EcoStruxure™ Plant

How to turn industrial automation into a business growth opportunity
Presenters

David Orgaz
Senior Vice President
Process Automation
Schneider Electric Asia Pacific
@davidorgaz
Follow me on LinkedIn

Pawan Mathur
Vice President & Head (E&I)
Technical & Monitoring Cell
Ultratech Cement Limited

Harpreet Singh Gujral
Senior General Manager,
Control & Automation
Ultratech Cement Limited

Kwangmin Park
Instrument Technical Manager
SK Innovation
IIoT & new business opportunities
24% is the forecast compound annual growth rate (CAGR) until 2021 for the global IoT services market.¹

64% of executives believe failure to leverage digital transformation will cause their companies to struggle for survival.²

²Source: https://www.accenture.com/us-en/service-industry-xi
Digitization is unlocking a new level of benefits, helping your business go from…

From reactive to proactive
From on-site to mobile and remote
From site by site to Enterprise
From limited to a new scale of computing and artificial intelligence

Confidential Property of Schneider Electric | Page 6
It’s about more than applying technology…
Data is increasingly available but significantly underutilized

The average cost of IoT sensors is falling

<table>
<thead>
<tr>
<th>Year</th>
<th>Average cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'04</td>
<td>1.30</td>
</tr>
<tr>
<td>'06</td>
<td>1.25</td>
</tr>
<tr>
<td>'08</td>
<td>1.00</td>
</tr>
<tr>
<td>'10</td>
<td>0.75</td>
</tr>
<tr>
<td>'12</td>
<td>0.50</td>
</tr>
<tr>
<td>'14</td>
<td>0.25</td>
</tr>
<tr>
<td>'16</td>
<td></td>
</tr>
<tr>
<td>'18</td>
<td></td>
</tr>
<tr>
<td>'20</td>
<td>0.38</td>
</tr>
</tbody>
</table>

2004 average cost: $1.30
2020 average cost: $0.38

Source: Goldman Sachs, BU Intelligence Estimates

Companies across the industry still use only a fraction of the data

Source: McKinsey & Company
EcoStruxure Plant
Mastering the digital future of Industry
Engaging on your Digital Transformation along 3 axis…

**SMART CONTROL**
From real-time process and operational efficiency control to real-time operational profitability control

**EMPOWERED WORKFORCE**
Tools and information in a format that is easily actionable to turn plant personnel into business decision makers.

**OPTIMIZED ASSETS**
When smart control and empowered workforce solutions are applied asset to asset, upward through the plant, and to the C-suite, performance of the entire industrial enterprise is optimized.

…doing it SAFELY, SECURELY and SUSTAINABLY
UltraTech case study
Ultratech Cement Limited

- UTCL is the consolidation of the Aditya Birla Group’s Cement Business.
- Largest manufacturer of grey cement, Ready Mix, Concrete and White Cement in India.
- Installed Capacity ~105.9 MTPA in India.
- World 4th Largest Cement Producer Group.
- The Group has operations across India, UAE, Bahrain, Bangladesh & Sri Lanka.
- India's largest exporter of cement
Who are we?

- As the largest Cement Producer in India, we continually strive to play a key role in finding effective and responsible ways to preserve the environment. Ultratech Voluntarily joined the Cement Sustainability Initiative (CSI), a part of World Business Council of Sustainable Development in 2006.
- With an Increased focus on Safety, the Company is collaborating with Dupont Sustainable Solutions towards enhancing Organizational Safety Best Practices.
- To maintain our market leadership & Cost Competitiveness, we continuously modernize by implementing innovative ideas in existing units, execution of new projects and acquisition.
• Operational Cost pricing Pressure
• Productivity challenges - Despite efforts to improve energy efficiency
• Megatrends driving cement growth are population, urbanization, Infrastruxure & technology
• A Changing Workforce demographic - Millennials will be the majority of the workforce by 2025.
• Data is increasingly available, however significantly underutilized
Connect Everywhere to achieve organizational KPI’s and Goals through digitization:

- Safety of people and equipment
- Maximum uptime of plant and equipments
- Operational Efficiency Improvement
- Energy Efficiency
- Asset Health Monitoring
- Predictive & Preventive maintenance practice
- Advanced data analytics to improve operational performance
- Augmented & Virtual reality for training and maintenance
Integrated Cement Plant with capacity

- 2.8 MTPA of Clinker production
- 3.5 MTPA of Cement Grinding
- 13 MW of WHRS

Mechanical OEM Suppliers

- Thyssen Krupp – Pyro-Processing
- IKN – Cooler system
- Loesche – 4 Nos. VRM Mills
- Macmet – 8.2 Km Long Over Land Belt Conveyor
Our Approach

