, TCE





Light up with

TRASH

Trash is generated, not in heaps but in tonnes, to use a figurative way of speak. With increasing population and changing lifestyles, municipal solid waste or MSW, is increasing phenomenally. In poorer countries, the most common way seems to burn it. But the gases released during burning are pollutants. If waste is not managed efficiently, we humans are likely to be smothered in the waste we generate. A World Bank report estimates that by 2025 there will be 1.4 billion more people living in cities worldwide, with each person producing an average of 1.42 kg of MSW per day.

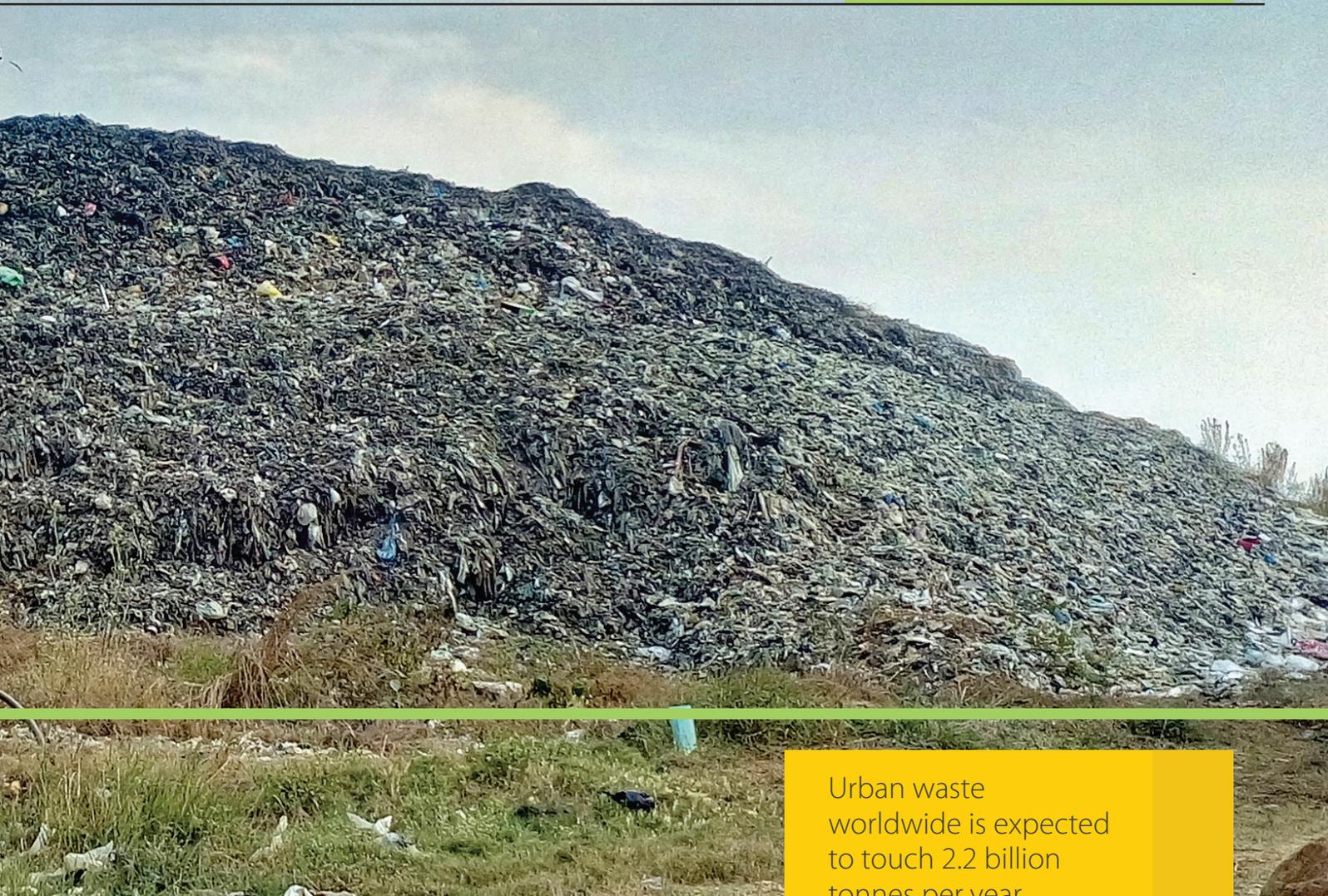
All the waste that is thrown, lands somewhere – as pollutants in the air affecting the air we breathe, plastic waste choking marine life in the oceans and polluting rivers. Several countries in the world do not have a structured waste collection and treatment process. They are simply dumped in non-scientific landfills or in illegal dumping grounds. Some cities

dump their waste in water bodies. Since, scientific processing/treatment, methods call for requirement of land, for many local bodies, burning the trash comes as an easy option. Combustion reduces the volume of material by about 90 percent and its weight by 75 percent but also increases the hazards of air pollution.

