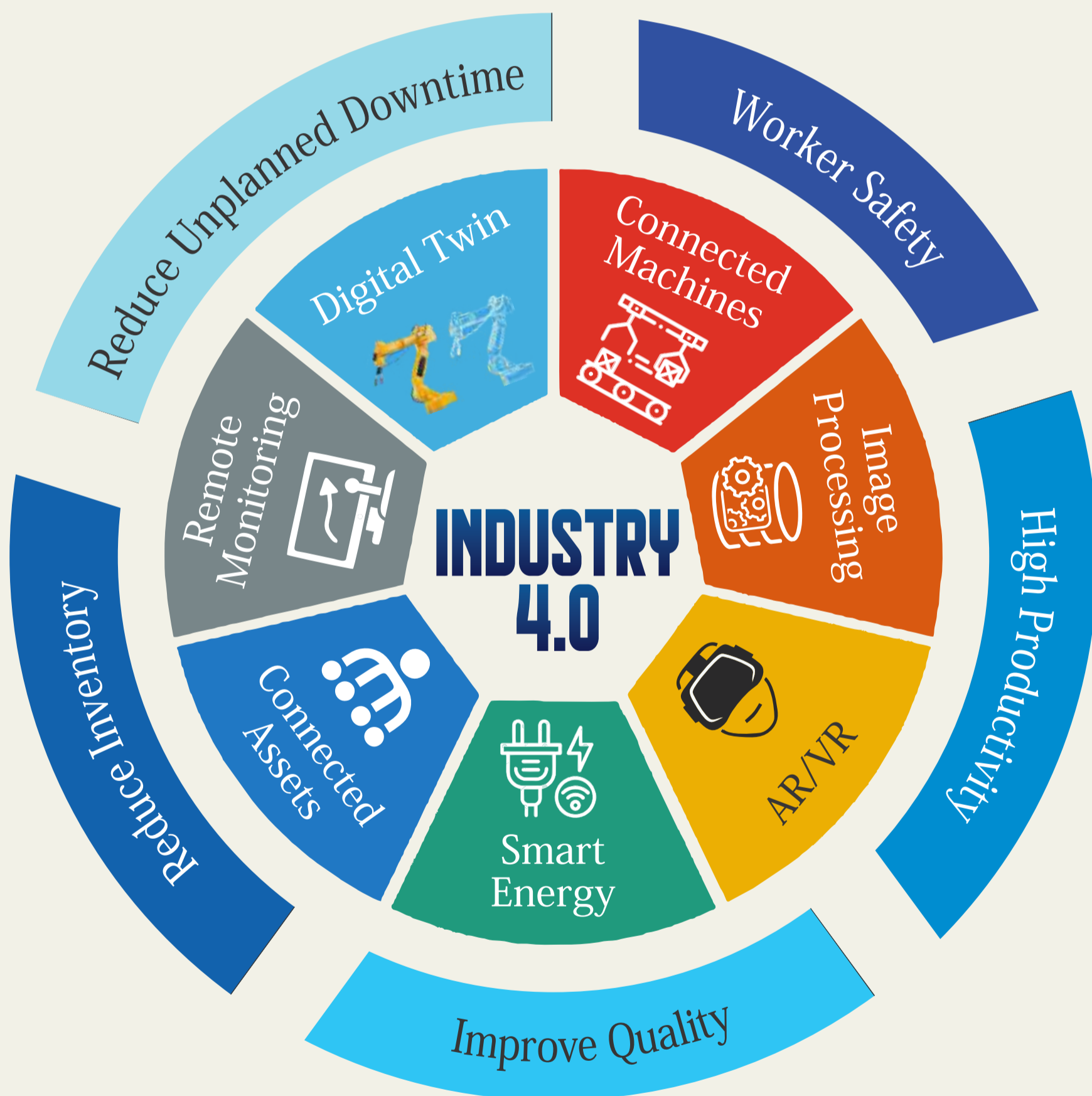


INDUSTRY 4.0

Transforming manufacturing with AI and IoT



Pipe manufacturer reduces unplanned downtime through shop floor digitization

India's leading PVC pipe manufacturer Aashirvad Pipes is the harbinger of innovation in water management. With a state-of-the-art factory spread across 40 acres, the company has an annual manufacturing capacity of 1,08,000 MT and manufactures a complete range of high technology and superior quality plastic piping systems for domestic and agricultural use. The manufacturing systems adhere to the highest level of international quality for a maintenance free life.

