LISTEN.
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SOLVE.®

Transforming Your Challenges Into Advantages

That's Smart, Safe, Sustainable Manufacturing

2012 WORLD'S MOST ETHICAL COMPANIES
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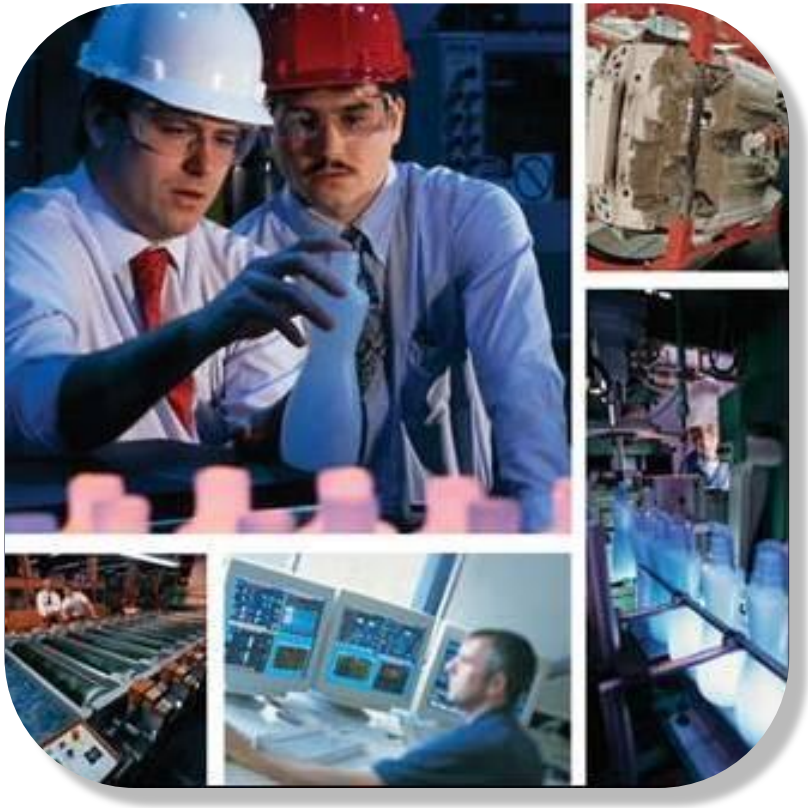


Allen-Bradley • Rockwell Software

Rockwell Automation

Transforming Your Business

Rockwell Automation

Today's marketplace demands innovative strategies and technologies to increase:

- *Productivity*
- *Sustainability*
- *Business agility*

That's Smart, Safe Sustainable Manufacturing

Rockwell Automation At A Glance

Leading global provider of industrial power, control and information solutions.

Fiscal 2011 Sales

$6 billion

Employees

Over 21,000

World Headquarters

Milwaukee, WI USA

Market

Over 80 countries

Emerging Markets

22% of total sales

Trading Symbol

ROK

Architecture & Software – Mayfield Hts., Twinsburg, & Mayfield Village

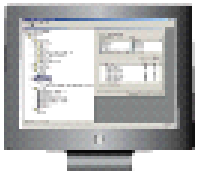
Rockwell Automation

Control & Information Platforms, Software Applications

Logix Family

Performance & Visualization

Production Management



Asset Management

Small Controllers

Data Management

Automation Components

Motion

Sensing

Safety

Control Products & Solutions - Milwaukee

Rockwell Automation

Motor Control Products

Industrial Control Products

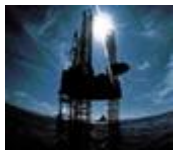
Smart Motor Controllers

Electronic Overloads

Variable Frequency Drives

Solutions

Automation System Integration



Information Systems

Motor Control Centers

Custom OEM Panels

Drive Systems

Services

Asset Management

Remote Support

Engineering & Repair

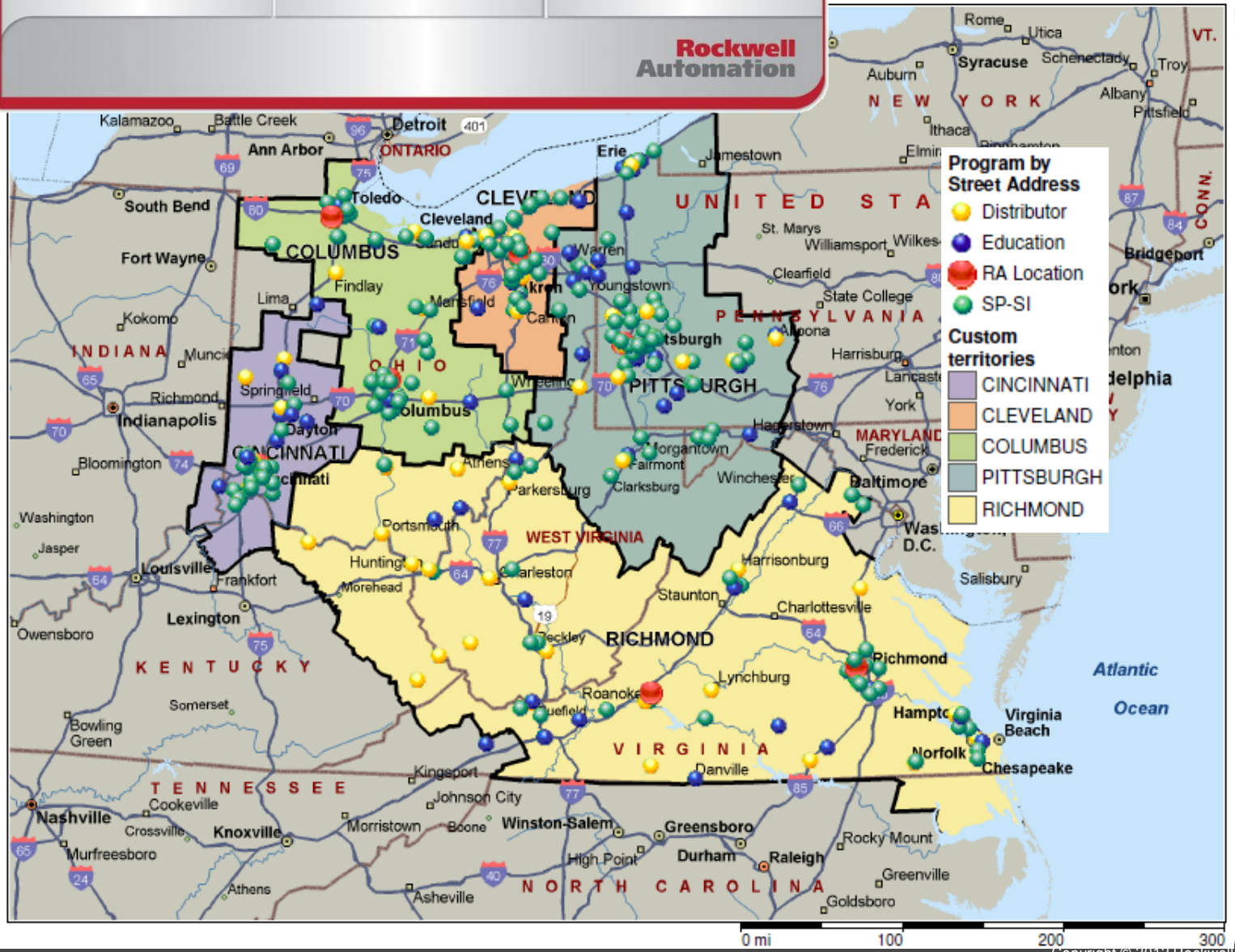
Training

PartnerNetwork™

Business Enterprise	Sales & Solutions	Products & Technologies
• Strategic Alliances • Enterprise Solution Partners • Consultants & Specifiers	• Distributors • Solution Providers • Machine Builders	• Product Reference • Technology Licensing

