

Industry 4.0 Challenges and Opportunities

Knowledge Lens



Our Panellist



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Agenda

1

Industry 4.0

Overview, Benefits ,Challenges and Solution Architecture

2

IIoT Opportunities

Problems, Solutions and Benefits across industries

3

Current Implementations

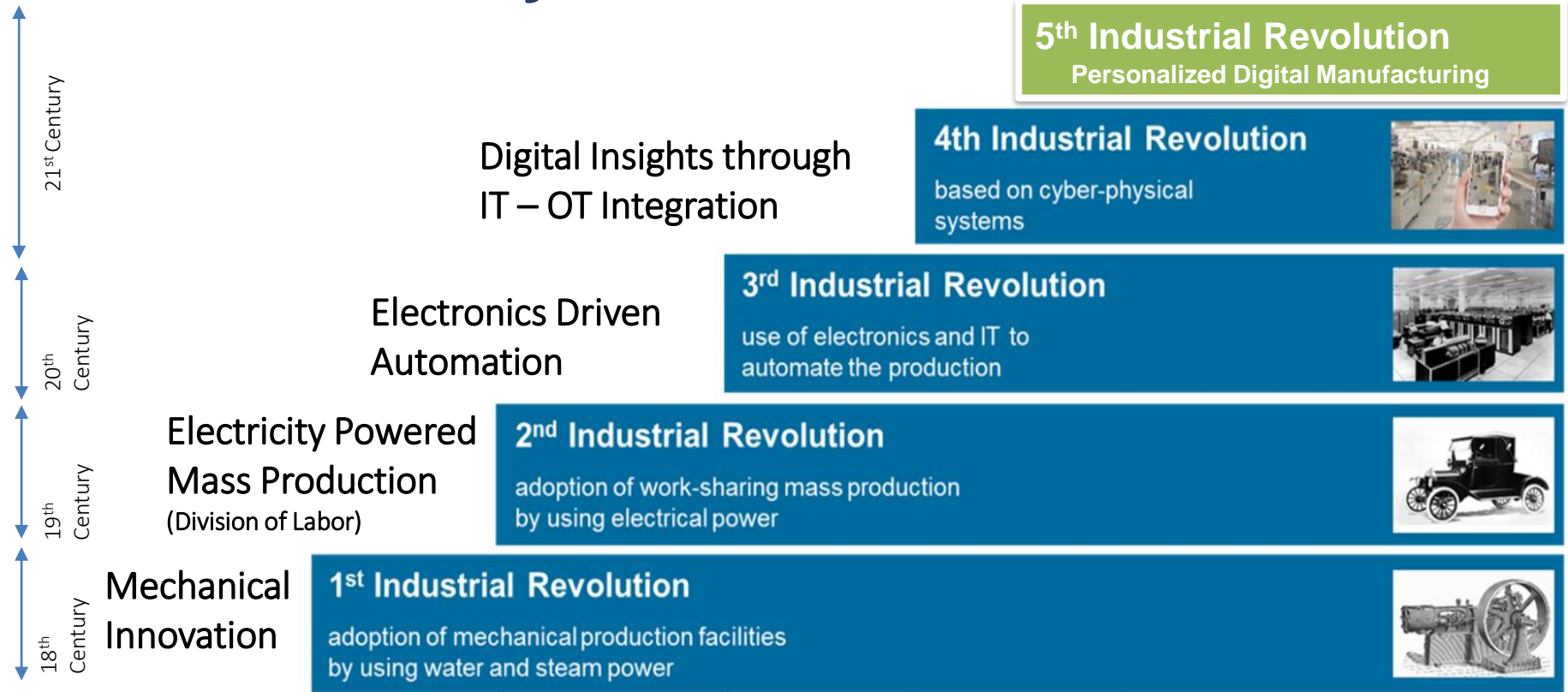
Our implementation experience and case studies



Industry 4.0

Overview, Benefits and Challenges

What is Industry 4.0?



“Almost every aspect of business will be profoundly changed by digitization and the IoT. Efficiency will increase, quality will improve, innovation will accelerate, costs will drop. Companies late to **adopt fourth industrial revolution, digital enterprise, or IoT techniques** will be left in the dust by competitors that got it a bit sooner,” *Chuck Byers, CTO of OpenFog Consortium*