There is indeed a strong case for managing waste in a technically sound and economically rational process. Waste management is a technology process that has a cost-benefit equation. In poorer countries, rag picking personnel make a living out of sorting MSW. But smarter MSW management techniques can throw up alternative opportunities.

MSW to MWe

Several high income countries have put effective waste management practices in place. According to a World Bank Report, urban waste worldwide is expected to touch 2.2 billion tonnes per year. This is tonnes of waste, literally wasted. Waste to energy or WTE, is a workable solution that has a long term perspective.



Urban waste worldwide is expected to touch 2.2 billion tonnes per year.

The science of WTE

Several technology solutions are available but the right technology that will work best starts right from the source – TRASH! MSW is the trash from households, shops and establishments, commercial outlets etc. The composition and characteristics (moisture content and calorific value) determines the WTE technology or any waste treatment process. Waste can be organic (food waste, etc.) and waste that can be burned (paper, plastic, leather, textile, etc.); waste that cannot be burned such as inerts, glass, metals, etc. Based on these parameters, a combination of technologies can be adopted for WTE.

WTE – Waste to Energy

Waste to energy is the technology-based processing of waste for generating energy in the form of electricity/heat/bio-fuel. The full suite of WTE technologies include thermal processes like mass burn incineration and gasification & non-thermal processes like anaerobic digestion and landfill-gas

recovery. The technologies used for WTE are:

- **Thermal Technologies** – Direct Combustion (Mass Burn and RDF-MSW-segregated or otherwise is burned and the heat generated is used to produce) steam or electricity.
- **Pyrolysis** – This is a form of gasification that occurs at relatively low temperatures of 300-600 degrees centigrade in the absence of oxygen.
- **Conventional Gasification** – This is a process that converts any material containing carbon such as coal, biomass or MSW into syngas. In the controlled presence of oxygen, temperatures of 480-1650 degrees centigrade break the feedstock molecules apart and recombine them into syngas.
- **Plasma Arc Gasification** – This method uses a plasma torch to provide supplemental heat for the gasification process wherein temperatures can reach 2760 - 11,000 degrees centigrade.



Managing Mumbai's humongous waste

A case in point is the ambitious WTE project of Mumbai city's municipal corporation that aims to address several complex issues in managing tonnes of garbage within the constraints of non-availability of land for landfills and the rising concerns of pollution in the island state. Mumbai city alone generates more than 8000 tonnes of waste per day and the Deonar dumping grounds receive approximately 3000 tonnes. A scientific process to stem the rot was called for on an SOS basis.

The Municipal Corporation of Greater Mumbai (MCGM) appointed Tata Consulting Engineers (TCE) as consultants for this ambitious project. In Mumbai's Deonar waste management project, the challenge was the un-segregated nature of trash, the acute shortage of land for the processing plant and the scale of operations. MCGM is considering a capacity of about 3000 tonnes per day which is compliant with the current SWM (Solid Waste Management) 2016 and all other applicable rules. The WTE project is a fresh start to manage the fresh waste generated each day at the Deonar facility.



WASTE TO NOTHING OR WASTE TO ENERGY

Given the conditions and challenges, the proposed solution is for the MCGM project in Mumbai based on open technologies which could be Pyrolysis, Gasification, Incineration (with or without pre-processing) for the entire waste.

TCE as a consultant is working with MCGM on the WTE project in the Deonar facility and the task involves Detailed Project Report (DPR), PREPARING BID documents and bid process management to ensure the project is executed within the given technological parameters and pollution control norms.

With 3000 tonnes being managed per day at the Deonar facility, this is the largest project in the country with this capacity in a single facility. The scale of this equals the facilities in leading developed nations in WTE.

The proposed plant is expected to produce 25-30 MW power while treating 3000 MT MSW per day.

WTE plants are aimed at addressing the catastrophes related to non-scientific dumping. The economic viability hinges more on using the revenue streams from the project to reduce the cost of scientific waste management. The revenue streams from WTE projects arise mostly from sale of electricity/fuel generated from the waste management process. In essence, this is a waste management process with power as a by-product. Added to this is the possibilities of benefits from the recycling/re-use ecosystem. In the Indian scenario rag pickers make a living out of the recyclable waste. However, in other developed nations, the recycling component is a revenue generating component.

There is also a cost element in overhaul and maintenance of the plant with a life span of 20 years.