Rockwell Automation

Rockwell Automation



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The Stage for Evolution

Energy is shaping our world and evolution is accelerating

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Ohio Manufacturing - We make stuff here!

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RANK	STATE	MANUFACTURING OUTPUT ($ IN BILLIONS)	% OF TOTAL
1	CA	$181.1	11.06%
2	TX	$158.8	9.70%
3	OH	$84.1	5.13%
4	IL	$78.8	4.81%
5	NC	$78.0	4.76%
6	PA	$75.5	4.61%
7	NY	$69.1	4.22%
8	IN	$63.8	3.89%
9	MI	$61.8	3.77%
10	WI	$48.9	2.98%

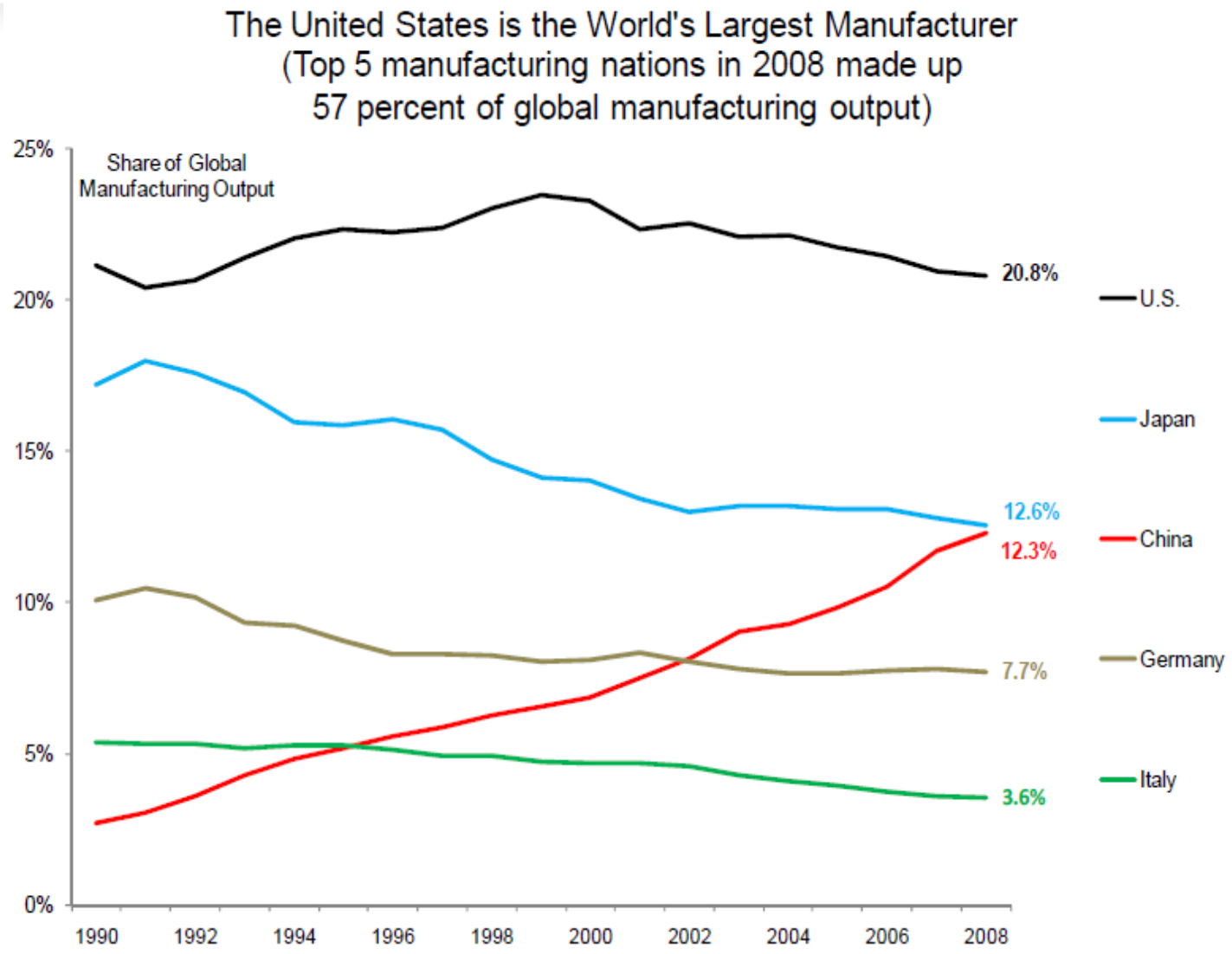
Source: Ohio Department of Development, Policy Research and Strategic Planning Office, Gross Domestic Product of Ohio, December 2009

FACT: Ohio is first, second or third among U.S. manufacturers in 84 NAICS categories of manufacturing.

Source: Ohio Manufacturers' Association, Ohio Manufacturing Counts, www.ohiomfg.com