Industrial IoT

Smart Factory

Connected Enterprise

Connected Factory

Industry 4.0

Smart Manufacturing

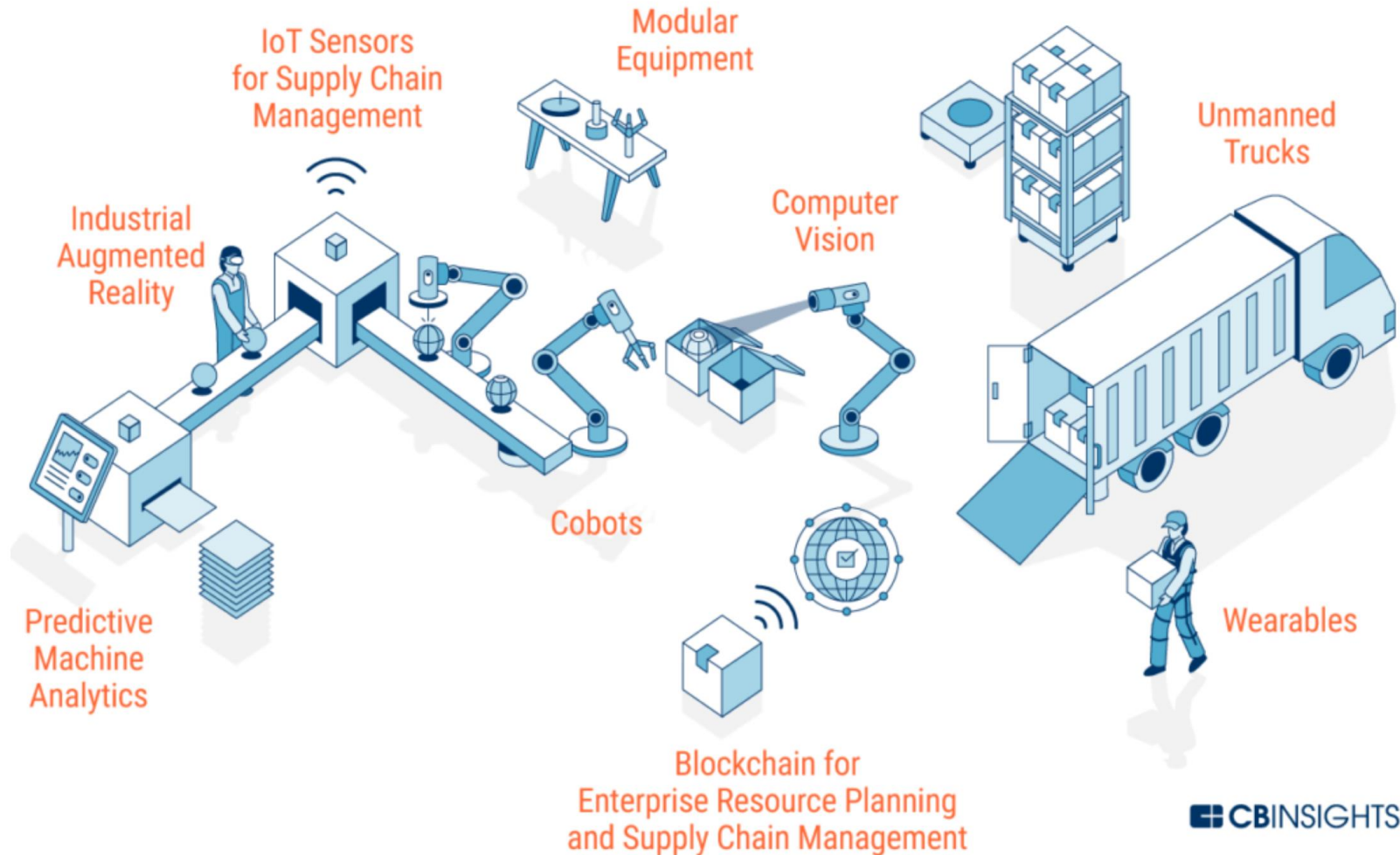
Manufacturing 4.0

M2M

Digital Twin

Terminologies

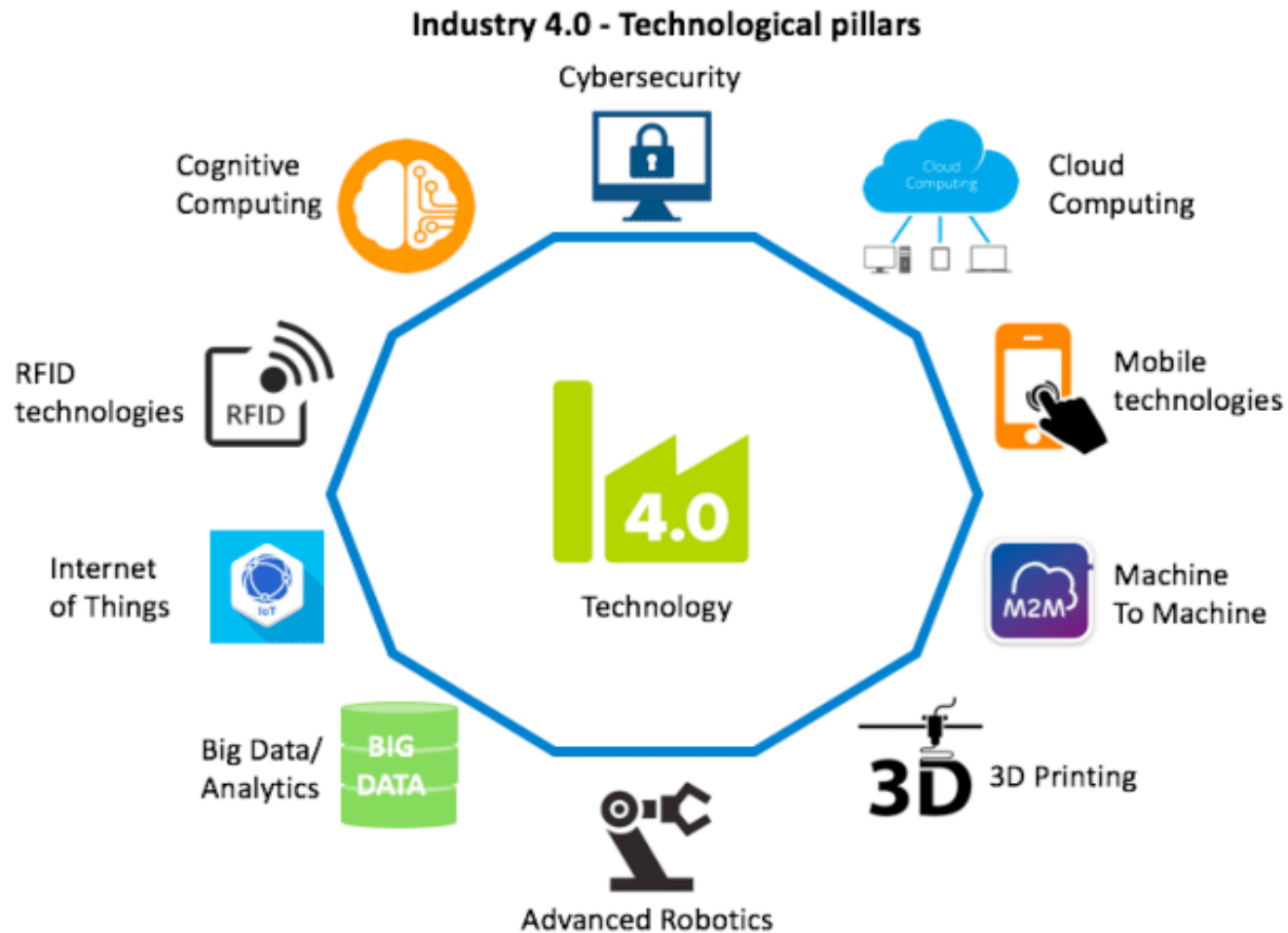
Industry 4.0- Factory of the future!!