The company presented a specific challenge, which was addressed with the

help of IoT. The manufacturing unit required connectivity of 524 machines spread over 12 shopfloors. Until the time a sustainable solution was applied, there were manual, paper-based process, which often led to mismatches and delays in production & quality data.

Aashirvad Pipes approached a solution partner having capability to provide required connectivity along with AI/ML capabilities. All selected machines were connected with data landing on Aashirvad's platform showing dashboard.



Key Takeaways

- Digitized shop floor operation, mitigating paper trails
- Provide real time monitoring of different machines on single dashboard
- Provide analytics around quality, productivity & OEE
- Alerts about machine downtime and create analytics to predict the downtimes
- Hourly, Shift-wise, Daily, Monthly, Quarterly & Annual reporting of operational metrics
- Ability to view specific parameters from historical data
- Be able to access from anywhere through internet connection – on mobile, tablet, laptops

Impact of IoT on the Shopfloor:

- Understand data & operational flows. Document current manual processes that needs to be Digitized for a more efficient Shop Floor operation
- Setup data collection flows from ChipBOT to ChipHUB along with manually entered data points via ChipTAB
- Configure & Customize analytics modules to generate reports and publish aggregated data on CRUNCH APP; Train Cognitive Models with process and machine data for predictive analytics
- After piloting with a subset of machines, go live in a phased manner to cover all shop floors across the country

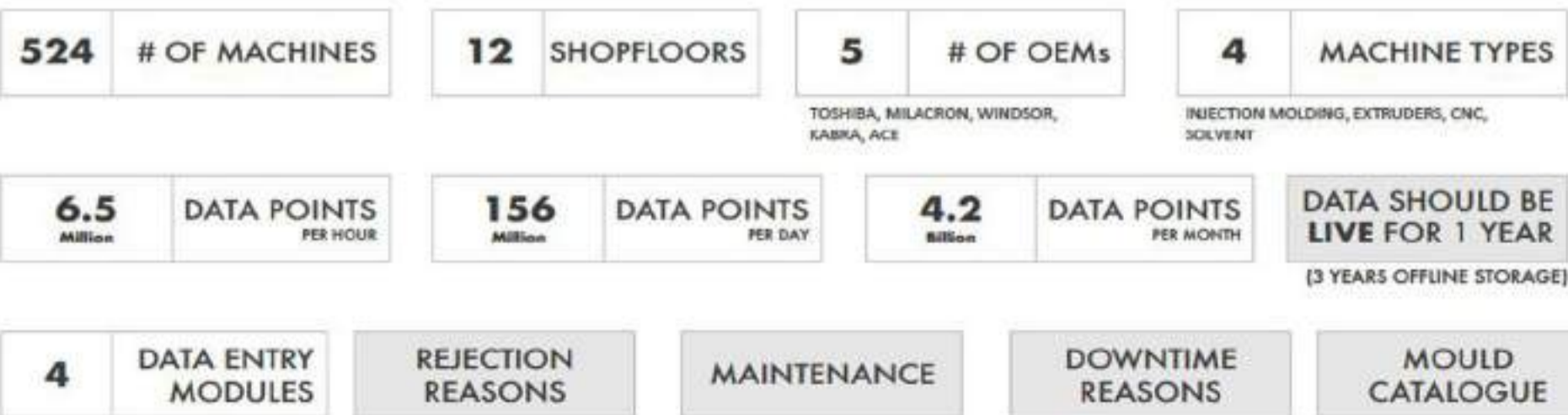
Discoveries Made By Chipster Technologies

- Number of Machines – 524
- Shopfloors – 12
- Number of OEMs – 5
(Toshiba, Milacron, Windsor, Kabra, Ace)
- Number of machine types – 4
(Injection Molding, Extruders, CNC, Solvent)
- Data Points Per Hour – 6.5 Million
- Data Points Per Day – 156 Million
- Data Points Per Month – 4.2 Billion
- Data Entry Modules – 4

Reasons for Rejection:

- Maintenance
- Downtime
- Mould Catalogue

* Details shared by Chipster Technologies, Bangalore



Creating A digital twin for a Aviation Major

A Europe based aviation major was looking to improve rates of Quality Gate and Work Closure. Quality gate performance for some assembly operations were quite erratic due to several issues such as late start of assembly process, supplier delinquencies and missing parts.

