From Anantha's desk

SNS at the 10K Connected asset celebration

We built a new office for the Digital Hub, an office that is a unique combination of exhibition spaces to showcase our solutions and workspaces that inspire, enable collaboration and innovation. We are now located at 4th floor CRR centre at Manapakkam. You are always welcome to drop in to experience the new settings and chat with us about new solutions.We also disrupted ourselves with the recent launch of L&T-Nxt, the vehicle that will take our digital solutions to the market in India and overseas. L&T-Nxt also operates from Landmark I floor and our Mumbai team works from there.

Read about it all in this issue and as always keep using our solutions and demanding more.

With Best wishes and Greetings of the festive season.

Anantha Sayana
Chief Digital Officer

We published our first issue of Digit.ally when we began our digital journey in early 2016. The objective of the newsletter was to communicate to all our readers about the latest technology, upcoming new solutions, the launches, success stories and adoption at various project sites and the benefits derived.

Its' been an exciting and fulfilling journey for us over the last three and a half years with a reasonable bag of achievements. While focussed intently on solutions and implementations, we perhaps dropped the ball on communications flowing through Digit.ally.

So here we are with a fresh new edition of Digit.ally to tell you where we are, what we have done and what we are cooking now and with a promise to keep the communication flowing.

We reached a milestone of 10,000 connected assets in July 2019.

A new solution for Workmen called WISA has been launched and is gaining significant adoption across ICs. A solution for tracking pipes for our mega irrigation projects, and more

Our Geospatial solutions won awards in India and USA.

The AI journey that we began after our AI Conclave in December 2018 is chugging along with a number of initial solutions being rolled out.

whats.in

Achieving 10K Connected equipments milestone

Speed and Scale are the hallmarks of our organization and we resolved that we need to achieve this in our connected assets program too. The idea that remotely gaining visibility of the operations of an equipment at site would help our operations was well validated and accepted. All that remained was for us go and do it. In order to make an impact we had to connect as many machines as necessary and provide solutions for remotely measuring a variety of parameters for monitoring.

We worked with zeal on both the technology and the implementation and jointly identified 12000 critical assets across a variety of machines and makes from out of a very large bank of big and small asset we had.

The journey started with baby steps in June 2016 when we connected a motor grader at the Delhi Agra Road Project . We pursued the journey vigorously with phenomenal support from our P&M Heads and staff and Digital Officers. On the way developed specialized solutions for the batching plant, for weighbridges, for tower cranes, for diesel generators concrete pumps, wheel loaders and so on. And recently on 21 June 2019 exactly three years from the time we started, we connected our 10,000th Asset.

Asset InSight our solution for connected assets is now a part of our operations monitoring at Construction. The business managers, project controllers and heads of operations do their reviews using the dashboards. A business task force of has determined the norms for utilization and productivity for many categories of equipment.

Our journey towards 10,000 connected equipment

- Jun 2019 **10,000th** Equipment
- Apr 2019 **300th** Weigh Bridge
- Dec 2018 **8000**
- Oct 2018 **1000th DG**
- Jul 2018 **5000**
- **3418**
- Feb 2018 **2000**
- LT Gateway
- MX2 Turbo
- 1st Weigh Bridge
- **1125**
- 1st Batching Plant
- 1st Equipment

Batching Plants #199	Diesel Generators #1374	Concrete Pumps #176	Transit Mixers #928	Weigh Bridges #312	Motor Graders #138
Wheel Loaders #432	Tippers / Trucks #468	Pick & Carry Cranes #478	Tensioners / Pullers #64	Gantry Cranes #157	Compactors #484

The norm is showed on the user friendly dashboards as a bright line and the ongoing performance of these equipment are monitored with reference to these norms. For the operating staff looking at these dashboards has become a way of life.

We are on our journey to connect up the remaining assets out of the identified 12,000 assets and will look at a phase II later. Our endeavor is to add more features to the Asset InSight solution with elements of AI ML leading to predictive maintenance and many other features. Watch this space as we achieve more progress and capabilities to our solution.

Enhancing ProCube

ProCube, our flagship product used for progress monitoring has been implemented at about 280 plus sites across all ICs. We have been contemplating on the usability features of this solution. The following talks about few enhancement that we were able to produce in the recent times.