 CBINSIGHTS

Source: CBInsights

Enabling Technology Pillars



Source: researchgate.net

Digital Revolution & New Business Model

Digital disruption
has already
happened.



The world's largest
taxi company owns
no taxis
(Uber)



The largest
accommodation
provider owns no
real estate
(Airbnb)



Large phone
companies own no
teleco infra.
(Skype, WeChat)



Popular media
owners create no
content
(Facebook)



The fastest
growing banks have
no actual money
(SocietyOne)



The largest movie
house owns no
cinemas
(Netflix)



Largest software
vendors don't write
the apps
(Apple/Google)



Smart Manufacturer



Business Challenges for Manufacturing Industry



Shortening of Product Lifecycles



Reduction of Lot Sizes



Increase Diversity of Versions



Address Cost Pressure



Varying Machine Utilization



Shortening of ROI



Energy Efficiency



Environmental Concerns

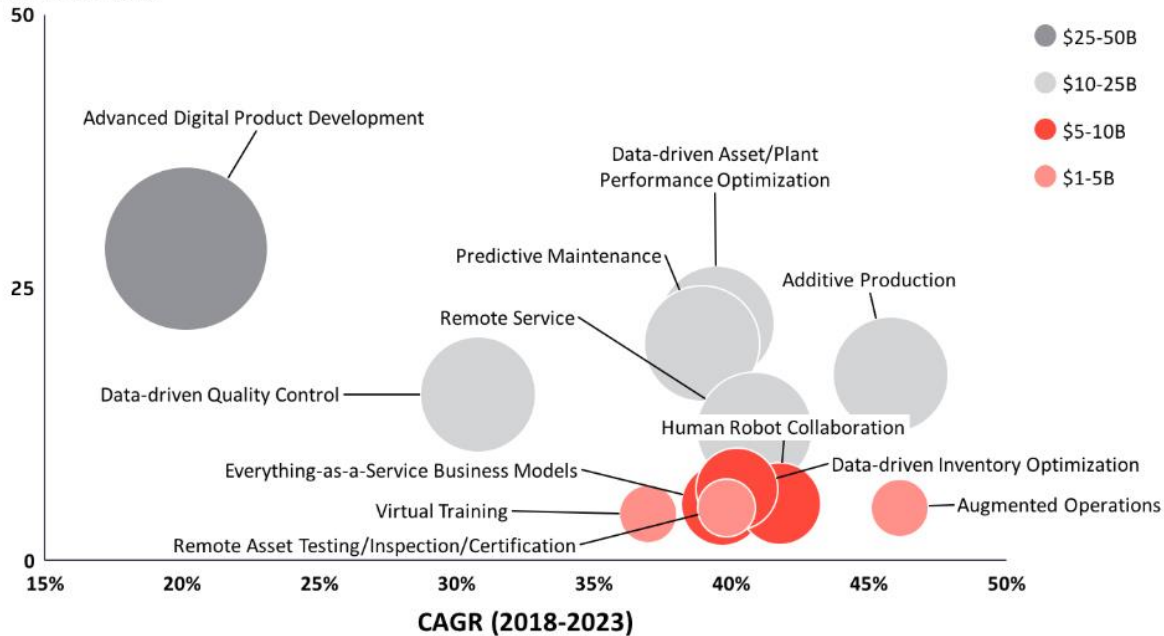
And now COVID19!!!