This required a complete assembly operation modelling as process twins using AI & ML, using non-linear and inter dependent relationship between different workstations, till the output of assembly line. The goal was to predict the impact on downstream workstation on the basis of output of an upstream workstation, and to predict the quality gate on the basis of current parameters and understand the gap for green quality at the quality gate

Key Benefits achieved:

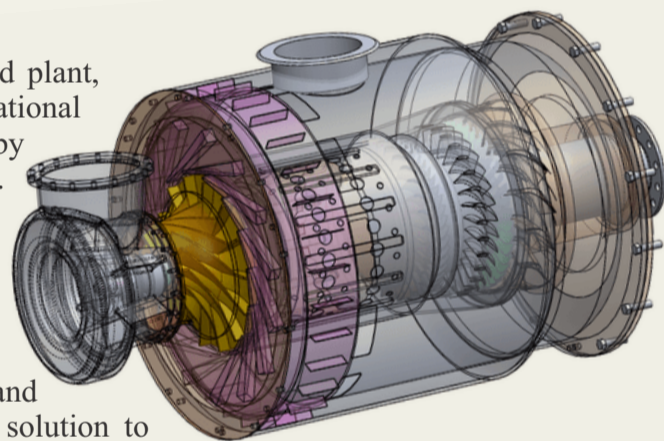
- Quality gate pass rate improved by 15%

* Details shared by Neevee, Bangalore



Using digital modeling to identify challenges in turbines

In a 30MW coal-fired plant, there were some operational challenges reported by the plant managers. Turbine vibration levels gradually increased by 200% within one month of servicing. Despite regular diagnostics and SOPs, there was no solution to this issue.



Eventually, a model was created to analyze all the upstream and downstream process data. The main challenge identified was in the LP heater being used. Adjusting the settings in the LP heater caused the vibrations to reach normal level. Creating a digital model was able to deliver the desired results and identify the problem areas without having to go through any plant shutdown

Key Benefits achieved:

- Prevention of breakdown and plant shutdown
- Prevention of mechanical damage to turbine
- Quick issue resolution

* Details shared by Exactspace

Quality optimization for a leading chemical process company

A major global manufacturing player into chemical processing was experiencing challenges in quality controls and checks. Due to below par internal quality inspections, there were increased customer rejections due to which losses to the company were mounting to hundreds of millions each year.

A process model was created and all the manufacturing process data, including the data about input material was used for analytics purpose. Historical data about failure was also used to create the baseline. This was to reduce the rejection on account of poor quality, and achieve visibility into quality issues during manufacturing itself, to allow corrective action

Key Benefits achieved:

- Reduction in quality related customer complaints by 40%
- Reduction in in-house quality rejection by 15%

* Details shared by Flutura Technologies



Predictive Maintenance for Transformer by creating Digital Twin

Sansera Engineering in Bengaluru, a leader in manufacturing of precision forged and machined components. At their facility, one critical transformer of 2500KVA was catering to the entire LT load, for which Sansera wanted to use predictive maintenance. Using data from different energy meters installed on transformer, a digital twin was created. The twin used current signatures from different meters for its analysis. Once the model was fully trained, it could detect anomalies using current signature itself to identify equipment faults and operational inefficiencies due to imbalance and low power factor. The goal was to avoid production losses due to unscheduled downtime, reduce maintenance costs and optimize energy costs by improving operational efficiency.



Key Benefits achieved :