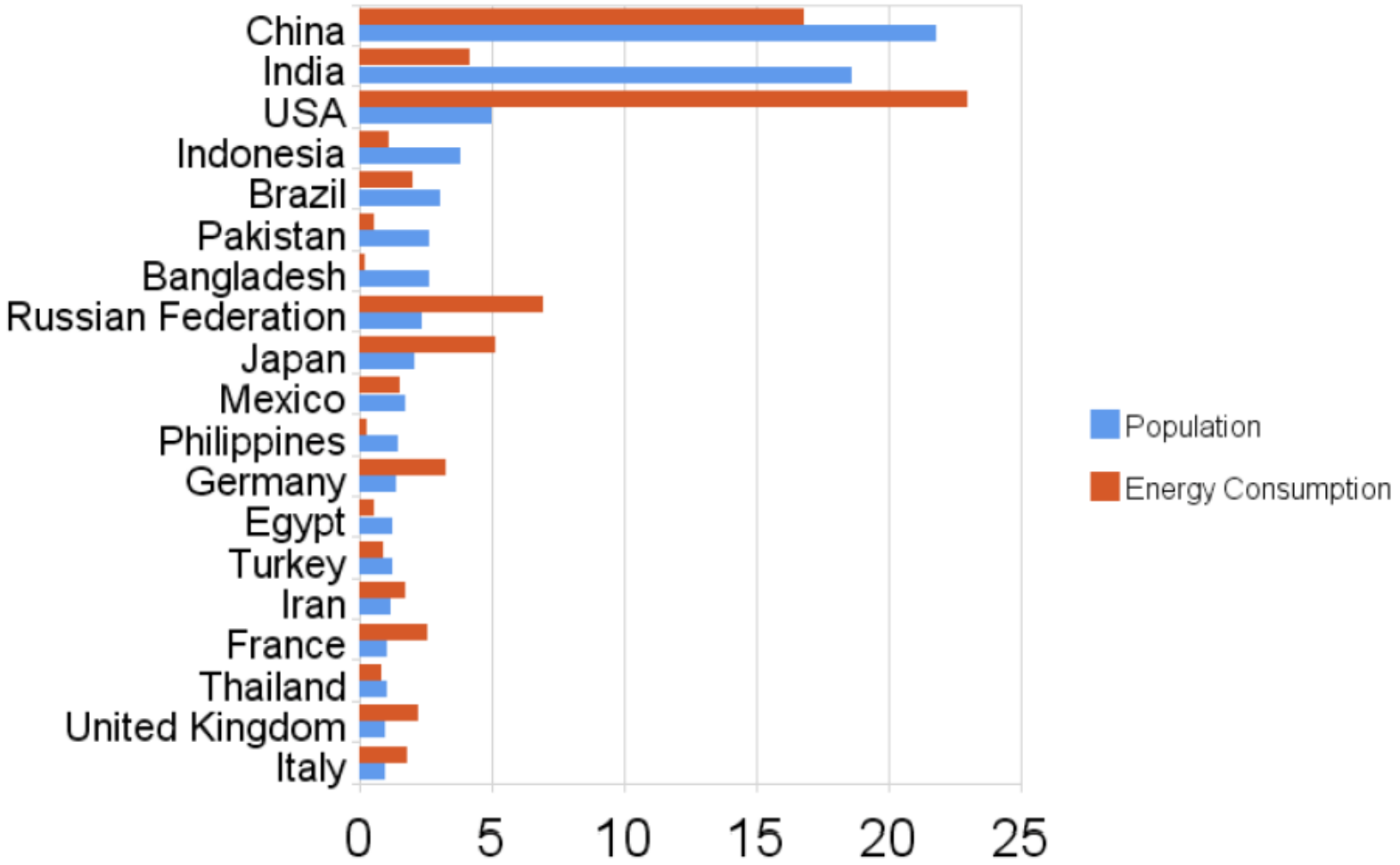
Global Manufacturing

Rockwell Automation



Sources: NAM calculations from U.S. Departments of Labor and Commerce and the United Nations

Energy consumption is about affluence not population



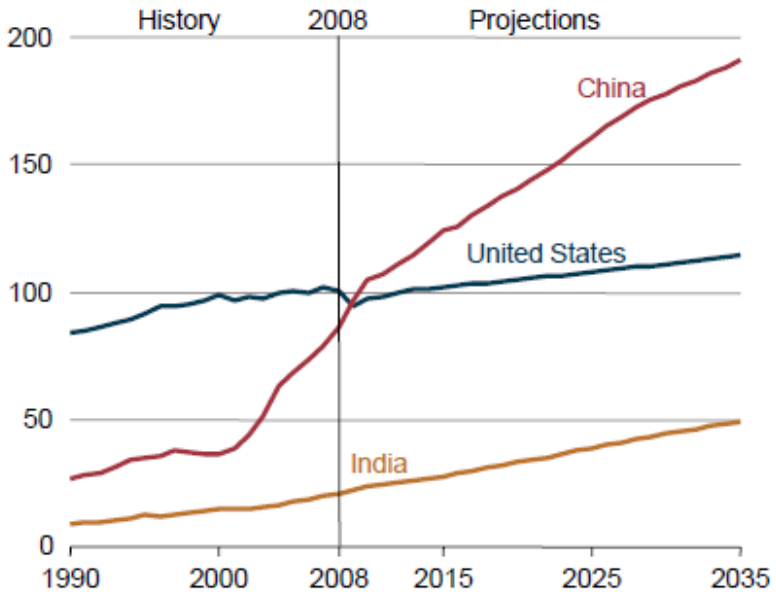
US EIA, 2007

Why Manage Industrial Energy?

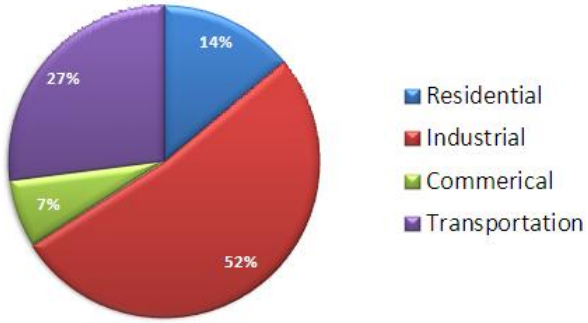
Rockwell Automation

- The Industrial sector consumes more energy than any other.
- Motors consume about half of all electricity, about 70% of industrial electricity in the U.S.

Figure 13. Energy consumption in the United States, China, and India, 1990-2035 (quadrillion Btu)



Total world energy consumption by sector



Source: US Energy Information Agency: http://www.eia.doe.gov/oiaf/ieo/ieoenduse.html

Source: U.S. Energy Information Administration | International Energy Outlook 2011

Key Drivers

Rockwell Automation

- Where does Ohio Electricity come from today?
  - 87% Coal
  - <1% renewable
- US Coal companies are exporting coal to China, India and UAE
- Regulations
  - Boiler MACT
  - CSAP
  - MA
- Retiring older coal plants
- Migration to Gas and Gas Turbine
  - Marriage with Renewables
  - Feedstock diversity