Industry Use Cases



Top 12 Industry 4.0 (I4.0) use cases

2023 Market Size (\$B)



Current Adoption Areas for Industry 4.0



Manufacturing
Operations &
Quality



Production
Asset
Monitoring &
Management

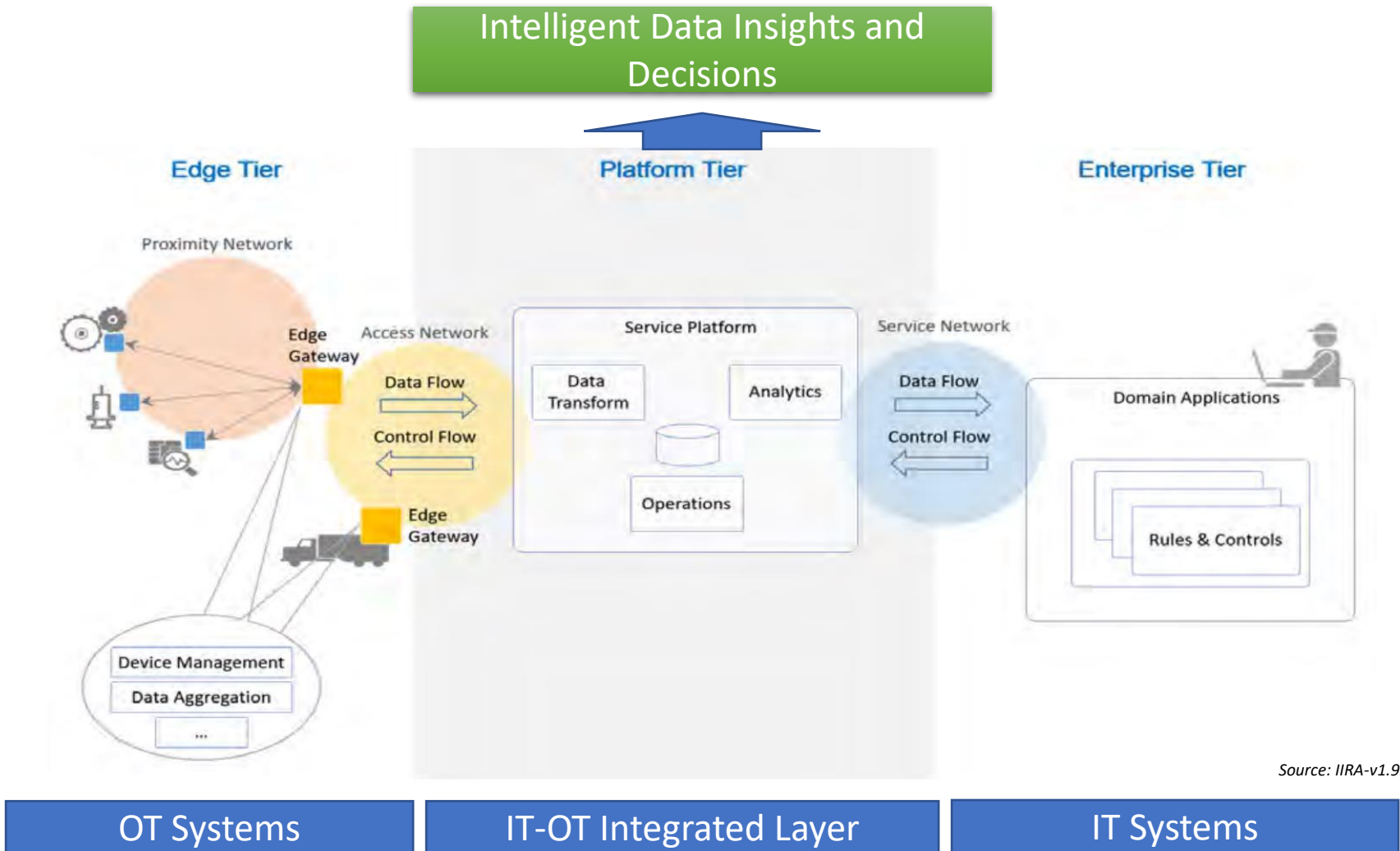


Inventory,
Logistics and
Transportation
Optimization

Key Benefits Realized by Industry 4.0

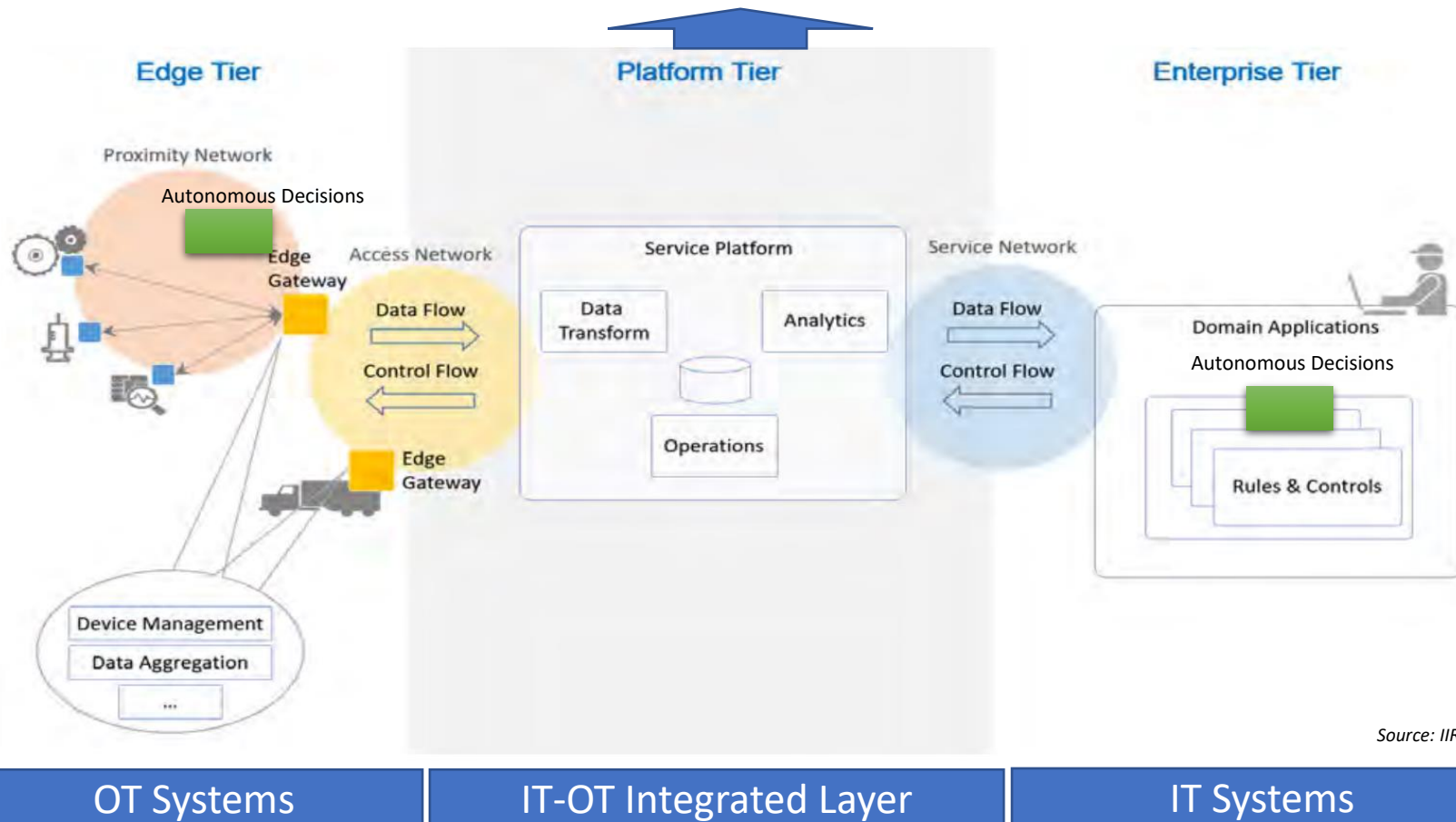


Conceptual View of Industry 4.0 Architecture



Conceptual View of Industry 4.0 Architecture

Intelligent Data Insights and Decisions



OT Systems

IT-OT Integrated Layer

IT Systems



Industry 4.0- Solutions

Key Solutions and Benefits

Top 5 IIoT Solutions that are changing the Manufacturing Industry



1. Manufacturing Operations: **Predictive Maintenance**



2. Manufacturing Operations: **Quality Inspection and Assurance**



3. IT-OT Integration: **Process Optimization and Benchmarking**



4. Employee Engagement: **Workplace Safety and Productivity**



5. New Business Models: **Connected Products/Services for Customers**

Predictive Maintenance



WHAT IS IT?

- Predict when maintenance has to be performed for any asset/equipment, before a failure or a breakdown actually happens
- This is done by training 'Machine Learning Models' on the sensor data collected and predicting 'Remaining Useful Life' of the assets



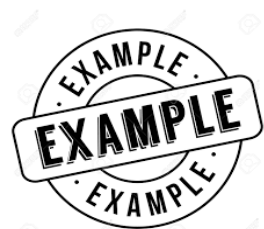
WHY IS IT NEEDED?

- Getting insights on failures and planning a maintenance schedule is still based on 'expert' knowledge of a few
- Data on failures and maintenance is siloed and not shared across the sites/plants



BENEFITS

- Getting insights on failures and planning a maintenance schedule is still based on 'expert' knowledge of a few
- Data on failures is siloed and not shared across the sites/plants



- A Large Oil & Gas major performs predictive maintenance of hundreds of costly assets deployed (specialized valves, motors etc)
- Offshore and onshore service engineers receive alerts for pre-issue maintenance tasks thus saving potential downtimes

Intelligent Quality Control



WHAT IS IT?

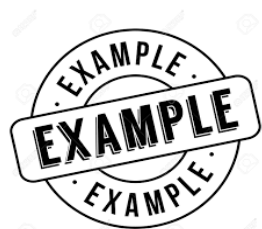