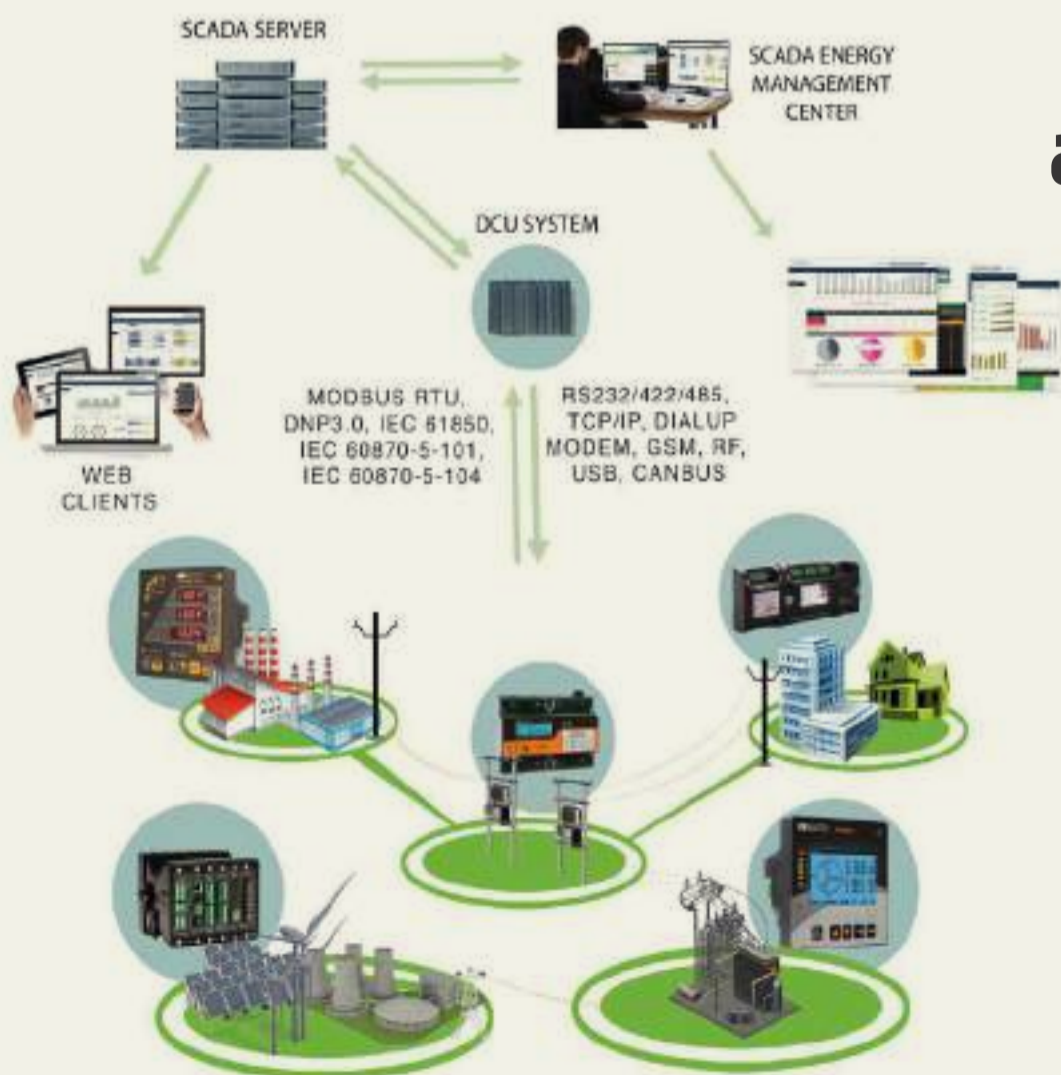
- Within few days of operationalization, the model identified the imminent breakdown. Since it were early days, the maintenance team did not act, leading to the breakdown in next few days and emergency actions
- Post this, the Sansera team decided to replicate predictive maintenance on remaining transformers
- The prediction reduces the maintenance effort from 8 days to 2 days and over \$ 6000 in DG operational costs

"Our relationship with our partner has grown from a small energy monitoring pilot to a large project covering and enhancing 9 of our plants today. It is the vision and perseverance of both organizations and the dynamic nature of solution that has brought us here"

- Inbaraj S Deputy General Manager - Sansera India

* Details shared by Ecolibrium Energy

Energy Monitoring and Management at different plants



A large manufacturing player is looking to analyze different plants for water, air, gas, electricity and steam consumption and to reduce the overall cost of management. The goal was to reduce OPEX by 3% of plant energy consumption and complete 28 site audits in four months globally.

For faster turnaround time, multiple IoT devices were installed to measure different parameters. The aggregated data was able to reach in once place for easier comparison and audit purposes. Through this solution, they were able to identify underperforming assets, and map utility costs to the product manufacturing, enabling more realistic pricing for the products

Key Benefits achieved:

- Estimated \$6.9m / year saving in energy costs
- Global monitoring on single dashboard

*Details shared by L&T Technology Services

Real Time Updates With CNC Machine Utilisation Helps Auto Major Yamaha Limit Downtime

Japanese auto and equipments manufacturer Yamaha has three major manufacturing units in Uttar Pradesh, Haryana and Tamil Nadu, under the name India Yamaha Motor. These manufacturing units face typical challenges and obstacles pertaining to floor efficiency and performance optimisation. Yamaha turned to Digital Technology to seek solutions.

Adoption of dynamic technologies has addressed these challenges in a cost-effective and time-conducive manner, making manufacturing processes efficient. Recently, the Uttar Pradesh manufacturing unit was looking to reduce its unplanned downtime, and did so by enhancing CNC machine utilisation.

*Details shared by Auring Technologies

“Getting real time information about the machines running in our factory is critical but a complex task. We trusted our partner for that, and they delivered as expected.”