WTE success factors

WTE projects can be truly successful and sustainable— both environmentally and economically, provided the right technology is adapted. Every city has its own socio-cultural lifestyles and the waste generated reflects the city's psyche. Rural waste is different from the urban waste. The availability of land and the density of the population in a given site matters too. The type of waste and the waste management technique used go hand in hand. For instance, if the waste is well segregated, the waste that can be incinerated may be kept within city

WTE Benefits MCGM Project



CDM
Benefits

25 - 30 MW
Energy from 3000
mt MSW per day



₹80 crore
Potential alternative
revenue streams

Reduced
Emissions



Clean Air
For the population

limits without adverse pollution effects while the non-combustible waste, electronic waste, etc; can be processed further away with the appropriate solution. This can have a bearing on the logistics of waste collection and hence a cost implication. In India and other developing countries, the awareness and consciousness on waste disposal and segregation is almost nil. Hence, the most efficient technique of waste management has to be selected by expert consultants as it requires expertise to evaluate the engineering technology and assess the economic viability of the technology. For instance, pyrolysis is a technique that is less polluting, more expensive and



Pollution management should be in line with the city's prescribed pollution norms imposed by the regulatory authority. Hence, the entire WTE ecosystem is a technological and scientific process that calls for expertise to ensure best-fit solutions.

the by-product is more likely diesel that can be used for the transportation industry. This may be evaluated based on the end use of the by-product, cost benefit analysis along with the waste characteristics – segregated or mixed waste. The consultant is also required to evaluate the pollution management technique used. Pollution management through the process cycle is to be monitored and should be in line with the city's prescribed pollution norms imposed by the regulatory authority. Hence, the WTE ecosystem is a technological and scientific process that calls for expertise to ensure best-fit solutions.

As an extension of the project, WTE is fast gaining ground world-wide with concerns on the environment and health hazards due to dumping. Slowly but steadily an ecosystem around WTE is fast building up especially in recycling and re-use. Another important consideration is the efficiencies that can be achieved in generating and managing the by-product – which is energy or biofuel. Energy generation from waste can be made a low cost option with the selection/management of appropriate methods.

Sweden: Where Waste is Wealth

Sweden is the best example for creating a thriving waste management industry. Profitable businesses are built around recycling and re-use of waste. 99 per cent of all household waste is reused, recycled or composted. 50% of household waste is incinerated to produce energy. Metal is separated from the burnt ash and recycled. Balance of the ash with material that cannot be burnt such as porcelain, tiles, etc., are used as gravel for road construction.

Typically, recycling stations are within 300 metres from any residential area. People separate all recyclable waste in their homes and deposit it in special containers in their block of flats or drop it off at a recycling station. (Saves waste transportation costs.)

There are 32 plants in Sweden that produce heat for 810,000 households and electricity for 250,000 private houses. Heavy metal emissions have been reduced by 99 per cent since 1985, even though Sweden emits three times more waste today. Total waste dumped is now reduced to just 1%. The smoke from incineration plants consists of 99.9 per cent non-toxic carbon dioxide and water, but is still filtered through dry filters. The dry filters are deposited and the sludge from the dirty filter water is used to refill abandoned mines. Now Sweden is targeting zero waste.

THE DIRTY PICTURE

Data of MSW management across countries:

Countries	%Dumps	%Landfills	%Compost	%Recycled	%WTE	%Others
Singapore	-	15		47	-	49
Denmark		5.09	15.28	25.57	54.04	0.03
Sweden		5	10	34	50	1
Cambodia	100					
Algeria	96.8	0.20	1	2		
Chile		100				
Canada			12.48	26.78		60.74
Japan		3		17	74	6
Niger		64		4		32
Uganda		100				

World Bank Report with data approx. 2001 to 2006

A Central Pollution Control Board Report indicates that, based on the information from State Pollution Control Boards/Pollution Control Committees, **1,27,486 TPD** (Tonnes per day) MSW was generated in India during 2011-12. Of this, **89,334 TPD (70%)** of MSW is collected and **15,881 TPD (12.45%)** is processed or treated.

MSW processing technologies reported in the country are – composting, vermin composting, biogas plant, RDF – palletisation and others. However, there is a large gap in collection and processing, calling for need for action in India and across the several countries in the world.

Pollution from landfills

Country	Methane Emissions from Post-Consumer Municipal Waste Dispos* (MtCO ₂ e)	Greenhouse Gas Emissions** (CO ₂ , CH ₄ , N ₂ O) (MtCO ₂ e)	% Methane from Disposal Sites Relative to Total GHG Emissions
Brazil	16	659	2.4%
China	45	650	1.2%
India	14	210	1.1%
South Africa	16	380	4.3%
Mexico	31	383	8.1%

Full Circle – Liquid Waste Management

Liquid waste includes effluents of industries, fertiliser and pesticide solutions from agricultural fields, leachate from landfills, urban run-off of untreated waste water and garbage, mining wastes etc. Tata Consulting Engineers provided consultancy solutions to the Bangalore Water Supply and Sewerage Board (BWSSB). Typically, about 1100 MLD of sewage is generated daily in Bangalore city. BWSSB had existing sewage treatment plants (STP) capacities of about 730 MLD capacity and about 330 MLD additional STP was added on under JICA-BWSSP (II) project.