Progress on Strip Chart

The progress of all road projects is monitored not just by numbers or quantities, but also by displaying the progress on a pictorial fashion called 'Strip chart'. A Strip Chart portrays the road construction progress in terms of various layers represented chainage wise and on either side of the road.

In construction sites, the Strip Chart is usually made in excel and printed chainage-wise over multiple sheets & pasted in the Site office for monitoring. With ProCube, all these manual procedures and hard copies can be replaced by a single colourful on-screen report, where the same progress can be viewed at different scales. The project progress will be represented activity/layer wise on both the sides w.r.t chainage where one can view the progress at a gross level of 10km and drill down till 1m level.
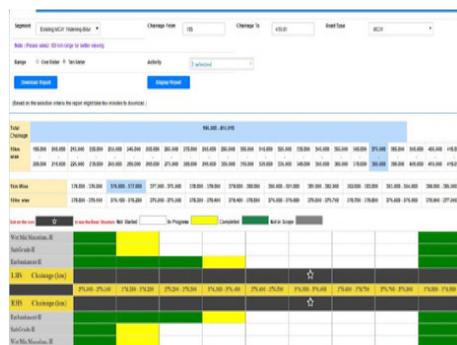

Different colour bands denote different stages of activity completion (Green – Completed; Yellow – In Progress; White – Not Started)


Progress on a GIS Map

TV App for monitoring

To make sure that the senior management of the organization is updated with the latest progress, a TV based application was developed showcasing the progress dashboards & site photographs of selected projects. The Business heads and Cluster managers can log in and monitor the progress of their repsective projects similar to a stock market ticker. No separate commands are required,all the required details with real-time updates can be watched on the screen and further course of action can be decided. The TV app can be configured by selecting the project and the view options o the dashboards.
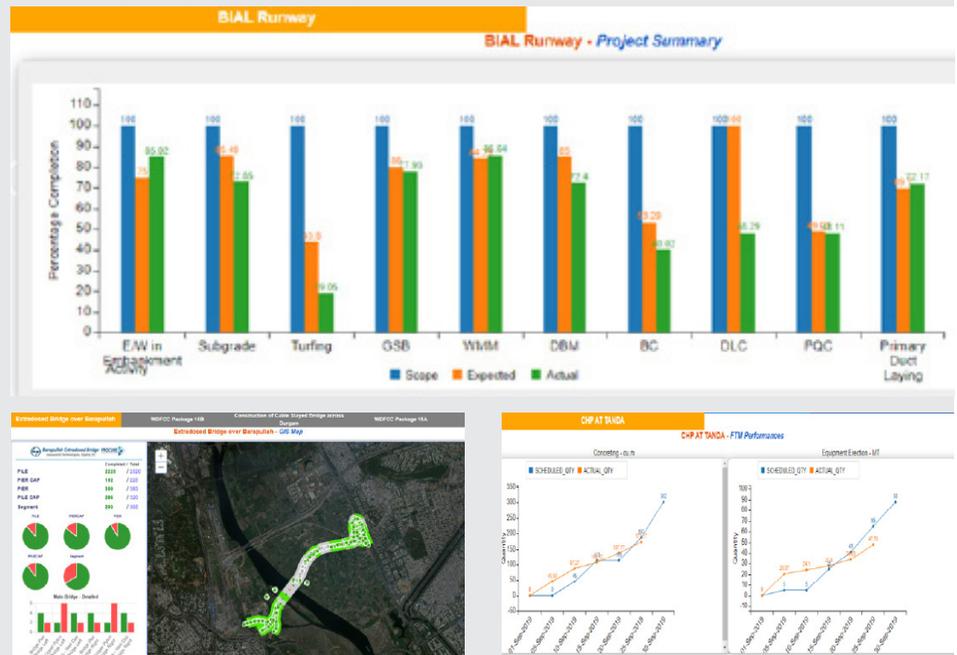
Regular updates thru In-App Notifications & SMS

We have introduced In-App / SMS Notifications to improve the adoption and implementation of the ProCube solutionacross project sites. These notifications are mainly aimed at site engineers and project managers to keep them updated on new enhancements, motivate them by recognizing the top user and to for send them daily progress update reminder
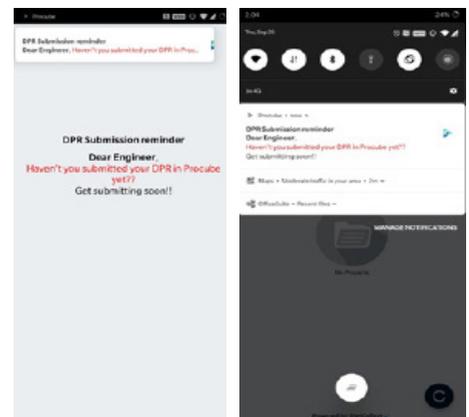
Going forward, we are working on directly extracting Procube data to be used as an input for subcontractor billing.We are also working on integrating existing industry standard project management systems like Primavera and Building information modelling with Procube.