-Lalit Sharma, Head of Emerging Technologies, Yamaha

Live Updates for Enhanced Performance & Monitoring

Using the data collected in the cloud, a real-time dashboard was created, which showed hourly shift and day Overall Equipment Effectiveness (OEE) and Overall Line Efficiency (OLE). There was real-time capturing of machine-cycle time with real-time display of part count (both faulty and passed). Machine level losses were monitored hourly, shift-wise, daily and monthly for the purpose of RCA, in addition to pareto analysis of failure reasons.

Eventually, with real-time capture of rejection reasons and downtime information, maintenance activities were recorded and tracked digitally. This helped develop an accurate measure of machine settings for a mold as well.

Additionally, the installation of a connected device gave a glimpse into production history, with real time notifications and machine alerts.



Real Time Monitoring Through CNC Controller



Plant managers reported not being able to obtain real-time updates, which led to delayed understanding of mismatches. Manual recording of shift parameters and consequent checking of the same created at least a 30-minute shift lag, apart from leading to errors typically associated with manual entry processes.

In its NCR plant, Yamaha has been using CNC machines from Brother. These CNC machines were connected using IoT devices for real time monitoring, with data being transported to the cloud. Overall 40 parameters from each machine were collected, with a 30-second polling interval.



Increasing Asset Utilization in Construction Company

InfraPrime Logistics, a Gurgaon-based logistics and electric vehicle startup, is driven to minimise rising pollution levels by deploying heavy-duty electric mega trucks – the first of its kind to be integrated and deployed in India. The mega trucks in infrastructure development are concentrated on selected routes which would enable the team to setup and expand its proprietary charger network. Further, due to frequent loading, the team envisages vehicle charging time to have no impact on vehicle utilization.

One of the challenges they faced in the course of deploying trucks was the inability to track location, operational hours and condition of machines in realtime. Moreover, tracking geo-fencing violations and idle time of the trucks was also not possible – but this data was essential to the fleet managers to understand resource deployment and plan cost optimization measures.

They solved this challenge by installing an IoT device with SIM card and GPS was retrofitted to each asset to be monitored.



Impact of Sensors on Trackable Assets

- a. Real time location of each asset, including time stamp for last location
- b. History of asset usage - total run and idling time
- c. Geo fencing rules and real time alerts
- d. Seamless auditing of each asset
- e. ERP integration for maintenance log

Immediate Success Metrics

- f. Reduced downtime
- g. Reduced idling, leading to higher revenue per asset
- h. Reduced cost of ownership