The Vrishabhavathi Valley (V Valley) STPs were upgraded periodically and the capacity was augmented over time. Under separate project, V Valley STP capacity augmentation is taken up by BWSSB yet again, with Tata Consulting Engineers providing sustainable solutions in managing liquid waste.

Brownfield confines, Greenfield value engineering

As consultants for the V Valley project, TCE had the challenge of working in Brownfield conditions. Along with the sewage treatment process, the capacities were increased with available limited footprint, that is, within the given plant area confines. TCE had the task of also evaluating the best technology for liquid waste treatment and solid stream treatment. The liquid waste contains both toxic and non-toxic substances and treatment releases green house gases.

TCE team proposed a conventional Activated Sludge Process (ASP) secondary and Tertiary treatment of new 150 MLD STP capacity with biological nutrient removal (BNR) facility to meet new Central Pollution Control Board / Karnataka State Pollution Control Board treated sewage discharge norms for Bangalore. Using the anaerobic digestion process, the sludge from the STP is designed to generate energy from the biogas. Through value engineering solutions, the sludge handling system is designed to handle increased capacities (Sludge from 300 MLD plant capacity including existing plant of 150 MLD capacity) such that sludge from the new and existing STP could be processed using advanced technology. The solutions planned will also reduce the volume of dewatered sludge by about 40-45% compared to conventional sludge treatment. The process also ensures better quality of sludge product (Class A biosolids) which is a sustainable solution and is very environmental friendly.

The sludge generated from the plant is proposed to be treated with Advanced Sludge Treatment to achieve United State Environmental Protection Agency (USEPA) Class A Biosolids treatment and disposal standards. The USEPA Class A Biosolids reduce the level of pathogens to below detectable levels (i.e. Fecal coliform 1,000 MPN/gm of DS) compared to Fecal coliform 2,000,000 MPN/gm of DS of Class B bio solids standards. This is a hygienic and healthy option as there is no risk of infectious disease transmission through casual contact or indigestion, no site restrictions are required for storage of Class A biosolids and there is less odour from solids which ensures hygienic transporting and disposing of Class B Biosolids, etc.

Energy recovery from the sludge helps reduce green house gas emissions. The waste to energy solution, is designed to contribute to about 35% of the total energy requirement for the operation of sewage treatment plant.

For achieving USEPA Class A Biosolids in the STP solids output, Thermal Hydrolysis Process (THP) is recommended. It is pre-treatment technology before anaerobic digestion of sludge. It optimizes digestion and dewatering (30-33% dry solids compared to typically 20% DS), reduces digester volume (about 30-

35%), and increases gas production (about 10-12%). Ultimately, it delivers a high quality (Class A) end product (biosolids).

The end product is a pathogen free and pasteurized biosolids with minimum odour which can be applied to land directly as bio fertiliser. The estimated sludge generation from the existing and new plant is about 24,000 tonnes dry solids (DS) per year. The Class A Bio solids has commercial value as it is used as a fertiliser and hence it generates revenue to the authority.

This is the first time in India that this technology (THP) is recommended for municipal STP. The THP technology is used in some leading developed cities such as Washington DC, USA with capacities of 130,000 tonnes DS/year, Manchester UK with 91,000 tonnes DS/year, Oslo Norway with 50,000 tonnes DS/year and London, UK with 40,000 tonnes DS/year, among others.

Energy recovery from the sludge helps reduce green house gas emissions. The waste to energy solution, is designed to contribute to about 35% of the total energy requirement for the operation of sewage treatment plant. The utilization of biogas for power generation causes reduction in emission of methane gas, qualifying as a Clean Development Mechanism project with eligibility for carbon credits. Since the energy recovery from sewage treatment plants is of the nature of 'non conventional' i.e., 'renewable energy source', it is eco friendly and increases sustainability. The estimated carbon trading price from the proposed sewage treatment plant is approximately ₹4.61 crores per annum.

With this sustainable project, TCE provided value to its client by retrofitting STP for augmented capacities with limited available footprint (plant premises) and provided advanced sludge treatment for handling large volume of sludge generated from the existing and new plant with better sludge quality for land applications in limited footprints. The project implementation period is estimated at 36 months including trial run, testing and commissioning.

This project will set the benchmark for other mega cities in India as a smart, value engineering solution to handle large volume of sludge from the sewage treatment plants. Waste to energy, from liquids and solid wastes, are sustainable in the long run with state-of-the-art solutions designed to provide long term sustainability.



BUSINESS Brief

Sculpting India's Smartcity Story

The concept of smart cities for India was mooted ten years ago. At this time, Tata Consulting Engineers had participated in a workshop with PowerGrid Corporation, to formulate infrastructure development, efficiencies in water management and power supply in cities. While the smart cities plan was formalised in 2014, TCE had developed capabilities in smart cities infrastructure, almost a decade ahead when the thought process was still taking shape. This enabled TCE to be the front-runners in smart city master plan and development.