Ohio Senate Bill 221/315

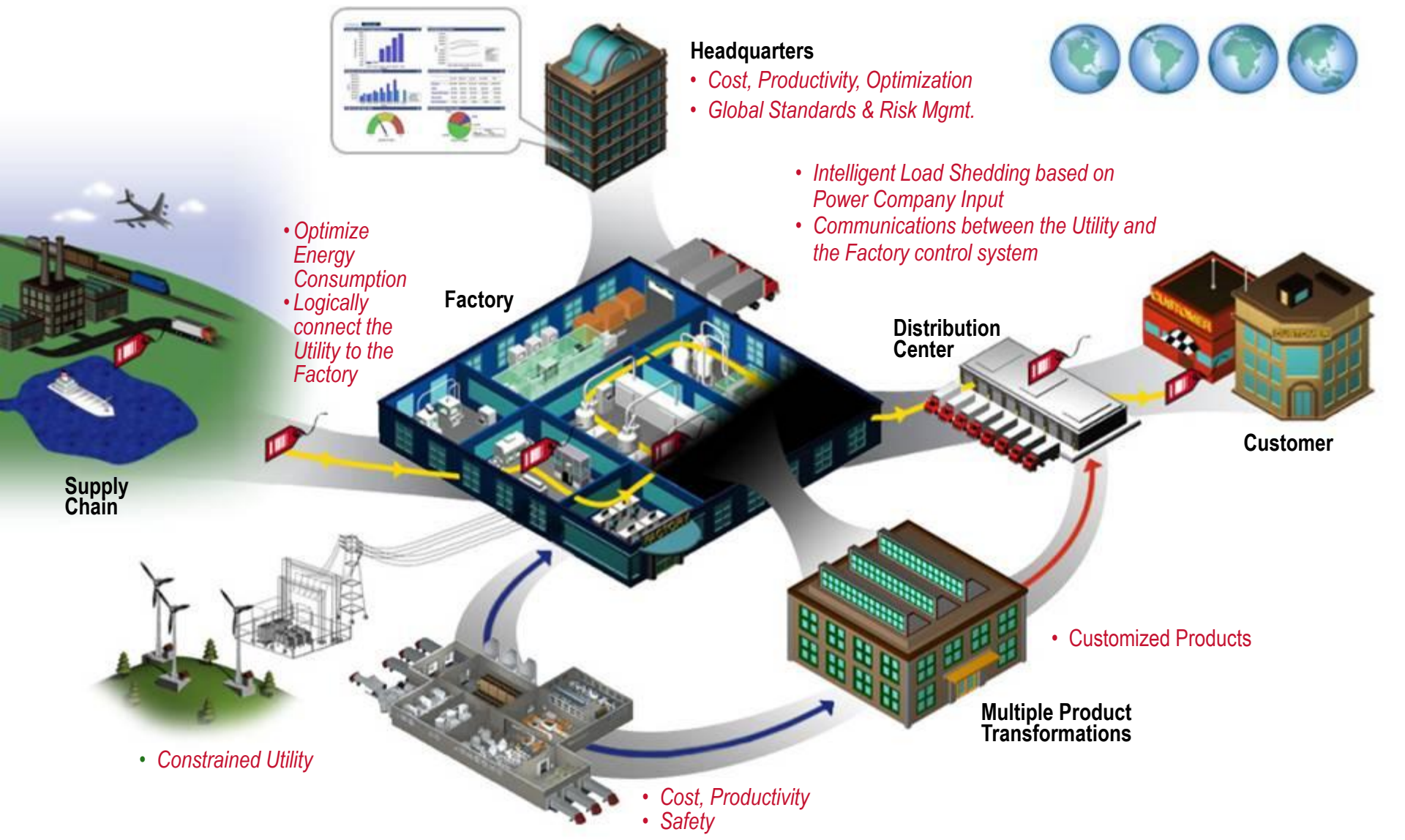
Rockwell Automation

- Mandates Investor owned utilities to reduce consumption
  - 22% by 2025
- Drive the renewable energy portfolio – currently .3%
  - 12.5% by 2025
- CHP
- Benefits
  - Create renewable energy jobs
  - Long term competitive advantages
  - Flexibility in feedstock cost variability
- Cons
  - Cultural / change management
  - Short term / Long term investment
  - Disruption / Change Management – evolution vs. revolution

Source: ACEEE (American Council for an Energy-Efficient Economy Report Number E092)

The Manufacturing Plant as a Smart Node

Rockwell Automation



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Sustainable Production

Maximizing competitive advantage across your operations

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Best in Class Study – Source: Aberdeen Group July 2011

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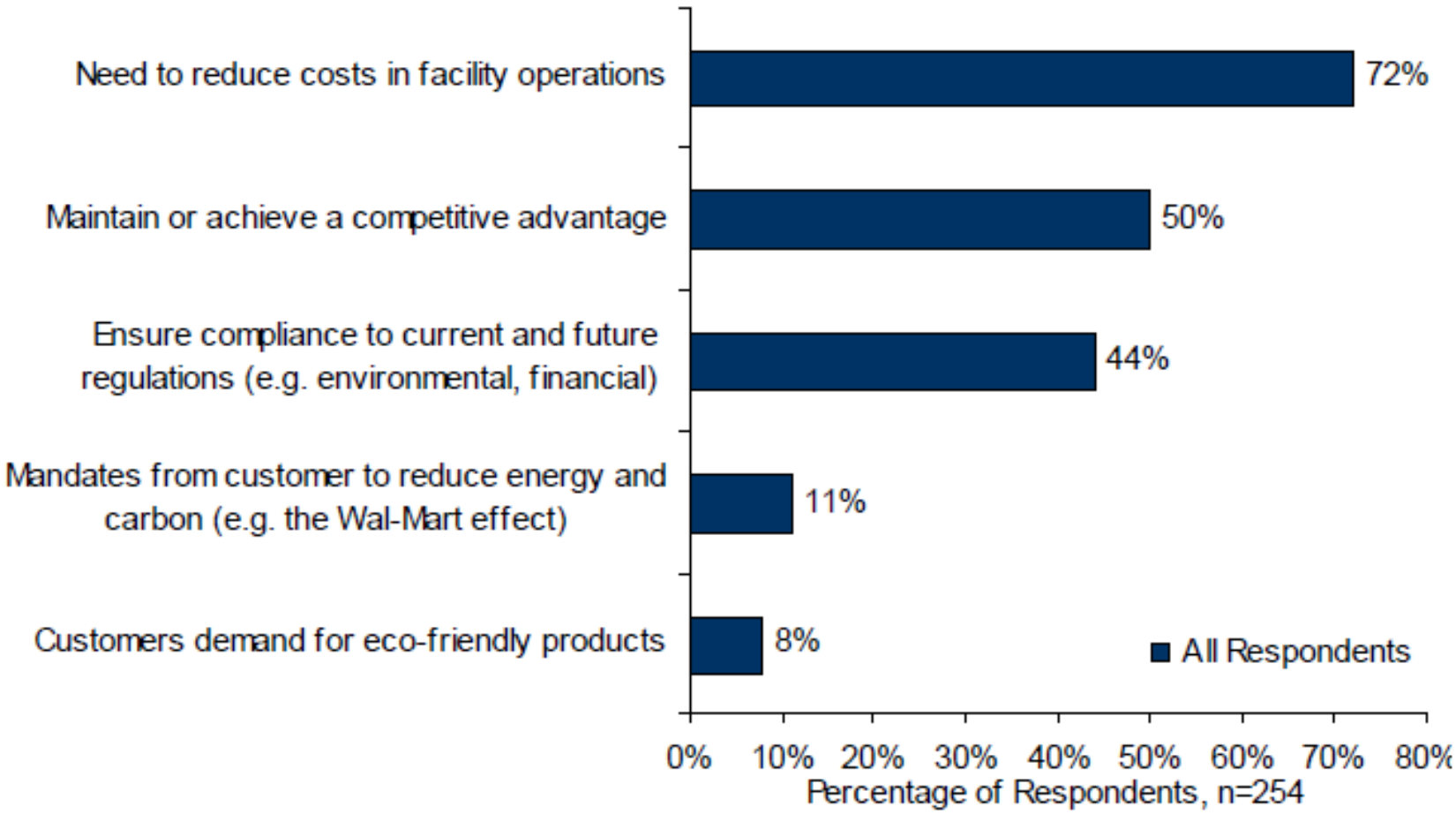
Figure 1: Top Pressures Driving Focus on Energy