*Details shared by EnrichAI



Utility company increases revenue through automated energy reading

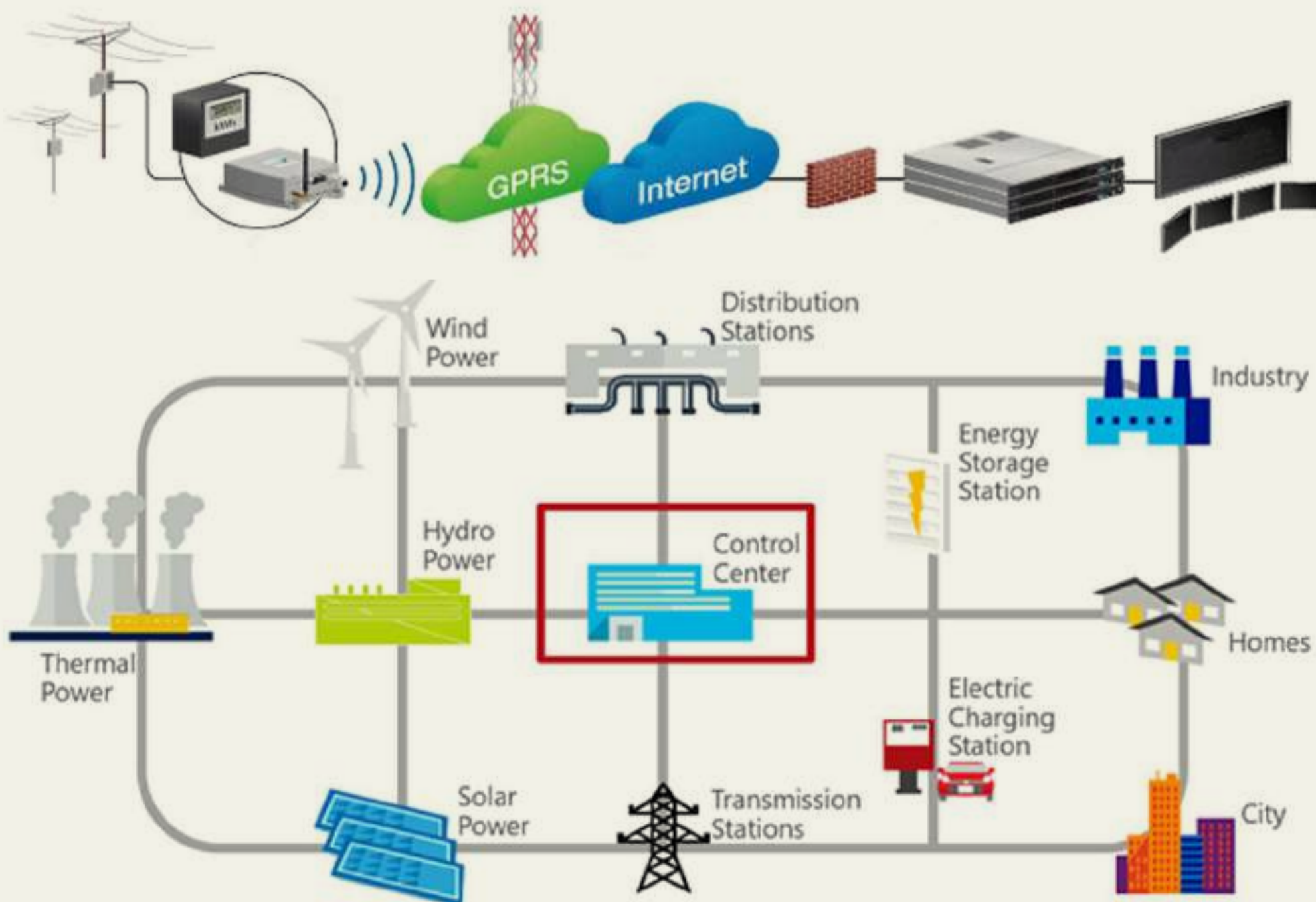
A utility company looking to automate meter readings in a factor. One of the main challenges was to transition from manual recording to automated recording in the cloud. Each meter fitted with LoRA based device, connected to LoRA base station which subse-quentially transferred data to cloud through LTE. This led to hourly, daily, weekly, monthly and quarterly energy consumption database. In addition, the trends analysis for energy requirement prediction and Irregular usage reporting was also monitored. Additionally, generation of online billing and payment for each customer, with customization as per specific customer needs was also achieved.

Key Benefits Achieved:

- Labor cost saving
- Accurate reconciliation and elimination of dispute
- Theft prevention
- Forecasting energy demand and prevention of blackout



*Details shared by EnrichAI



Refrigerator manufacturer using Image Processing to speed up quality inspection

A refrigerator manufacturing company looking to automate quality inspection. A specific challenge identified was to transition from manual inspection of refrigerator main cabinet and door to an automated one. In order to achieve this, two cameras were placed that captured images of the refrigerator door and interior body on conveyor belt. The most common problem seen was that specific parts like shelves or door usually get missed out during manufacturing process. Ideally, the system should be able to identify such a problem and immediately interface with the conveyor to stop assembly line. It should also be able to eliminate a drop in quality due to manual inspection

*Details shared by Qualitas



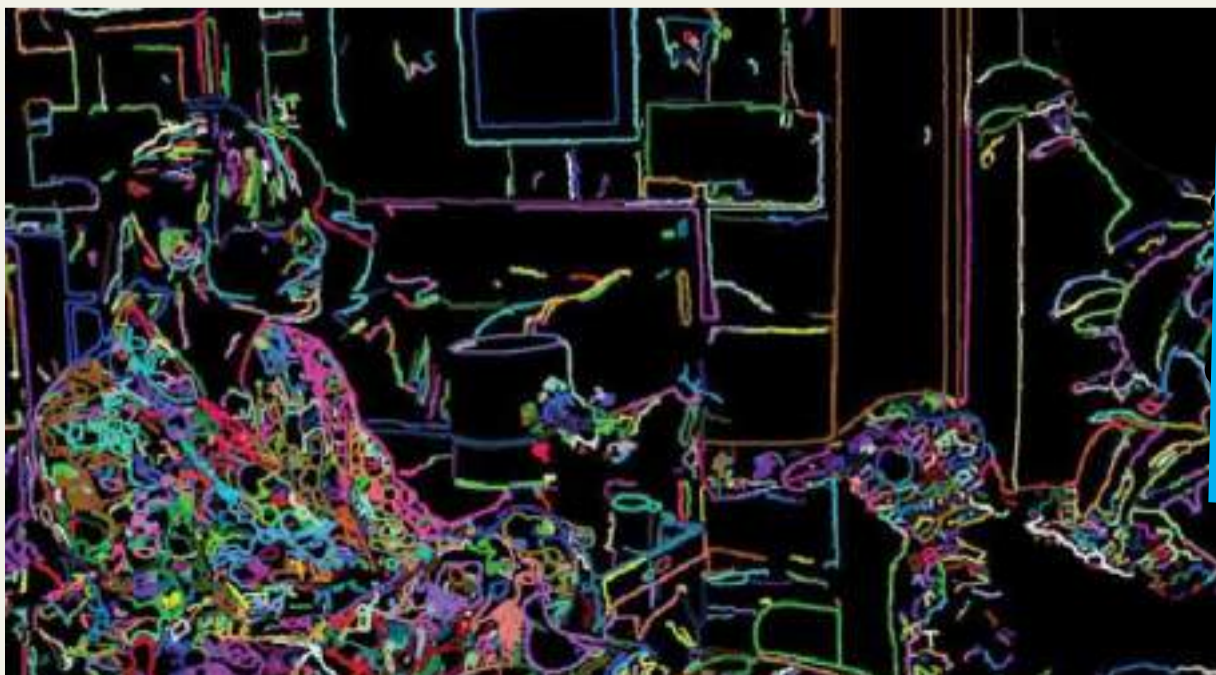
Inspection of Internal Parts of Refrigerator