Document Comprehension

The DigitAI conclave organized in 2018 made us realise how AI can be a key enabler across different functions in our organization. Out of the ideas discussed in the round table during the conclave was to use Natural Language Processing (NLP) for document reading and comprehension especially for complex and voluminous documents like tenders and contracts.

Many times the turnaround time for submitting bids is limited to a few weeks. The tender team scrutanise the RFP document manually for key clauses impacting time, cost and risk. With the process being extremely tedious and time consuming there is a high risk of missing out on a key clause which might have a detrimental impact if not factored. Resulting in a strong need for automation in the process of contract reading and clause discovery.

We initially started working with WET IC for extracting the red flag clauses (risky clauses) from tender documents. At first the AI model had to be trained manually by annotating (labelling) the risky

clauses. This training required a coordinated effort with the subject matter experts and a team of 15 contracts personnel from various business units of WET IC were nominated and trained on the AI platform. We collected sufficient number of historic tender documents for training and defined the categories for risk clause discovery in the platform.

The model training process took over 6 weeks and more than 2500 annotations on various tender documents were executed. Post training, the AI model commenced predicting the risky clauses for live tender documents with an accuracy of more than 85% in about ten risk categories. User feedback is also enabled in the clause predictions by upvote/downvote, which inturns boosts the accuracy of the model incrementally. The discovered clauses can be extracted in a pdf document for risk reviews. Ultimately our AI model was able to read and analyse large document and generate a short extract of risk clauses within 5 minutes making a significant return for the business in terms of speed and accuracy.

Identification of red clauses in tender documents

After our successful stint with WET IC, our next objective is to quantify the risk (red, amber and green in the extracted clauses and segregate them accordingly. We are also working on adding more features to the platform like Work flows, risk approvals and dashboards for management. Other ICs have also expressed interest in adopting this solution. We have now initiated enterprise wide implementation of the AI platform for Contract Comprehension for commercial risks. This platform will provide insights to the management for making fast and effective bid go/no-go decisions.

CONQUER- Steering digital transformation of quality

The objective of going digital is to improve the overall efficiency of each processes involved in a project. While we endeavour to complete the project as per the deadline we always strive towards providing the high quality end result. This need ushered in CONQUER, an integrated Quality management platform. CONQUER stands for "Construction Quality Enabler" and true its name has been enabling sites to manage their field quality processes effectively. Making sure that the client is also involved at every step of our Quality process to have a centralized platform to enable effective control.

CONQUER is used for a range of field quality processes right from RFI's, quality checklists, Pour cards, Site walkdowns, reporting NCs/observations, Customer & executive feedback. The Site Engineer

can update the relevant checklist and configures the workflow on the app which goes through requisite approvals. Once the checklist is approved the user gets a notification for go ahead.

The features of the App are:

a)Configurable checklists: Quality teams at HQ/Cluster can quickly configure the inspection checklists and associated workflows based on the site need and publish them on the App. This means that any new checklists can be configured quickly and dependency on the development team is significantly reduced

b)Observation record: Users can attach photos, annotate on them along with their checklist

c)Offline functionality : Users can download the requisite checklists when they are online and then execute it even without internet connectivity

d)Mobile cum Desktop App: Its not all on the Mobile (Android & iOS), the checklists can be executed on the Desktop also

e)Instant reports: Unlike traditional apps where

reports can be seen only on the Web portal, CONQUER offers the facility to view inspection reports on the Mobile app itself. With the swipe of a button, the reports can also be mailed to anyone from the App itself.

B&F took the lead in implementation of this solution and have been using it extensively followed by MMH and Heavy Civil. Many of our clients have also expressed interest in this platform and some of them have started using this App to approve RFIs and for giving feedback. Multiple concerns can be addressed by a single click ranging from step-by-step approach to creating a quality management system; involving stakeholders in the quality process; identifying and mapping key processes; marketing, monitoring and improving ongoing business performance and much more.