Sustainability has to be profitable and drive an advantage

Best in Class Study – Source: Aberdeen Group July 2011

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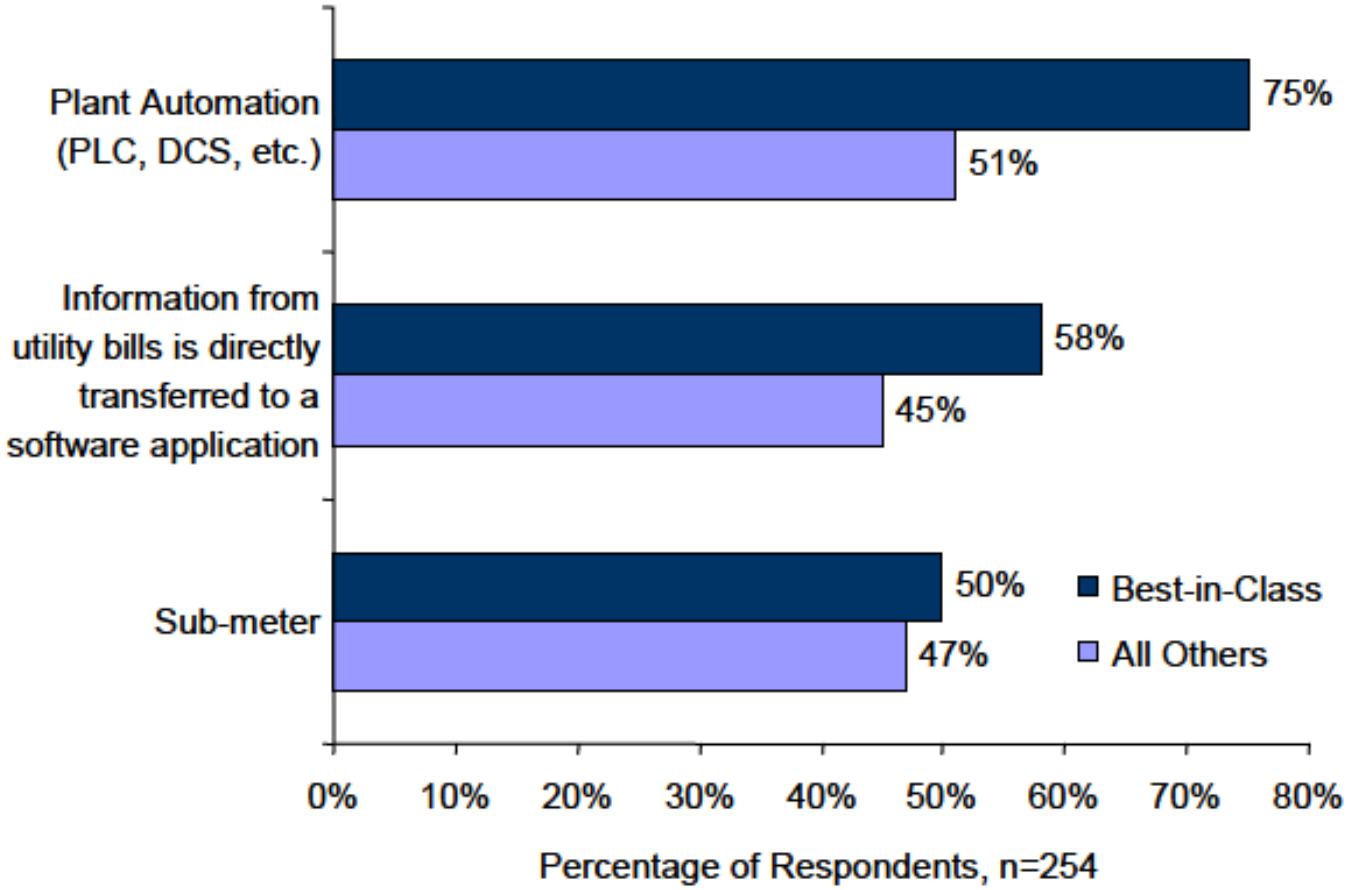
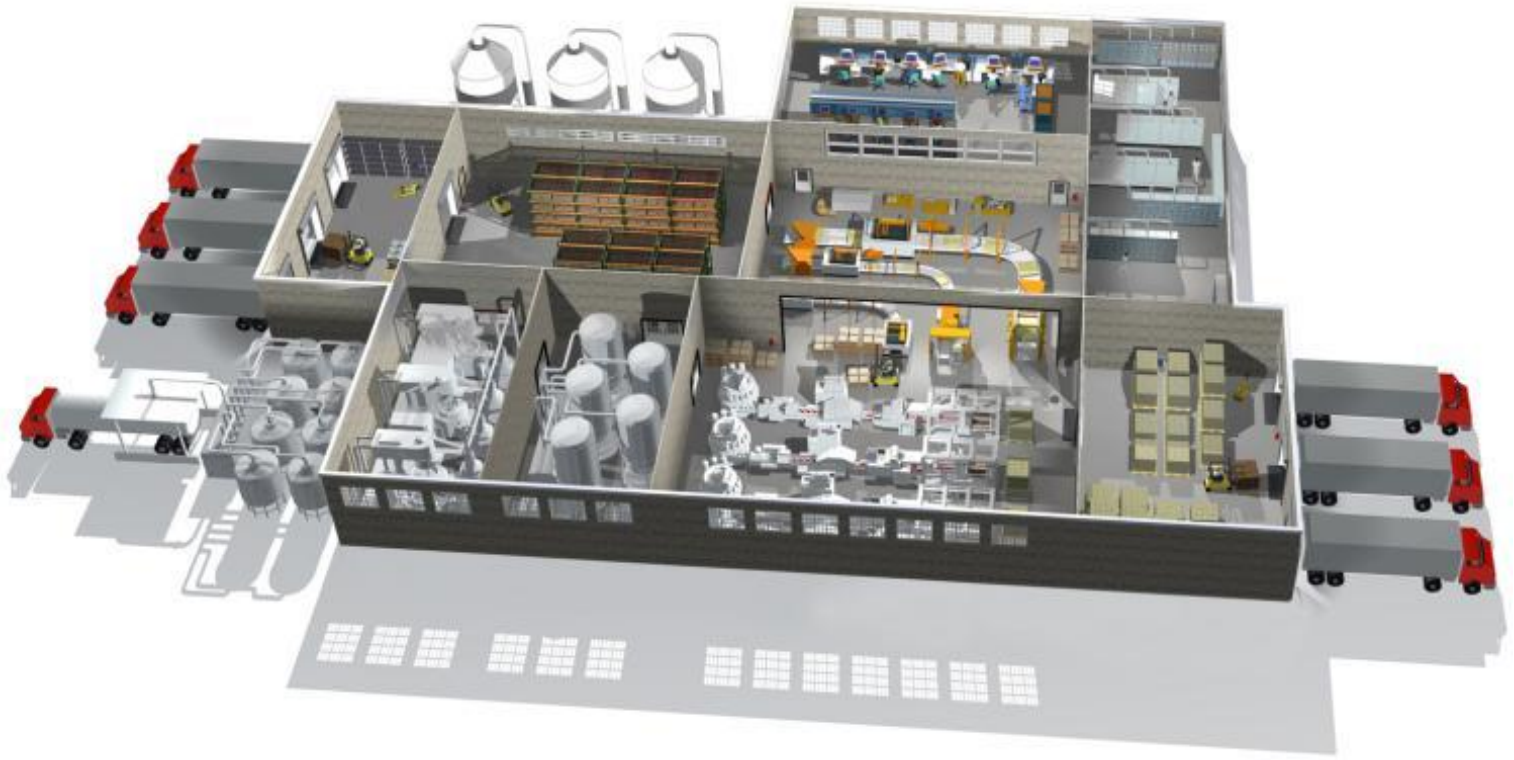
Figure 5: Data Collection Process