2 cameras that are capturing images of a refrigerator door and body are checking for the presence and position of internal parts (like shelves, manuals, cabinets, etc). If a part is found to be missing, it will interface with the conveyor to stop the assembly line.

Speed: 12 parts/min

Technology Used: 2d Image Processing + Artificial Intelligence

Watch on



Key Benefits Achieved:

- Eliminated the missing out of the situation where refrigerator with missed out shelf or any other part would get shipped
- Labor costs saved

Godrej secures its manufacturing premises against fire, leakage

Leading Indian conglomerate Godrej Group was keen on securing its manufacturing premises against leakage and fire. Late detection of issues like smoke & chemical leakage can cause fire. In addition, violation of safety instructions by personnel leads to injuries and mishaps on site.

One particular time, there was a fire in one of the chemical factories that led to huge losses and eventual shutdown of the factory.

The company was keen on avoiding such incidents, and wanted to deploy a long term solution.

* Details received from Integration Wizards

Customer Expectations:

- Realtime monitoring of fire, with immediate notification to administration, along with ability to notify authorities.
- Detection of leakages / smoke
- Detection of safety instruction violations by the on-ground personnel like not wearing helmet An AI/ML based solution that uses existing CCTV network and analyses video feed to identify the fire / smoke / leakage situations and safety instruction violations was deployed. The system was able to analyse 28 million images per day for fire & smoke detection.



Key Benefits achieved:

- Fire & smoke detection time reduced to 30 seconds
- Automatic notification to relevant authorities makes for faster intervention
- Detection of safety violations and corrective actions lead to cost saving for the company by eliminating serious physical losses

DASHBOARD Today : Jan 3, 2019

<p>2 FIRE VIOLATIONS DETECTED</p> <ul style="list-style-type: none"> 16:04 pm, Jan 3 2019 1 violation detected in Boiler room 02:13 am, Jan 3 2019 1 violation detected in Assembly 10A 	<p>15 HELMET VIOLATIONS DETECTED</p> <ul style="list-style-type: none"> 15:09 pm, Jan 3 2019 1 violation detected in Assembly 10A 13:56 pm, Jan 3 2019 3 violation detected in Assembly 2B 11:26 am, Jan 3 2019 2 violation detected in Manufacturing unit 3 10:57 am, Jan 3 2019 5 violation detected in Manufacturing unit 1 <p style="text-align: right;">+ 11 more</p>
<p>7 SAFETY VEST VIOLATIONS DETECTED</p> <ul style="list-style-type: none"> 15:11 pm, Jan 3 2019 1 violation detected in Manufacturing unit 1 15:05 pm, Jan 3 2019 1 violation detected in Lab 12A 12:12 pm, Jan 3 2019 5 violation detected in Assembly 3 09:31 am, Jan 3 2019 2 violation detected in Assembly 2 <p style="text-align: right;">+ 3 more</p>	<p>30 LABEL VIOLATIONS DETECTED</p> <ul style="list-style-type: none"> 15:09 pm, Jan 3 2019 1 violation detected in Assembly 2W 13:58 pm, Jan 3 2019 1 violation detected in Assembly 1G 11:25 am, Jan 3 2019 2 violation detected in Assembly 3F 10:57 am, Jan 3 2019 3 violation detected in Assembly 4A <p style="text-align: right;">+ 26 more</p>

Leading Agro chemical manufacturer saves over \$10k by early identification of electrical faults in production motors

Raj Agro is one of the leading manufacturers and suppliers of agro chemicals. One of the challenges faced on site was unplanned downtime in motors, which cause heavy losses due to shutdown apart from high costs of repair.