- Spot and identify quality issues close to real time
- This is done by collecting real time sensor data and applying statistical algorithms/Anomaly Detection/Computer Vision based models to trigger alerts to take corrective actions



- Quality Control is in many cases manual and labor intensive
- Defects are not consistently identified and before a correction action is taken, the amount of wastage typically is very high



- Reduce defect slippage and ensure quality compliance
- Capture data and build data foundation to make the system intelligent in the future, to predict issues based on process parameters



- A leading Industrial Automation Major performs Visual Quality Control on the electronic circuit boards printed
- Placement and counts for thousands of parts is checked and boards are automatically rejected

Process Optimization & Benchmarking



WHAT IS IT?

- Use real time data from OT to improve KPIs of critical business processes like inventory, supply chain etc
- Data from real time OT is combined with IT system data (e.g SAP) using tech. like Data Lake and insights obtained

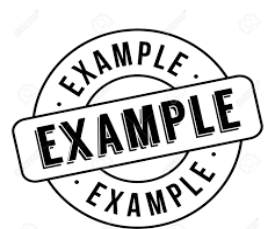


WHY IS IT NEEDED?

- Data from OT is in majority of the cases manually entered after adjustments
- Security concerns for getting data from OT systems is now addressed with recent technology improvements



- Define business KPIs and improve business processes like Variance Planning (Planned Vs Produced), Supply Chain Optimization, Inventory Optimization, Energy Optimization etc



- A leading Life Sciences major is integrating its process data with ERP systems to improve operation and business analytics
- KPIs defined and piloted in 1 plant, will be rolled out across plants as a benchmark

Employee Safety and Productivity Improvement



WHAT IS IT?

Leverage IIoT and Digital technologies to:

- Ensure safety of workers in plants and avoid workplace accidents
- Improve productivity of workers by digitizing their day-to-day operations using Electronic Log Books

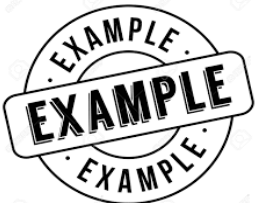


WHY IS IT NEEDED?