Automation is the hidden value amplifier!!

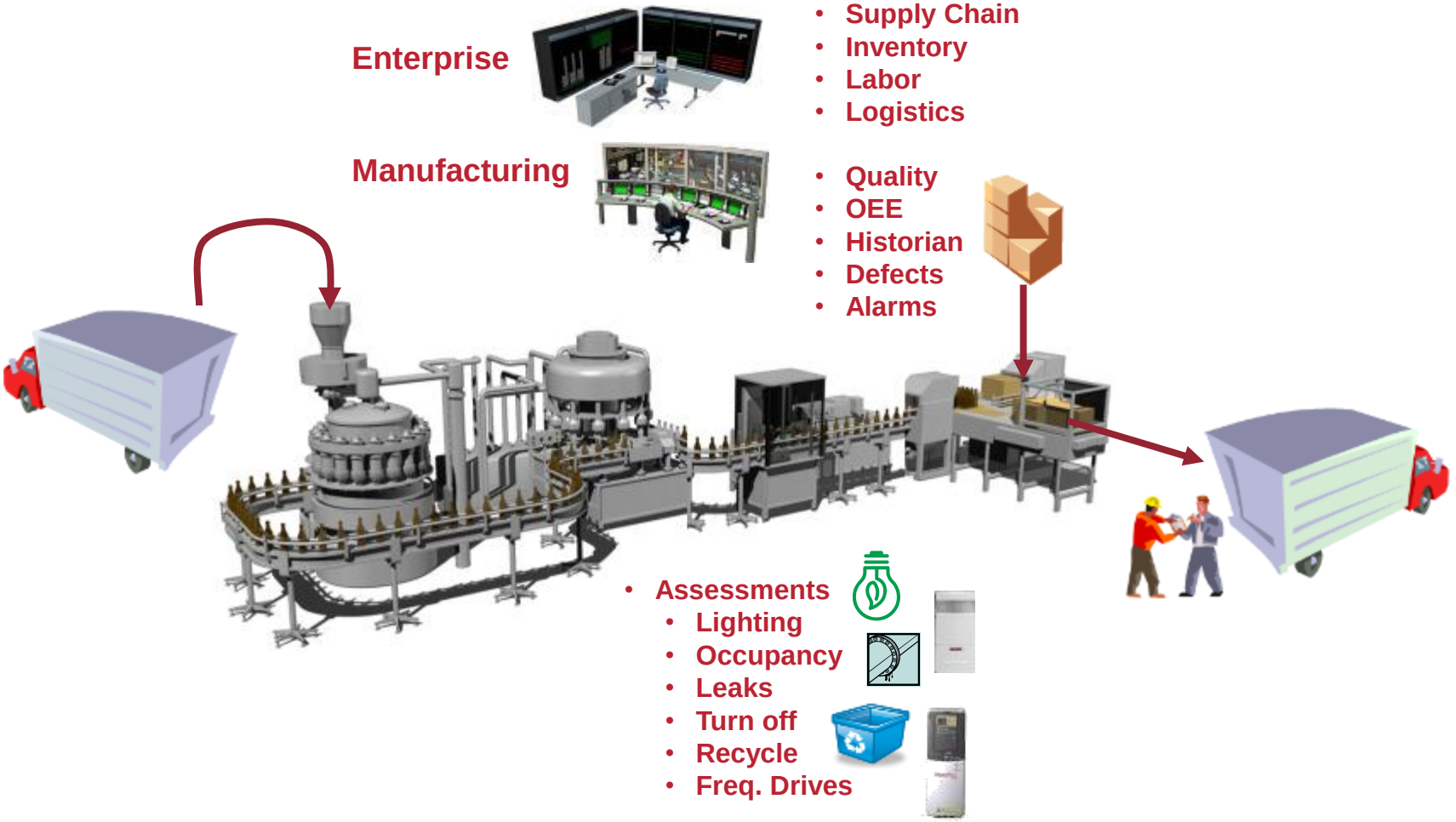
Energy Management Process

Rockwell Automation



Manufacturing Energy Management Process

Rockwell Automation



Manufacturing Energy Management Process

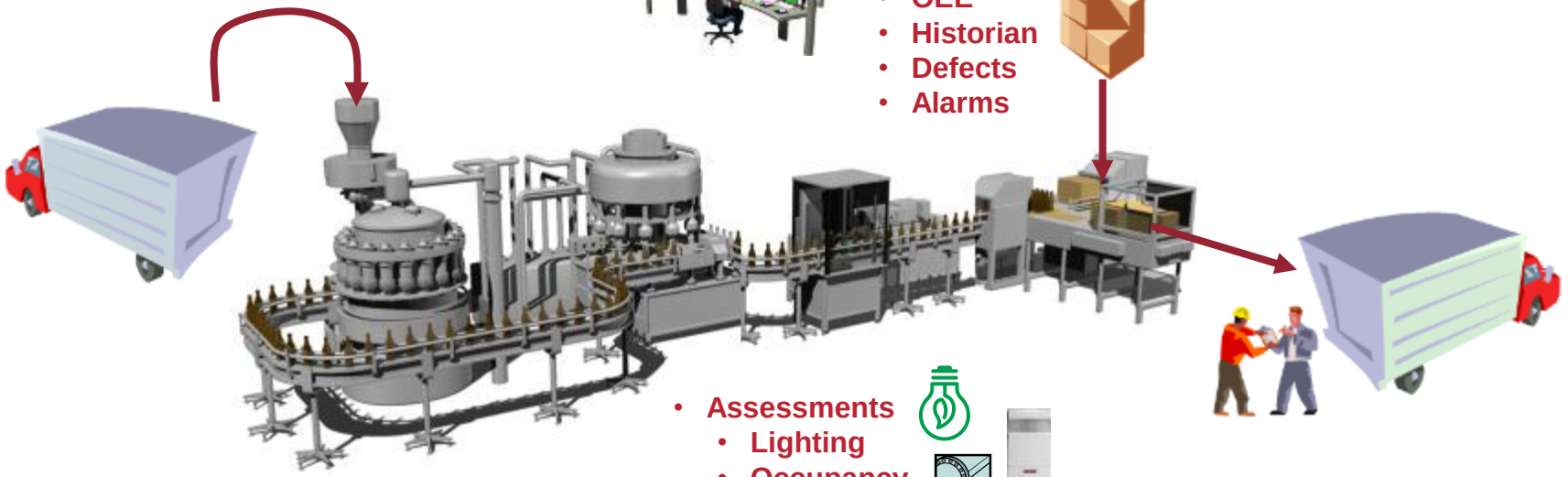
Rockwell Automation

Enterprise

- Supply Chain
- Inventory
- Labor
- Logistics

Manufacturing

- Quality
- OEE
- Historian
- Defects
- Alarms



- Assessments
  - Lighting
  - Occupancy
  - Leaks

Water | Air | Gas | E | Steam | WAGES

Freq. Drives

Manufacturing Energy Management Process

Rockwell Automation

Efficiency
Enterprise Energy Management

Aggregation
Energy Supply Chain Management

Enterprise

- Energy Supply Chain
- Automated Demand Response
- Co-generation Optimization
- Aggregated Manufacturing View
- Supply Chain
- Inventory
- Labor
- Logistics

Manufacturing

- APC
- OEE
- Sub Metering
- Safety
- Design Tools
- Quality
- OEE
- Historian
- Defects
- Alarms

Optimization