The smart city program in India presently comprises two phases. The first phase involves the preparation of proposals for smart cities in consultation with municipal corporations and urban local bodies. TCE prepared several such proposals for smart cities in the country, is a critical deciding factor of the city to be developed into a smart city. In the second phase, the earmarked cities are moved for project implementation. The smart city program includes identification of infrastructure bottlenecks, citizen services, city planning aspects, air pollution and sustainability.

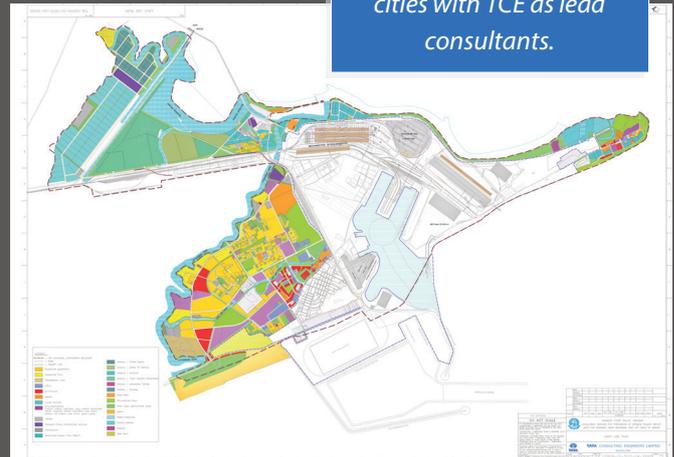


Lead consultants for India's first smart port cities

First of the three smart port city is Paradip smart port city. This project is being developed for the Port Authority of India with TCE as lead consultants. The concept of a smart port city is based on the idea of developing a smart city around port-related activities. TCE conducted market demand assessment and proposed a product mix that includes logistics park, fishery and furniture industries, residential and educational institutions. These recommendations are along the lines of Government's Smart Infrastructure guidelines covering solid waste management, water, power and transport planning, disaster management (considering Paradip is a cyclone prone area), safety and ICT networks. TCE has completed master planning, DPR (Detailed Project Report) and financial feasibility evaluation. The infrastructure process has commenced as per plan and marketing campaigns to attract both domestic and foreign investors into the port city is underway.

The second smart port city of Kandla Port in Gujarat in the Western part of the country is also being developed. The third smart port city is being planned by TCE for Cochin. In all, the total area under development ranges from 800 acres to 6500 acres for India's first three smart cities with TCE as lead consultants.

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Greenfield smart cities

The past success of several smart industrial cities where TCE were consultants along the Delhi Mumbai Industrial Corridor (DMIC) are DC Ujjain, Dadri, Dholera and Bengal Aerotropolis. DMICDC cities are benchmarked for international best practices in terms of infrastructure provisions.

Smart cities are proposed as a self sustaining cityscapes with economic, environmental and social sustainability. The second round of smart cities are underway where TCE serves as lead consultants while several proposals for smart cities are being considered for development.

The Guwahati smart city project involves the rejuvenation of five water bodies in Guwahati which includes the Brahmaputra River and its tributaries. The project focusses on river-front development and potential commercial and residential development. TCE is involved in concept to commissioning planning complete with ICT networks, command centers for city service management, disaster management, safety and security networks.

In Bhopal, 350 acres of largely government-owned land has been sanctioned for development as a smart city under the Special Purpose Vehicle model. TCE as lead consultant has proposed a city plan centered on an iconic structure and establishing blue network – connecting existing drains and ponds with a view to retain and replenish existing water sources.



TCE Triumphs

CEAI's first woman President from TCE

Ms. Sayona Philip from the TCE Delhi NCR office becomes the first woman to be elected as President of CEAI (Consulting Engineers Association of India), the national association of engineers. The Governing Council members unanimously elected Ms. Philip on 20th December, 2016. Congratulations and best wishes to Ms Philip on her prestigious assignment.

Two TCE employees win CEAI national awards

Mr. Jitendra Singh and Mr. Manoj Kumar won the 2016 CEAI National Awards for young engineers. Mr. Singh from Delhi office won the 'Sherpa' award for the project 'PMC services for Bihar Urban Development Investment Program', and Mr. Kumar from Pune office, won in the 'Innovations in project engineering' category for the project 'Duvha Unit Recovery Project- Eskom South Africa'.

Discover India Contest Finalist from TCE

Amit Senapati, from TCE participated in the 'Bharat Ko Janiye' Quiz. He qualified to secure a place among the 20 finalists selected from over 27,000 participants. He was invited to a tour of India, prior to the final round of the quiz, where he had the opportunity to meet the Prime Minister and received a token of participation from the External Affairs Minister. The quiz was held for the Indian Diaspora living abroad; Amit Senapati is associated with the Eskom project in South Africa.