- Safety compliance is mostly monitored manually and leads to workplace accidents
- Most of the data entry operations by shop-floor employees is still paper-based



- Use Computer Vision to monitor compliance to safety metrics
- Data from Electronic Logbooks can be automatically analyzed, aggregated and shared with other plants/Head-quarters for best practices/benchmarks



- A leading Cement Major is using AI based vision systems to monitor compliance of Personal Protective equipment for workers operating in hazardous areas, at very tall structures etc

New Business Models: Packaged Services/Products



WHAT IS IT?

- Industries are coming up with innovative business models by taking sensor data and personalizing it for their customers.
- Done using a combination of IoT, Datawarehouse, AI/ML and Mobility/Wearable technologies

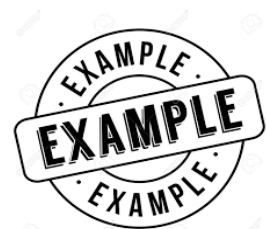


WHY IS IT NEEDED?

- Competitors are bundling this as feature differentiation (e.g connected car)
- Every industrial company has to become a 'Data and Analytics' driven org. to survive in the future



- Rich and personalized experience for customers
- Helps to differentiate or defend against competition
- Opens up new business models and helps the org. become data rich



- A leading vehicle manufacturer is combining data from its vehicles to look for anomalies and presents insights to customers in a mobile app
- Business model is to package extended warranties and cross-sell services/parts proactively based on the data generated

Revolutionizing IoT & AI for Industry 4.0



- 010
01010
01010
010
- REAL-TIME ANOMALY DETECTION
- CONVERSATIONAL AI - NLP, CHATBOTS
- SMART INDUSTRIAL SAFETY AND SECURITY
- PREDICTIVE MAINTENANCE
- AI-DRIVEN VIDEO ANALYTICS
- FACIAL RECOGNITION
- SMART VISITOR MANAGEMENT
- SUPPLY CHAIN LOGISTICS
- IMAGE CLASSIFICATION
- HAZARDOUS WASTE MANAGEMENT

- SMART DEVICE CONNECTIVITY
- INDUSTRY 4.0 WEB SCADA AND DASHBOARD
- EDGE COMPUTING WITH GATEWAY
- FAILURE PREDICTION IN MANUFACTURING
- AUGMENTED REALITY
- SMART ENERGY MANAGEMENT
- DIGITAL TWINS

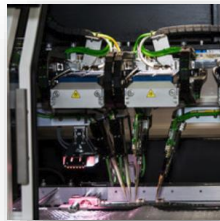
- BLOCKCHAIN PROVENANCE
- ENTERPRISE BIG DATA SOLUTIONS
- CLOUD, DEVOPS, CONTAINERIZATION

Knowledge Lens Solution

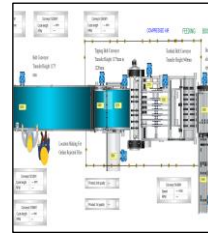
iLens Industrial IoT Platform

Unified Industrial IoT Platform for Smarter Solutions!!

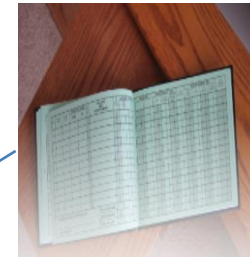
- Predictive Equipment Failure Prediction
- Anomaly Detection for Machine Performance
- Product Quality Deviation Prediction with AI



Predictive Maintenance



Secured remote Monitoring & Cloud Historian



Digital Log books

- Digital logbook at the plant or Batch Manufacturing Records
- Shop floor machinery data maintained in a Data Lake – an Unlimited Historian



Intelligent Apps

- Operational Efficiency – OEE
- Process Analytics – SPC etc.
- Energy Monitoring & Optimization
- Inventory & Logistic Optimization
- KPI Dashboards
- ERP Integration



Edge Analytics



Condition Based Monitoring and Real Time Alerting

- Condition based Real-time alerts and Alarms
- Insights using configurable alarms, events and business driven workflows.

- Connectivity to any device (DCS, PLC, SCADA, Sensors)
- Protocol Agnostic Connectivity – (OPC, Modbus, MQTT, Serial etc.)
- Secured IT-OT Integration with Data Diodes
- Remote Web SCADA/HMI



Intelligent Apps

Knowledge Lens Industry 4.0 Suite

Sudheesh Narayanan Admin

Apps

Search apps...

Native Apps

- OEE Dashboard**
OEE is a measure of how well a manufacturing operation is utilized compared to its full potential, during the periods when it is scheduled to run.
[Launch](#)
- E-Logbook**
An electronic logbook is a computer-based software program for recording (logging) states, events and values.
[Launch](#)
- Machine Fault Prediction**
Artificial Intelligence based Hydrolic Motor Failure Event Prediction
[Launch](#)
- Anomaly Detection**
Artificial Intelligence based Anomaly detection
[Launch](#)
- Personal Protective Equi...**
- Flare Monitoring**
- Intrusion Detection**
- Attendance Management**

Digitize the logbook at the plant or Batch Manufacturing Records

The screenshot displays the Knowledge Lens Industry 4.0 Suite interface. The top navigation bar includes the user profile of Sudheesh Narayanan (Admin) and the date Monday, April 13, 2020, 12:21 PM. The main dashboard shows a grid of E-Logbooks for various products, categorized by status (RUNNING or STARTED).

Products 4

Product ID	Colour	Design	Cup Weight	Start Time
JK112753	UR04 ST/BR	WABISABIO4	200	25-03-2020
SD112854	SC/LS	ORIGAMI-04	250	
Soft carpet	SC/LS	ORIGAMI-04	200	
MQ-001-K	UR04 ST/BR	1x1 TEXTURE	250	

The interface also features a sidebar with navigation options: Dashboards, Apps, Things, SCADA, Alarms/Events, and Pipeline Builder. The main content area is divided into 'Plants' and 'Lines'.