Economic Energy Optimization

Awareness
Measurement & Verification

Water → Air → Gas → Electric → Steam → WAGES

Manufacturing Energy Management Process

Rockwell Automation

Efficiency
Enterprise Energy Management

Optimization
Economic Energy Optimization

- Energy Supply Chain
- Automated Demand Response
- Co-generation Optimization
- Aggregated Manufacturing View

Aggregation
Energy Supply Chain Management

- APC
- OEE
- Sub Metering
- Safety
- Design Tools

Awareness
Measurement & Verification

Water → Air → Gas → Electric → Steam → WAGES

Functional / Cultural Problem

Rockwell Automation

Operations

- *Line metrics*
- *Process Improvements*
- *OEE*

Utilities / Maint

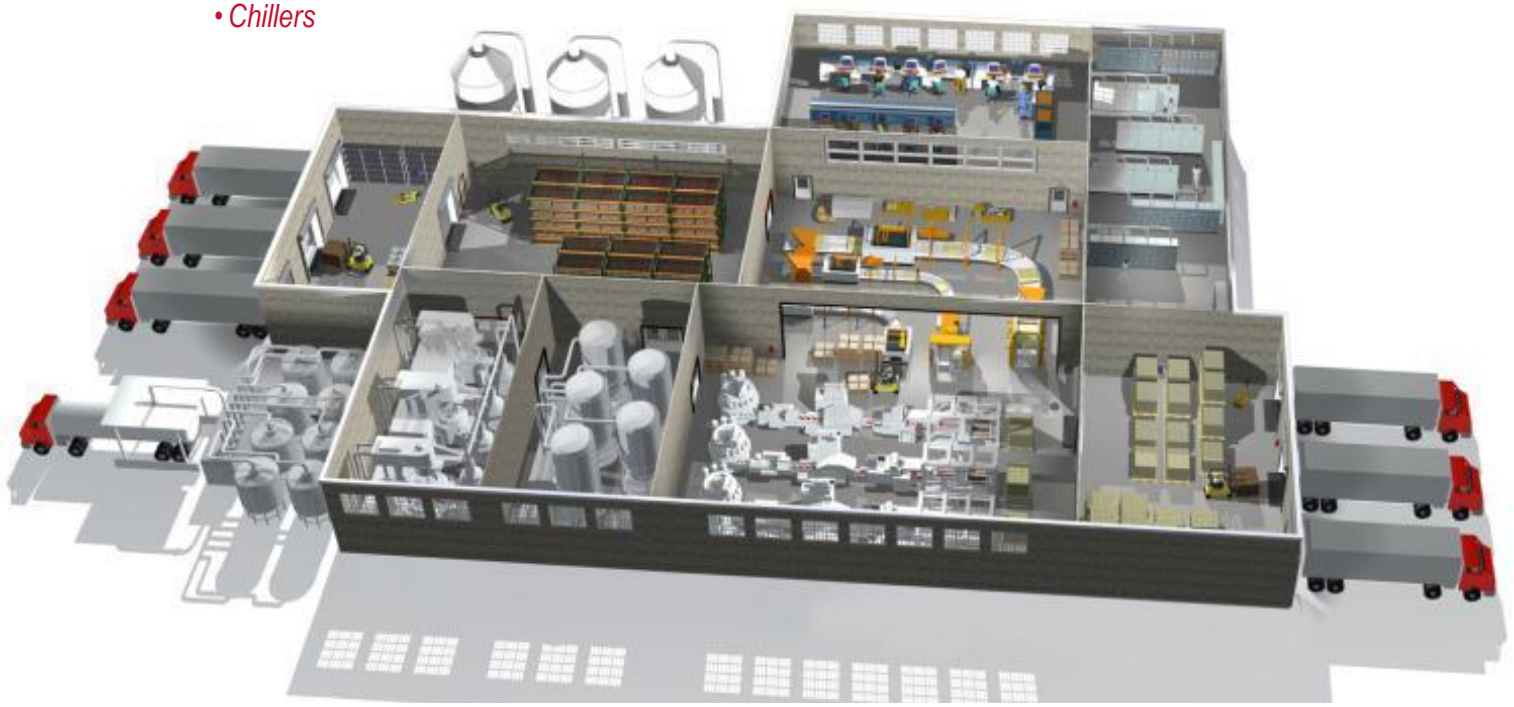
- *Boiler*
- *Co-Gen*
- *Compressed Air*
- *HVAC*
- *Chillers*

Finance

- *Utility Bills*
- *Utility allocation*

Executive

- *COGS*
- *RONA*
- *Capital Investment*



The biggest hurdles to achieving optimization and competitive advantage may not be technical!!!