The site managers at Raj Agro wanted to identify the potential electrical and mechanical failure in installed motor and narrow

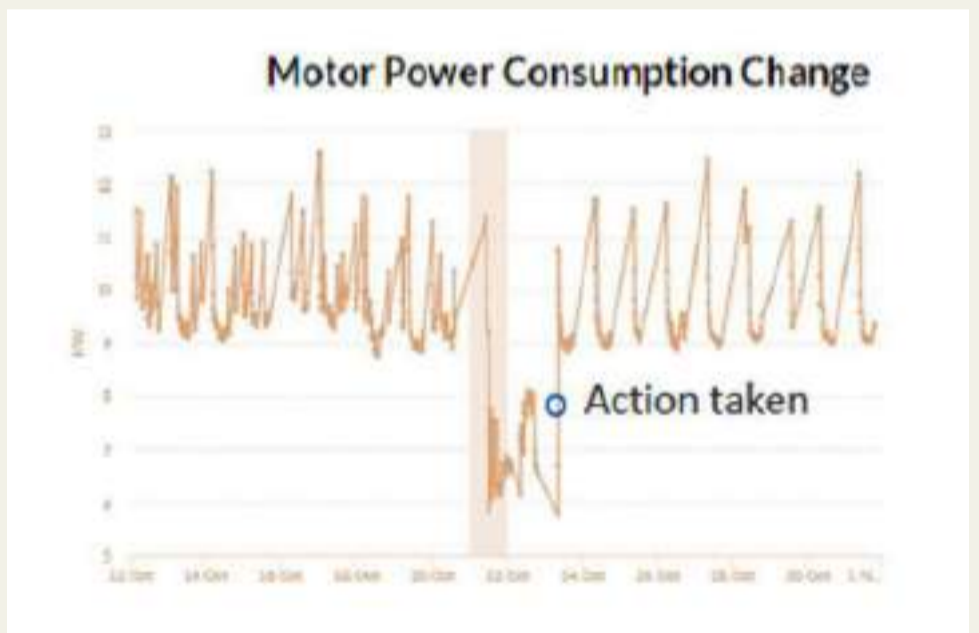
down on operational inefficiencies due to low power factor and load imbalance.

This challenge was addressed by collection of electrical data from the installed energy meter and eventually using AI & ML to create the digital twin to the motor

Key Benefits Achieved:

- The system provides alerts for over-loading, over-voltage, under-loading
- Identifies situations of mechanical fault, electrical fault, abrupt load shift
- In one instance the system identified a degradation event in one of the motors running crushers for sulphate and raised an alarm. The operator noted the event, which led to change of motor without loss of any production time
- Realignment and timely replacement led to energy saving for the user

* Details received from Ecolibrium



Bajaj motorcycle reduces the dispatch time

Leading auto manufacturer Bajaj motorcycle had a unique challenge at hand - a typical motorcycle unit dispatches over 8,000 motorcycles in a day, with over 10,000 motorcycles being stored in the yard. While dispatch data is usually available, the presence of a massive yard results in dispatch personnel having to search for the motorcycles manually. This causes immense loss in valuable personnel time. Moreover, the available data does not pinpoint the exact location where motorcycles are stored. During the peak season, manual data gathering leads to errors, increasing the risk of incorrect dispatches.

Eventually, a solution integrated with the SAP system was installed at Bajaj. A number of ultra-wideband tracking devices were installed at the plant to zero in on the exact location of the motorcycles, and all the data was available on a single tablet that was present with the operator at all times.

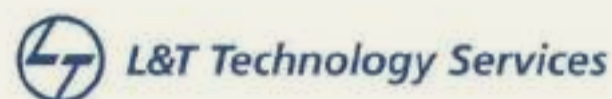
Key Benefits achieved:

- Reduced the dispatch time by over 30 minutes per dispatch order
- Reduced the errors associated with manual intervention

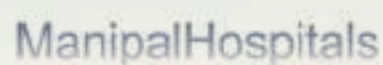
*Details shared by Integration Wizards



Our Partners



Innovation Partners



FOR FURTHER INFORMATION CONTACT:

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