Activity Log for Product JK112753:

- Feeding (Completed)
- Primary coat (Completed)
- Pre-Dryer (Completed)

Operator Entered Parameters:

- Soft_Carpet_Weight: g/m2
- Width: metres

Property Parameters:

- CAMPEN Product - Design: WABISABIO4
- CAMPEN Product - Colour: UR04 ST/BR
- CAMPEN Product - Cup weight: 200

Machine Captured Parameters:

Outlet U-box	Outlet Steamer	Inlet accumulator 1				
Device Name	Set_Tension (KG)	Act_Tension (KG)	Device Name	Set_Tension (KG)	Act_Tension (KG)	Device Name
Outlet_Ubox	NA	NA	Outlet_steamer	NA	NA	Inlet accumulator_1

At the bottom, there are buttons for 'Cancel' and 'Finish'.

Plant Operational Insights and Centralized Plant Management

Transformer
Unit : 43170 kWh

Generator
Unit : 720 kWh

Basement Meter

SSB Meter 4th Floor
Voltage : 422 V
Current : 4 A
Unit : 50517 Wh

AC Meter 4th Floor
Voltage : 422 V
Current : 4 A
Unit : 48155 Wh

Air Conditioner
Count of ac 0

Other Appliances

Navigation: < Back, Orient Cements, Hira Sugar Mill, Grow Bench-1

User: Sudheesh Narayana Admin

Notifications: 10, 5, 84, 8

User: Sudheesh Narayanan Admin

50 %

CAMPEN

Inlet accum 1

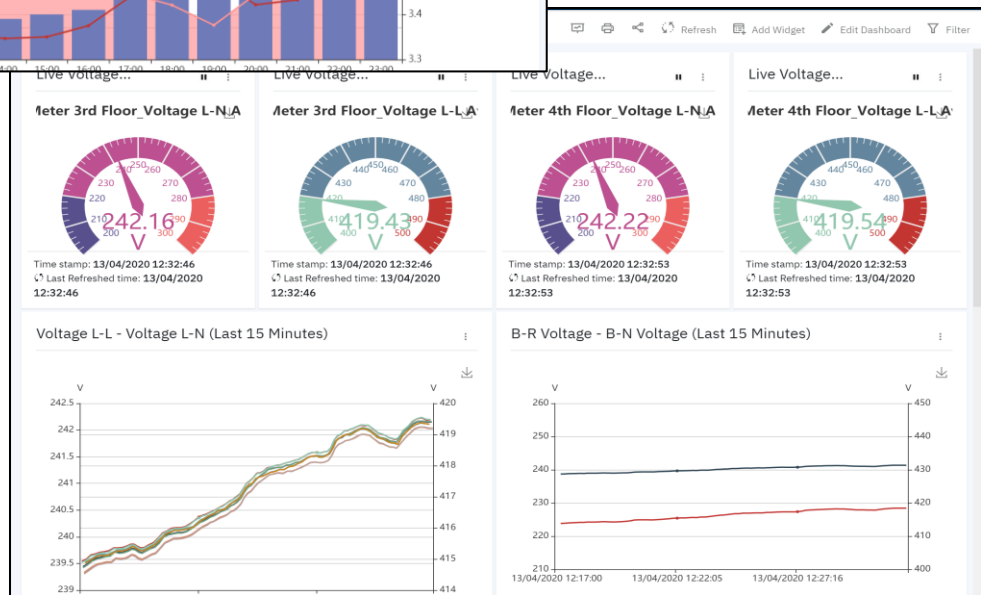
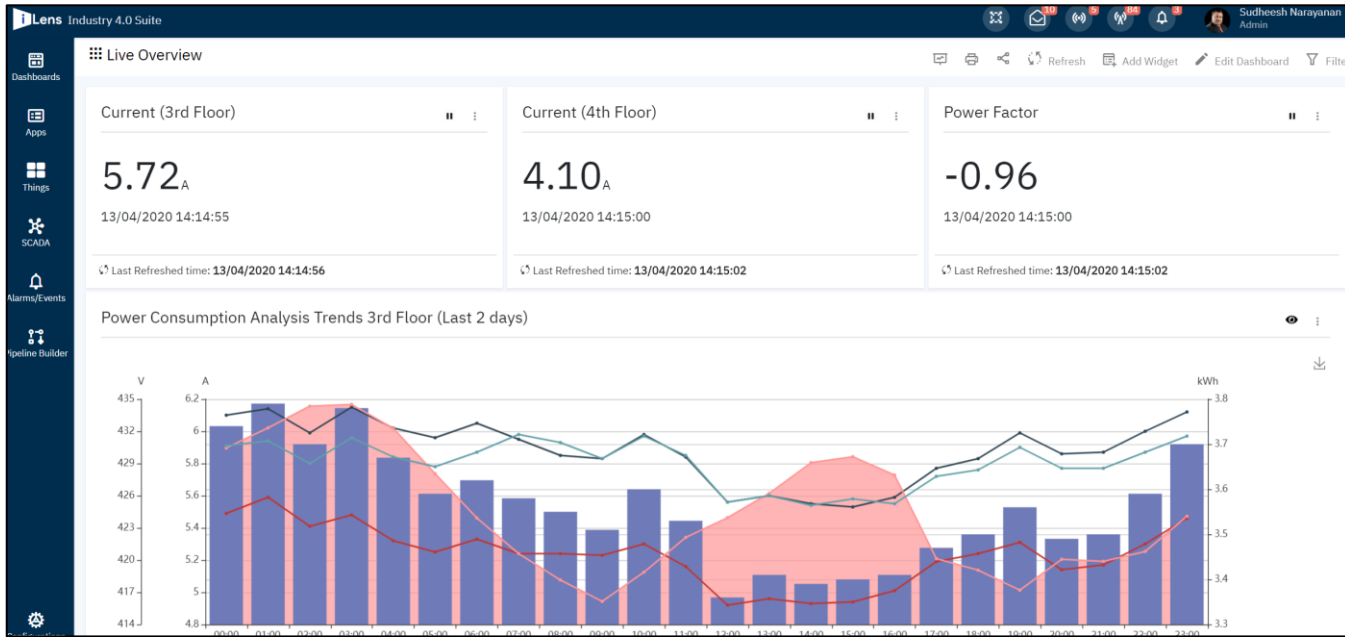
Inlet accum 1(kg): 7 4