Amit Senapati, from TCE participated in the 'Bharat Ko Janiye' Quiz

ENR

Engineering News-Record

TCE moves up on international ranking of consultants

Tata Consulting Engineers moved up on the ENR rating, a global ranking of large contractors and design firms in the U.S. and internationally. TCE moved up to 166th rank on the ENR rating from the previous rank of 188.

Engineering News-Record (widely known as ENR) is an leading American engineering and construction news magazine that provides news, analysis, data and opinion for the engineering design and construction industry worldwide.

TCE was able to move up the ENR ranking on the strength of its increased presence in the international markets and prestigious domestic projects. ENR rating is considered a global benchmark in the industry and global firms use this as a measure to evaluate the strengths of firms they engage with.

IGBC Fellow Award for Ecofirst senior management

Chitrnanjan Kaushik (COO) and Rakesh Bhatia (Sr VP), Ecofirst Services Ltd were honoured with the IGBC Fellow Award 2016 by the Indian Green Business Council. The GBC recognised the Ecofirst management and 47 such distinguished leaders for their contribution in optimizing natural resources with state-of-the-art modern technologies and building spaces that ensure a greener and healthier India. The awards were presented at a ceremony

held on 6th October at Grand Hyatt, Mumbai. Ecofirst Services Ltd is a subsidiary of Tata Consulting Engineers Ltd and provides boutique services in the built environment segment. The company was involved in the leed certification for Bombay House, the Tata Group headquarters which is a heritage building.



Chitrnanjan Kaushik (COO) and Rakesh Bhatia (Sr VP), Ecofirst Services Ltd were honoured with the IGBC Fellow Award 2016

TCE GET engineer is part of the Indian Satellite Project



Project Swayam is the smallest satellite, measuring just 10cm x 10cm x 10cm.

India's youth did us proud when 'Swayam' one of the two satellites built by Indian students, was launched on 22nd June, 2016. ISRO has a student satellite program where students from various engineering colleges present their proposals. More than 100 students from all disciplines participated and Mayuresh Khadse, then student at College of Engineering Pune (COEP), worked on this project. Mayuresh, currently a graduate trainee at TCE, was the Head of the Power Sub-Systems on the project. His team's work involved solar panel boosting to a stable 5V output to charge the batteries and then creating the next output of 3.3 volts for entire system, load protection system, trip facilities, among others.

Project Swayam is the smallest satellite measuring just 10cm x 10cm x 10cm. The main objective of the project was to launch a communication satellite that would be passively stabilised, so that the antenna is directed towards earth. This is the first such project in India.

TCE Buzz



TCE Day

TCE-ites across locations, showcase their talent through various entertaining performances.

1

Delhi



2

Pune



3

Jamshedpur



4

Chennai





5 Bangalore



6 Mumbai



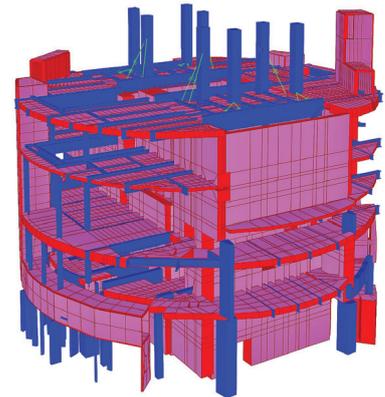
PROJECT Patchwork

MUMBAI

Safety Assessment of Narora Atomic Power Plant, Uttar Pradesh

TCE is executing a project for Seismic Margin Assessment of all safety related civil structures for Narora Atomic Power Plant, Uttar Pradesh and is on the verge of successful completion. In the aftermath of the Fukushima catastrophe, there are stringent regulatory requirements imposed on the nuclear industry. TCE's expertise in this area is expected to be sought for similar on-going nuclear installations in India.

The project required the team to be stationed at Narora site for three months to digitize extensive data involving almost 1300 drawings which were originally done 35 years ago, processing of huge data-base for performing and reporting Seismic Margin Assessment. TCE is working with the Atomic Energy Regulatory Board which clears the project methodology etc.



DELHI

Design and supervision of construction works for Technology Centres, MSME

'Technology Centre Systems Program (TCSP)' - a World Bank funded project under the aegis of Ministry of Micro, Small and Medium Enterprises (MSME) of Govt. of India, is a prestigious project for skill development in India. The TCSP seeks to enhance the technological skill base of MSMEs by establishing Technology Centres (TCs) by providing training/skill development courses that will help job seekers to improve their career prospects and find employment.

TCE is the Project Management Consultant (PMC) to the Office of Development Commissioner - Ministry of MSME for TCSP project. The scope is to provide architectural planning, engineering design and construction management services for the construction of 10 new technology centres viz. Bhiwadi, Durg, Bengaluru, Rohtak, Pudi (Visakhapatnam), Greater Noida, Sitarganj, Puducherry, Baddi, Imphal and upgradation of three existing technology centres viz. Mumbai, Aurangabad and Bhubaneswar.



