Convergence of IT and OT Across Information and Control in Modern Campus Power-Plant Operations

Tom McDonnell
Power and Energy Industry Leader
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ROCKWELL AUTOMATION IN POWER AND ENERGY

World’s largest company focused on industrial automation.

Point Technology Solutions for ACIS, SCR, TIAC
CHP Microgrid Hospital
50 MW CSP
Large Scale Hydro Globally
Remote Monitoring & Control of Wind and Solar
20 MW CHP (2016 CHP Plant of the Year)
Simple Cycle
2.6x1 CCGT 840 MW

Rockwell Automation supplies technology and services in all phases of Power Generation and Industrial / Institutional Energy
Trends and Pressures

**MARKET**
Global Competitiveness
Opportunities and challenges in changing global landscape

**WORKFORCE**
Talent Shortages & Skills Gap
Global challenge hiring and retaining

**RISKS**
Changing Risk Patterns
Highly publicized and expensive incidents worldwide

**TECHNOLOGY**
Industrial Internet of Things
IoT value at stake and growth of internet enabled assets

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**220,000**
New engineers every year until 2022 to connect the unconnected
*The World Bank Studies*

**70%**
Suffered a security breach in the last year
*Ponemon Institute Survey*

**11%**
Of worlds economy in 2025 will be provided by IoT
*McKinsey & Co*
Business Risks and Drivers

Realizing Smart Operations has become a business imperative

**$65B**
Automation systems reaching end of life

**~75%**
U.S. plants are more than 20 years old

**$20B**
Cost of unscheduled downtime

**2 Exabytes**
Big data generated in manufacturing

**<14%**
US Plants completely integrated

**21%**
Suffered a loss of IP in the past year

SOURCE: ARC

SOURCE: Industry Week

SOURCE: ARC

SOURCE: McKinsey

SOURCE: Industry Week

SOURCE: Kapersky (2014)
Global Initiatives

**Intended Outcomes**
- Faster Time to Market
- Lower Total Cost of Ownership
- Enterprise Risk Management
- Improved Asset Utilization

**Industry Consortia**
- Smart Manufacturing Leadership Coalition, NNMs
- Industria 4.0
- Produktion 2030
- Made Smarter
- ABii - Associação Brasileira de Internet Industrial
- China Manufacturing 2025
- Manufacturing Innovation 3.0
- Industrial Value Chain Initiative (IVI)
- Make in India

**Internet of Things**
- World Forum
- Industrial IP Advantage
- Industrial Internet Consortium
- MESA International
The Modern DCS is essential in the evolution of the Connected Plant as the foundation for transforming data into business value for improved asset utilization. Across all power generating assets, a Modern DCS is the source of the data with its single integrated platform to aggregate data. Historically, a plant control system provided an infrastructure that captured, analyzed, and contextualized data at its source. With the convergence of information technology (IT) and operational technology (OT) systems and the increase of intelligent devices, the *ecosystem of data is expanded exponentially*.
DIGITAL TRANSFORMATION

Enterprise Infrastructure

One Common Environment

Automation Infrastructure

HIERARCHICAL – HISTORICAL DATA

TRANSPARENT – LIVE DATA

EXECUTIVE FINANCE

OPERATIONS QUALITY IT

ENGINEERING MAINTENANCE OPERATOR

IoT INFORMATION INFRASTRUCTURE
REAL-TIME DATA
Voltage, Kwh, Running Time, Temperature, Vibration

INFORMATION
Contextualization
Energy/Product

SCALABLE COMPUTING
Control, Edge, Cloud

OPTIMIZE
KNOWLEDGE
Analytics
Predict Bearing will Fail in 10 Hours

TECHNOLOGY + PROCESS + PEOPLE
All within a Secure Network Infrastructure
INTEGRATED POWER & AUTOMATION

SYNCHRONIZES
Facility-Wide Data

SINGLE NETWORK
High-Accuracy Data Stamping

Design Software
Controllers
HMI

EtherNet/IP

Motor Starters
Drives
IntelliCENTER MCC

Unmodified Ethernet

Intelligent Switchgear
Intelligent eHouse

INTELLIGENT MOTOR CONTROL
INTELLIGENT PACKAGED POWER
Improve Visibility to Energy Usage to Reduce Costs

Challenges:

- Reduce energy consumption
- Limited ability to collect WAGES process data for analysis and decision-making leading to inefficient resource usage

Solutions:

- Utilize existing automation devices and systems currently installed to gather data for Water, Air, Gas, Electricity & Steam usage
- Reduce energy costs by knowing how much, when & where you are using energy and deploying low cost / no cost operational changes

Energy Savings Can be Achieved Enabling Technology that Provides Energy Usage Awareness
Digital Worker / New Workforce

Safety
• Employee Health - Wearable Biometric Monitoring
• Equipment Identification - Geolocation or Scanning
• Real-time Equipment Status – Trend Overlays
• Remote SME – Face Time
• Briefings – Walkthrough Before Execution

Efficiency
• Work Management – Paper Reduction
• Operator Inspections – Real Time Entry
• Inventory Access – Part Availability in the Field
• Access to Media – Component Information

Effectiveness
• Documentation of Conditions – Work Management
• Condition Based Maintenance – Provide Feedback
• Reduce Rework - Accuracy in Repair
• Training – AR/VR in the Classroom
Real-Time Dispatch Optimization

Real-Time Optimization™ sits above control

- Calculates optimization at the plant level
- Uses equipment models, business requirements, plant-wide operating conditions, forecast and scheduling information to:
  - Predict optimal products (energy) to make in a plant
  - When to make them
  - What are the best operating conditions to maximize profitability

Reads real-time data and sends targets to a control system

- Where control maintains operations at targets:
  - **Optimization determines best targets**

Where advanced control provides best operator performance:

- **Optimization calculates best performance and only optimization identifies new ways to operate**
Optimization of Plant Energy Systems

- Graphically drive to Economic Optimization of overall utilities
- Consider System Holistically
  - Electricity, steam, chilled water, refrigeration, fuel
- Optimize against current and forecast operating conditions of the plant
- Automated model retraining for simplified maintenance and accuracy.
Detecting a Problem

- Detect an emerging problem **immediately**
- Pinpoint the **cause** of the problem
- Determine remaining **time to act**

Eliminate Cost & Risk of Failure
Digital Transformation and AI

DIGITAL TRANSFORMATION & AI

Engage customers
Empower employees
Optimize operations
Transform products
Every job in manufacturing creates another 2.5 jobs in local goods and services.*

78% of manufacturing leaders believe the talent gap will hurt their ability to adopt new technologies and increase productivity.*

More than 1M new engineers are needed globally in the next 5 years.*

Over the next decade, more than 3.5M US manufacturing jobs will be needed. 2M are expected to go unfilled.*

Contact us at AAM@ra.rockwell.com for information
Summary

- Universities with their large physical infrastructure are prime to take advantage of the Connected Campus.
- The Digital Transformation bridges the intelligence gap between people and machines.
- The right approach is crucial - from the right application of technology to the right “app” to get the job done.
- The right platform and technology is critical to the future state.
- Worker safety and productivity must be enhanced – cannot risk situational awareness or be overly complicated.
- Employee benefit as well as utility value must be considered- field workers have to be involved in development.
Thank you