Outlet Accumulator: 4 5

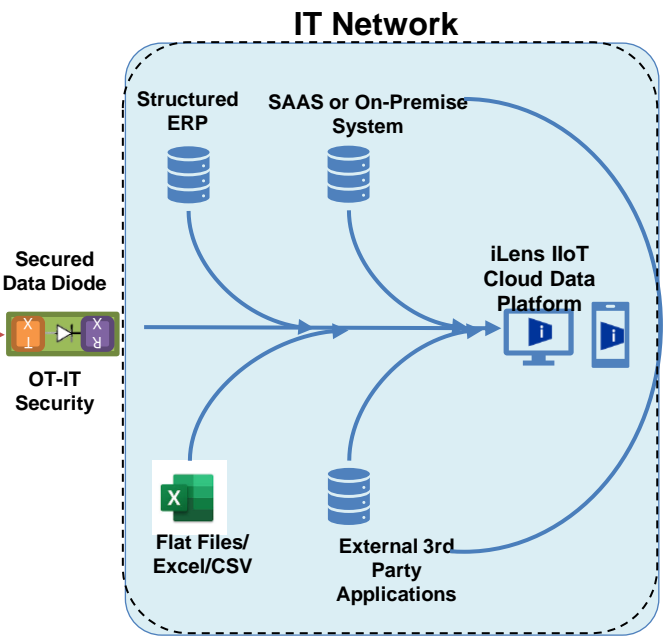
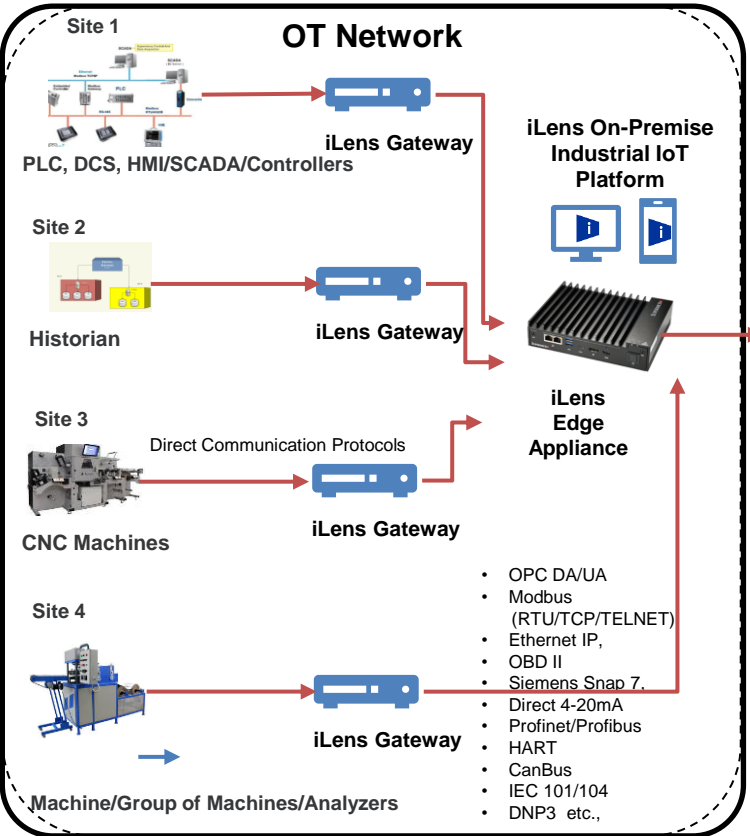
Dryer Temp (°C) Upper		Fan speed (Hz) Right	
Left	Right	Left	Right
422	244	422	244

Dryer Temp (°C) Lower		Lower	
Left	Right	Right	Right
422	422	244	422

Secured Remote Monitoring and Visualization



Architectural view of the Solution



- Connectivity to any Device, Anywhere with Edge Analytics**
 Hardware/Protocol agnostic platform
- Secured IT/OT Integration using Data diode**
 Sensor network secured from public network
- Secured Remote Monitoring & Control**
 Real Time Monitoring and Control of plant systems. SSAE-16 and ISO27001, PCI and HIPAA compliant
- WEB SCADA/Remote HMI**
 Integrated Remote View of the Control Room Graphics and Utilities
- Electronic Logbook/ MER**
 Digitize the various Factory shop Logbooks or Batch Manufacturing Records
- Predictive Maintenance or Quality Issues Detection**
 Detect anomalies, predict upcoming maintenance events using machine learning algorithms
- Real-time alerts/alarms**
 Predictive Alerts to Operators for operation anomalies or breakdowns or quality issues

THANK YOU!

Reach out to us at

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