Coal fired project at Zambles, Philippines

Masinloc Power Partners Co. Limited has awarded the Engineering, Procurement and Construction (EPC) contract to M/s POSCO engineering and construction limited. Tata Consulting Engineers Limited (TCE) is providing the consulting engineering services to the EPC company for this project. The scope of services includes basic and detailed engineering services covering mechanical, electrical, C&I and piping.

Steam Management System modelling and Power Island engineering, Abu Dhabi

Emirates Global Aluminium has awarded TCE with the Steam Management System Modelling and Power Island Engineering project located in Abu Dhabi. The project involves the power and steam integration consisting of upgrading and expanding EMAL power plant installation and ancillaries to supply the ATA refinery power and steam requirement.

Grati Combined Cycle Power Plant Extension Project

Lotte E&C has awarded TCE with the Grati CCPP project in Indonesia. TCE will provide engineering services covering mechanical, electrical civil-structural-arch, instrumentation and controls associated with the project, along with HVAC, fire fighting, plumbing and detailed engineering of field fabricated tank. Grati CCPP is a brown field project where in TCE will provide solutions for extension of the plant.

Kachchh Branch Canal Small Hydropower Projects

SSNNL is implementing three small hydropower projects in EPC mode at three locations of canal falls in Kachchh Branch Canal of the Narmada Main Canal in Gujarat to generate power. SSNNL has entrusted TCE with the consultancy services for planning, designing, formulation of bid documents, bid evaluation, and owner's engineering tasks including review of design, documents and drawings, and project management.

Value additions by TCE include cost and time saving through layout optimization, suggesting alternative alignment of water conductor system for avoiding time-consuming relocation of a high voltage transmission line tower, standardisation and facilitation of compact and efficient design of electromechanical components, guiding the CFD analysis and physical model studies of the projects.

BANGALORE

Telangana Super Thermal Power Project Stage

TCE is providing consulting engineering services to Alstom Bharat Forge Power Pvt. Ltd. for STG package for Stage-1 of the Telangana Super Thermal Power Project to be setup by NTPC.

The scope of services include structural and architectural works for main power house with control building, service building, CPU regeneration building, hydrogen cylinder shed and other utilities services such as transport, sewage management, landscaping, etc., related to the STG package.



JAMSHEDPUR

Owner's engineering services for Coal Handling Plant

NTPC Ltd. was allotted 'Pakri Barwadih' Coal Block in North Karanpura coalfield situated in the Hazaribagh district, State of Jharkhand, India. NTPC has engaged Thriveni Sainik Mining Private Limited as Mine Developer cum Operator (MDO) for mining coal from Pakri Barwadih Coal Block and supplying the coal on an exclusive basis from the Pakri Barwadih Coal Block.

Tata Consulting Engineers Ltd. (TCE) is providing consultancy services for procurement assistance, review engineering for coal handling plant and detail engineering, review engineering & procurement assistance for associated mine infrastructure facilities. In addition to above, TCE is providing project management services for the project. Mine infrastructure facilities are being designed by TCE considering not only functional requirements but also vastu requirements. To focus on efficient project management and knowledge management, Wrench is also being implemented for document control.

Engineering services for port infrastructure development and material handling, Guinea

Guinea Bauxite Export is a bauxite exploration and mining project located in the Boke region, Republic of Guinea, West Africa. The project is developed by Guinea Alumina Corporation SA, a fully owned subsidiary of Emirates Global Aluminium (EGA). TCE is proud to be associated with this project with a high capacity for material handling (10000 tonnes per hour (TPH)). The project entails pre bid engineering services comprising accurate BOQ estimation. The project includes the mining and crushing of high quality bauxite at the mine face and the transport of bauxite to the port area where it is stored before being loaded into ships for export. This is also one of the largest EPC mode projects for engineering services provided by TCE.



225 MW Combined Cycle Power Plant at Bhola, Bangladesh

Nutan Bidyut Bangladesh Limited is setting up 225mw combined cycle power plant at Bhola Island (Phase II), in Bangladesh. Engineering, Procurement and Construction (EPC) contractor for the project has appointed Tata Consulting Engineers Limited (TCE) for LNTP (Limited Notice to Proceed) engineering services for this project.

Multipurpose Pilot Plant at Digwal, Telangana

Piramal Enterprises Ltd is building a multipurpose pilot plant which would manufacture Active Pharmaceutical Ingredients; TCE is involved in carrying out detailed engineering services.

60,000 TPA Integrated PVC Plant at Makelle, Ethiopia

The first PVC manufacturing plant is being constructed in Ethiopia by Dejenna Chemical Engineering PLC and TCE is offering PMC services for this project. It is a prestigious project involving Indian, Chinese & Ethiopian Nationals and TCE will interface with these multiple partners for successful project commissioning.