Quality Audit is next focus for CONQUER. The idea is to streamline the Internal Audit process and provide a single platform for manging the Audit scheduling, execution and close out. More on this coming soon, watch this space for updates…

WISA- Managing workforce

Onboarding and managing workforce in our industry is a very tedious process. In order to minimize the complexity involved we developed an application called WISA. The idea was to drive the process digitally and make the worker information available centrally.

WISA stands for Workforce Induction & Skills Application, committed towards managing both end-to-end processes and data of workers from the time of induction through their entire journey in the organization. It replaces the dated systems with new technology, offers online assessments and real time analytics. With this we can take a systematic approach to onboarding and managing workforce.

WISA has dramatically increased the efficiencies of entire workforce management process by ensuring accurate and consistent alignment of each worker by speeding assimilation of worker into the work structure. The solution has a very user friendly mobile and a web portal component for different processes in form of checklist and workflow that can be configured dynamically. WISA also arms the users with insightful strong analytics in form of various dashboards related to business intelligence, workforce's behavior analytics, retention and Mobility Insight.
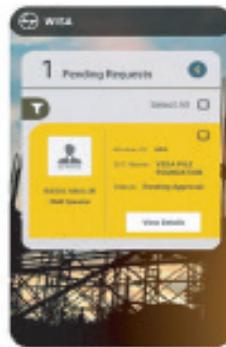
It doesn't stop at that but extends its offerings to an array of undertakings right from providing a centralized platform to assess skills of worker, online approvals, wage processing which records wage payments and maintaining statutory document compliances, biometric attendance reports, observation/appreciation, blacklist records, customizable gate pass and templates of document along with regular alerts and notifications.

In short, WISA aspires to manage human assets proactively and cater to the client's requirement. As of now, we have 150+ projects using WISA and have growing potentially. Currently we have inducted 58,000 workers and have total of 2100 plus active end users.

Watch this space as we enhance and upgrade ourselves with unique and sustainable value proposition.

Implementation of WISA in WET IC

"Congratulations ! We seek to achieve our ambitious goals with implementation of such smart solutions. We foresee the same helping us to a great extent.
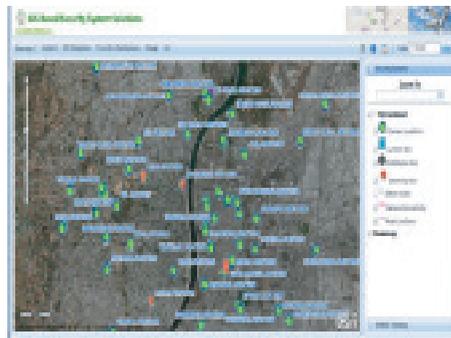
S. Rajavel
Senior Vice President and Head - WET IC

Smart City! Smart Communities! Smart Geography!

The Geographic Information Solution (GIS) offers advanced and user-friendly capabilities for smart city projects. The following shows how GIS helped in the implementation of smart city projects and describes its use in the construction of a large-scale model of the smart city. We provide centralized information system based on GIS (Geographical Information Solution) furnishing an IT framework which integrates not only every stakeholder but also every aspect of smart city processes – starting from conceptualization, planning and development to maintenance.

Dr. Pari and team receiving the award at GeoSmart Excellence Ceremony

Our Solution, GISSOM (Geographic Information Solution for Smart Operations & Management) is capable of supporting Operation and Maintenance activities of City Surveillance system by integrating NMS (Network Management System) and VTMS (Vehicle Tracking Management System). There are four modules in the system namely Asset Maintenance, Preventive Maintenance, SLA (Service Level Agreement) monitoring and Outage Impact. By integrating NMS with GIS system, the cameras which are not working are being identified and displayed in maps with geographic perspective along with the details of fault information. Integration of VTMS with GIS supports the fault restoration team to locate and rectify the cameras on the blink. Various reports listing Route history, Trip report, idle report, over speed report, cross district and state reports, etc., are made available to the users. The NMS integration also helps in achieving the SLA component.