• Selection of Latest Art of Technology for the plant machinery and equipment.
• Adoption of Best Engineering practices available across the World.
• On Schedule delivery of the equipment and its erection & commissioning
• Implementation of PSSR (Pre Start Safety Review) Checks for each equipment trial to make it Ready to Operate.
• Vertical Safe and trouble free Start-up with all pre-tested systems.
• Set Standards, develop and propagate world best practices across the existing plants and new projects.
• Seamless 3rd party device integration with no impact on the scan time.
The Solution – EcoStruxure Hybrid DCS
leveraging the Modicon PAC platform

- EcoStruxure Hybrid DCS (PES) with customized Cement Library.
- Ethernet-based, energy aware architectures.
- Modicon M580 controller iMCC Integration, 3rd party connectivity.
- Global Database for engineering, operation and maintenance.
Our Command Control Centre – Dhar Plant:

- EcoStruxure Hybrid DCS (PES) provides a bird eye view of entire plant and is “the ear and the eye” of an operator.

- 14 Nos. Modicon M580 controllers along with 15000 hardwired IO’s and 15000 soft IO’s are connected to PES global database.

- Seamlessly connected systems:
  - ~1300 iMCC feeders
  - ~100 sub control systems,
  - ~800 smart sensors
EcoStruxure Plant – our benefits

EcoStruxure Plant Architecture implemented in our plant in the first phase of our Digital Transformation, which has provided us with:

- Rugged Hardware Modicon Platform
- Integration of sub control systems, iMCC, Sensors, analyzers, weighing systems for stable operation.
- Open Ethernet based network architecture to drive full data transparency.
- Energy aware Hybrid DCS bringing information of production and energy
- Increase operational and maintenance efficiency with Cyber secured system.
We are now ready to engage in the second phase of our Digital Transformation Roadmap leveraging advanced apps and digital services on top of future ready EcoStruxure Plant platform.

Our Future Needs of Digitization:

1. We are exploring with Schneider Electric for Asset Monitoring, maintenance response center, advanced data analytics applied to operational performance, Process optimization & Augmented reality for routine maintenance.

2. We're exploring with Schneider Electric for Asset Monitoring, maintenance response center, advanced data analytics applied to operational performance, Process optimization & Augmented reality for routine maintenance.
SK Innovation case study
Introduction of “SK Innovation”

SK innovation

- E&P
- R&D
- B&I

SK energy
- Refining & Marketing

SK global chemical
- Petrochemical

SK Lubricants
- Lubricants

SK incheon petrochem
- Refining & Petrochemical

SK trading international
- Trading

6,500 employees
42 billion dollars
1,150,000 barrels/day
Introduction of “SK Innovation”

Well Balanced Portfolio

- Korea’s No.1 Refinery
- Central Role in Petrochemical Industry
- Global No.1 Group III Lube Base Oil
- Superb Technology in Battery & LiBS

Global Partnering & Network

- Global Partnership
  - Petrochemical: Sinopec (China), SABIC (Saudi), JX (Japan)
  - Lubricants: Repsol (Spain), Pertamina (Indonesia), JX (Japan)
  - Battery: Beijing BESK Technology

Diversified Feed Sourcing

- Industry-leading Competitiveness by refining more than 50 types of crude oil to produce top quality petroleum products
- Operational Excellence with business stability & efficient production to maximize profitability
Introduction of Turbo Machinery Control (TMC)

Turbomachinery Control Scope

- Mechanical Retrofit and Protection
  - Actuator with LVDTs

- Prime Movers
  - Steam Turbine
  - Gas Turbine
  - Motor
  - Hydro-Turbine

- Driven Equipment
  - Generator
  - Compressor

- Auxiliaries
  - AVR
  - Compressor Performance

Apps, Analytics And services

Edge Control

Connected Products

EcoStruxure

- Triconex Safety System
- Sensors & RFID
TMC in “SK Innovation”

Before using TMC

- Individual single systems for governor, anti-surge, sequence
- T.T.V Governor V/V
- Anti-surge Valve
- Steam
- Turbine
- Compressor
- Relay Sequence (S/Up, S/D, Trip)
- Governor Controller
- Anti-surge Performance Controller

After using TMC

- Integrated TMR System & HMI for governor, anti-surge, sequence
- T.T.V Governor V/V
- Anti-surge Valve
- Steam
- Turbine
- Compressor
- TMC
  - Sequence, Governor
  - Anti-surge, Performance
- HMI
TMC in “SK Innovation”

- Relay Sequence (S/Up, S/D, Trip)
- Governor Controller
- Anti-surge Performance Controller