Nyagak Small Hydropower Project in Uganda

Nyagak III Small Hydro Power Plant (SHPP) is a scheme proposed on the Nyagak River in north western Uganda. The scheme consists of a high dam, diverting water through trash racks into a long pipe conduit which terminates at a forebay structure. TCE is providing consultancy services for preparation of bid document, detailed engineering and construction supervision services for this project.



Play Video

School on Wheels Program for children of migratory workers

Tata Consulting Engineers launched the School on Wheels program in Pune, partnering with NGO, Door Step School.

The program aims to provide mobile schooling facilities, where a bus visits construction settlements to provide basic education to the children who live there. Children of construction and migratory workers find it difficult to attend school as their parents often move from site to site and they have to care for their younger siblings while the parents are at work. The concept of a school that goes to the site is to provide access to basic education for these children.

The interior of the bus is remodelled into a classroom and it also serves as a mobile library. Mr Amit Sharma, MD, TCE along with the BU heads at Pune office Mr K Ramesh, Mr Vikram Bapat & Mr Arun Prabhudesai, inaugurated the bus in the office premises. The bus went to the site, where the first class was conducted.

The kids got to interact with the MD and other senior leaders. The employee volunteers distributed snacks and stationery kits to the children. The bus covers 75 students everyday with 3 classes of 25 children each.

The 'School on Wheels' program is one of TCE's flagship CSR projects and was inaugurated during the Tata Volunteering Week 6 (Sept-Oct), in the spirit of volunteering and social responsibility. TCE Pune volunteers' design solutions included vinyl flooring; cabinets for storage, open roof top for light and ventilation, storage space in the rear, provision for a genset in the luggage haul area, audio visual provision for installation of LED screen, etc. This was indeed a proud moment as volunteers happily took selfies near the bus. The children were equally thrilled to get a swanky new classroom right at their doorstep.

Tata Uttarakhand Rehabilitation Program – TCE serves as a reliable partner



Play Video



The Tata Uttarakhand Rehabilitation Project is a collaboration of Tata Companies and Tata Relief Committee to rehabilitate the flood affected people in Uttarakhand in 2013. Tata Consulting Engineers Ltd. plays a pivotal role in the rehabilitation efforts, supporting the cause through design, engineering and construction project management services.

The project scope includes reconstruction of schools, ICDS centres, water and sanitation, anganwadi centres, women's weaving centres, government schools and polytechnics.

TCE reviews Tata STRIVE's Skilling Centres

TCE has been engaged by Tata STRIVE– a Tata Sustainability Group's Venture – to volunteer their engineering expertise. Tata Strive is a group-wide skilling initiative aimed to develop training and skilling capacity to train one million youth per year by 2022, for employment, entrepreneurship and community enterprises.

Tata STRIVE has been setting up training centres at various locations across India, some of which are leased premises.

To ensure fire safety and other structural stability of the premises, TCE assisted in reviewing these centres. The TCE team comprising of Kishor Lawar, Ramesh Ramakrishnan, Sushil Sarangi and Pankaj Kumar, carried out survey of the premises in Airoli, Thane, Hyderabad and Jamshedpur. They assessed to identify possible gaps related to fire safety and constructional aspects, and submitted a detailed report to Tata STRIVE.



Swachh Bharat Mission – TCE plays a role

Towards realising Mahatma Gandhi's vision of a clean India, the Mahatma Gandhi Swachhta Mission is being integrated with Swachh Bharat Abhiyaan. TCEs worked with GNFC with a target of constructing 3000 toilets in the rural areas of Gujarat state. TCE is providing Engineering & PMC services to the project and five engineers are working with the client towards this cause to meet tough deadlines. About 2300 toilets have been completed, of which about 1764 have been handed over to the authorities.

TCE Engineers who worked on this project were – Dhiman Boral, Vivel Dutta, Ravi Singh, Anjani Singh, Sushil Sarangi and Soumen Debnath – under the undeterred support of Mr Jayesh Patel from TCE's Gandhinagar office. The team was extremely excited for this project, one of the members, Mr Anjani Ravi said, "Giving something back to the society has always been on my mind and being able to work on such a noble project was indeed a privilege. I am grateful to be part of TCE – an organisation which is taking an effort to contribute to the health and hygiene of society."





342 Volunteers
1300+ Manhours
20 Volunteering opportunities

23 ladies from Khoripada trained in papad-making



Awareness on government schemes for support staff



45 students received career counselling

Training and counselling in AutoCAD for ITI students



Kitchen waste management session for employees



Beach and lake cleaning drives



Footwear distribution in slum area



NGO exhibition and workshop on paper-bag making



School on Wheels program launch



Cleanliness drive at historical monument: Sinhgad



Blood donation drive



Quiz Competition held at primary school



Extra classes for St. Patrick's students by employees



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TCE Corporate Communications

Engineering A Better Tomorrow