One of our prestigious project has been Gujarat CSITMS (City Surveillance and Intelligent Traffic Management System). The broad scope of the project was to install IP based surveillance system & traffic solution at strategic locations, traffic junctions of Ahmedabad, Vadodara & Gandhinagar City to provide security to the citizens. Altogether, 255 cameras and 4 ANPR (Automatic Number Plate Recognition) have been installed. Now, the project is in O&M phase for which enterprise GIS solution is being used.

As-built asset information are captured with DGNSS based 3D scanning systems

Awards received at Construction Award Chicago (Left) and GeoSmart Excellence Award (Right)

Identify the location of the vehicle by querying based on the vehicle ID

Mobile App

A map based mobile app was developed for preventive maintenance of the asset activities. Site engineers inspecting an asset are guided with the help of predefined forms in the mobile app. Geotagged photos are captured using the app before and after inspection for verification. The details entered in the mobile app are submitted and synchronized to the web portal seamlessly.

Stay tuned for more updates on our projects as we give more meaningfull and actionable insights to business.
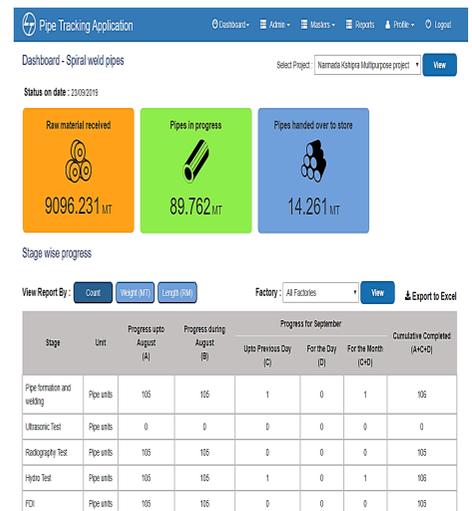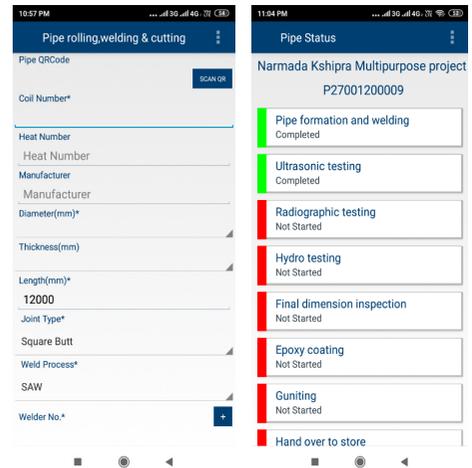
Pipe Tracking Simplified

With WET IC securing three mega irrigation projects- Kaalinsindh, Kshipra and Parwati from Narmada Valley Development Authority. It was felt that the economics of the project dictated in-house fabrication of all pipes at strategically located. The quality management and progress tracking was being done manually leading to lack of visibility and traceability of pipes and wield joints. Considering the huge volume, the IC felt that there was strong need for a digital solution.

We designed and developed the pipe tracking application to provide complete visibility of pipes from raw material to finished pipe. This solution covered the complete genealogy of every pipe and weld joint including the quality records at every stage. Each pipe is identified by a unique QR code and collecting the pipe data at each stage become as simple as scan QR and update. The historic information of every pipe is available at the tap of a button. The solution is a combination of a mobile app for QR scan and field updations and a web portal for monitoring dashboards, inspection records and masters management. The dashboards are updated on a real time basis and enable the management to monitor the progress regularly and take corrective action if required. The solution has configurable workflows (incl. rejection) for pipe processing based on the project requirement with role based access given to its users.

All in all, the pipe tracking application enables both quality and progress monitoring in one single application. It has reduced time and effort for site engineers for data updation in the field, provides real time visibility on progress and collects rich data for analytics. Data from the application can be analyzed to find out trends and patterns in quality and productivity.

The application is currently under implementation at the three ILWS MP projects and their corresponding factories. About 10% of the overall scope of pipes are on boarded and are being tracked live in the application. We are developing new modules in the solution to cover pipe laying activity for end to end coverage. Besides we also extended the application to monitor the pipes which are directly purchased from third party manufactures and are coated at our factories. The pipe tracking solution is dynamic and easily scalable for implementation in in any large scale piping projects in WET and other ICs.

Solution Screens

Implementation of Pipe Tracking Solution in WET IC

> "Congrats! To be deployed with all sincerety as this could help us in smooth and efficient execution of our projects. All the best!

K. Asok Kumar
Executive Vice President & Head - WET IC