TMC Integrated TMR System & HMI

- User customized control logic & HMI
- Easy to analyze logic & simulate
- Easy to maintain TMR system
- Effective managing spare parts
- Effective troubleshooting with SOE
TMC in “SK Innovation” – Best Practice: Surge Test

We could take more operation margin and save utility by surge test

- Surge margin was bottleneck for operation
- Surge Test → Find real surge limit line → Take more operation margin & save utility

[ Before Surge Test ]

Surge Limit Line
Surge Control Line

[ After Surge Test ]

More margin
We could solve the problem by our suggestion and co-work with Schneider Electric

- OP was in right side of SCL, however, anti-surge valve was opened until 11%
- Analyze logic with simulation → Suggest Schneider to change logic
  → By co-work with Schneider, find the reason and solution (increase ASV close rate)
TMC in “SK Innovation” – Best Practice: Managing Parameters

We manage the parameters by using summary pages

- All parameters are summarized in summary pages
- Every turn-around, we check which parameters were changed in operation
- We can track when the parameter was changed using software
We developed “start permissive” monitoring for easy to preparing start

• As Schneider Electric standard, only start permissive status can be monitored in HMI (Yes or No)
• We added the current value of transmitters and each setpoint → Easy to start
We designed VMS monitoring screen for high visibility

- Monitor current vibration, temperature and alarms from VMS (Vibration Monitoring System)
SK Energy is deploying Turbomachinery solutions from Schneider Electric based on EcoStruxure to

Maximize Operator Efficiency
• Customized and enhanced HMI

Maximize Asset Performance
• Integrated TMR System and HMI
• Removed bottlenecks (surge margin)
• Easy to analyze logic & simulate

Maximize Asset Reliability
• Easy to maintain TMR system
• Effective managing spare parts
• Effective troubleshooting with SOE
As conclusion
Leverage EcoStruxure Plant to engage on your Digital Transformation

**SMART CONTROL**
From real-time process and operational efficiency control to real-time operational profitability control

**EMPOWERED WORKFORCE**
Tools and information in a format that is easily actionable to turn plant personnel into business decision makers.

**OPTIMIZED ASSETS**
When smart control and empowered workforce solutions are applied asset to asset, upward through the plant, and to the C-suite, performance of the entire industrial enterprise is optimized.

...doing it SAFELY, SECURELY and SUSTAINABLY
Learn more about digital transformation by visiting the EcoStruxure Plant hub and attend to the hybrid or process guided tour.
Kickstarting your digital transformation with EcoStruxure Plant Hybrid DCS

Bringing together the best from the PLC and DCS worlds and combining it with integrated energy management features to deliver superior value throughout the life cycle of your plant.
Implementing smart control
Put data in context to unlock new levels of operational efficiency in your plants

Leveraging an energy aware EcoStruxure Plant architecture to combine process and power to gain new insights into your process and eliminate energy waste at the source of overconsumption.
### Case Study: Empowering Operators at Sasol Infrachem

#### Progress in your digital transformation
Leverage IT/OT convergence to move from realtime process control to realtime profitability Control

<table>
<thead>
<tr>
<th>Month</th>
<th>Measure</th>
<th>Empower</th>
<th>Improve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Month 1</td>
<td>Month 2</td>
<td>Month 3</td>
</tr>
</tbody>
</table>

#### ~$6.1M Energy Cost savings
Asset Centric Object model: logical representation of the physical machines, equipment, and plant assets

Unique real-time navigation services provide operators with contextual information

Open and extendible

Consistency from integrated objects

Standardization and reusability enforced by object model

Focus on sustainable efficiency with comprehensive change control and propagation

Empower your workforce - the right information at the right time
Digitize your plant with EcoStruxure Hybrid DCS
Empowering your workforce – taking it to the next level…

**EcoStruxure Augmented Operator**

- **Downtime Prevention**
- **Improved Service Speed and Quality**

**Avoid costly downtime** by looking inside the machine without opening a cabinet door.

**Reduce amount of time spent searching** by accessing digital specs and user manuals from tablet.
Driving maintenance excellence
Air Liquide, Leveraging IIOT to realize value from predictive asset analytics and modeling

Our predictive asset analytics maintenance and decision-support platform enables personnel to make smarter business decisions.

Your benefits:
- Improve Operational Reliability and Availability
- Reduce unscheduled downtime
- "Right size" maintenance efforts

This is what a bearing failure looks like.

And this is how to ensure it never happens again... a bearing through the eyes of our predictive analytics model...empowering your teams to take early and effective action.

Confidential Property of Schneider Electric | Page 43