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Intelligent Motor Control

Data – Safety - Energy

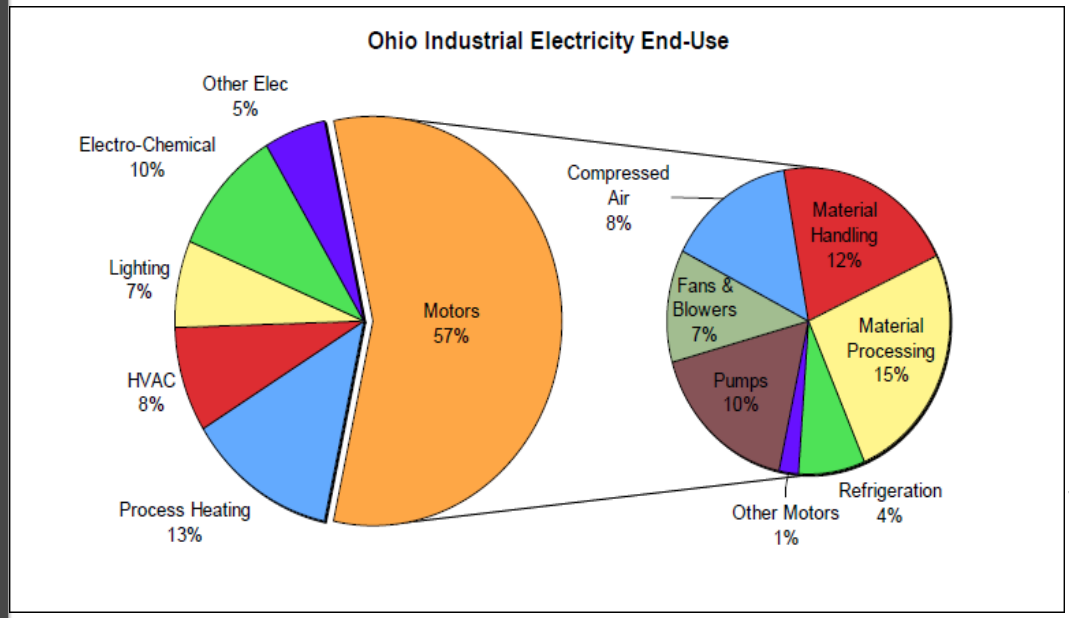
Allen-Bradley • Rockwell Software

Rockwell Automation

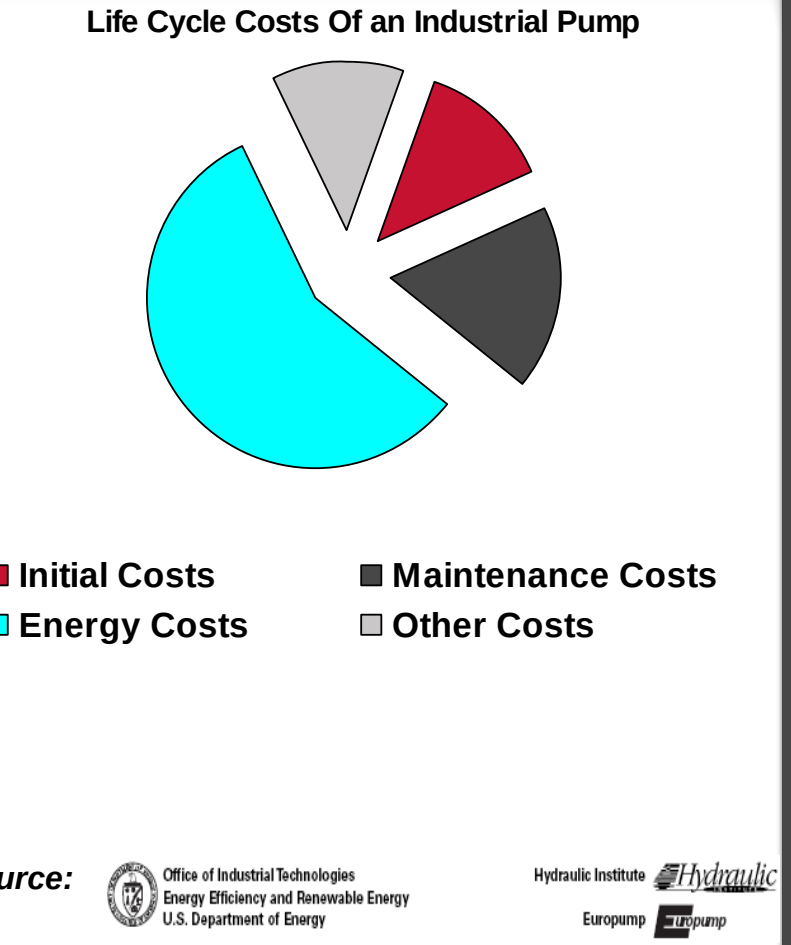
Consider the lifecycle

Rockwell Automation

- Motor Systems consume 57% of the Industrial Energy
- Lifecycle costs tell a unique story



Source: ACEE (American Council for an Energy-Efficient Economy) Report Number E092

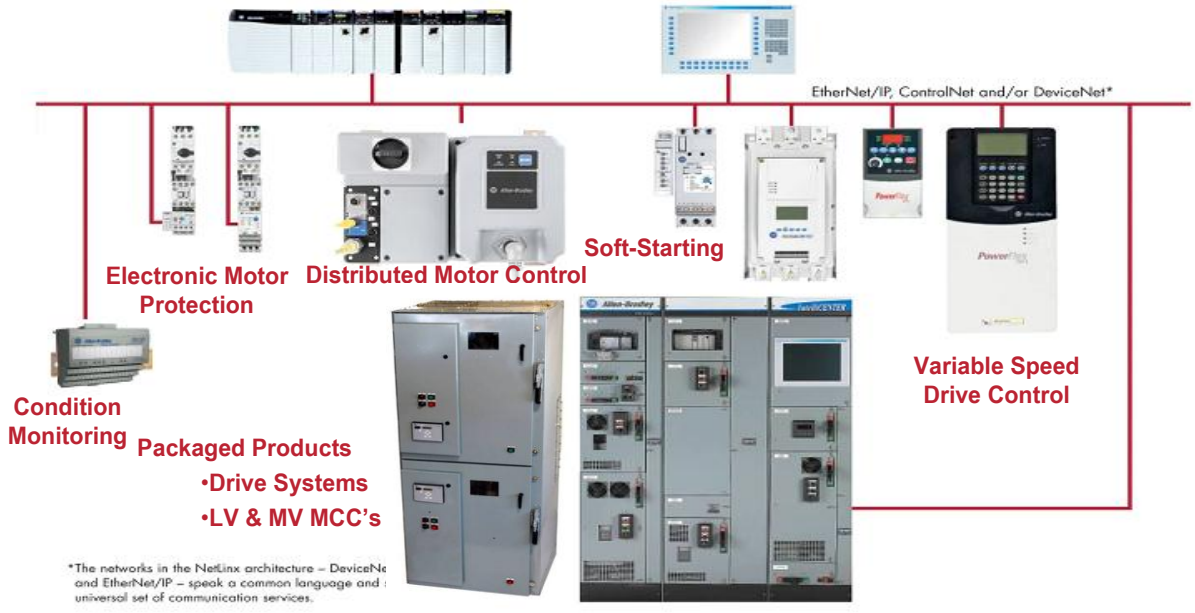


Optimizing Plant Performance, Protecting Your Investment

Rockwell Automation

- Electronic overload protection relays
- Soft starters
- Condition monitoring
- Supporting capital investments long term

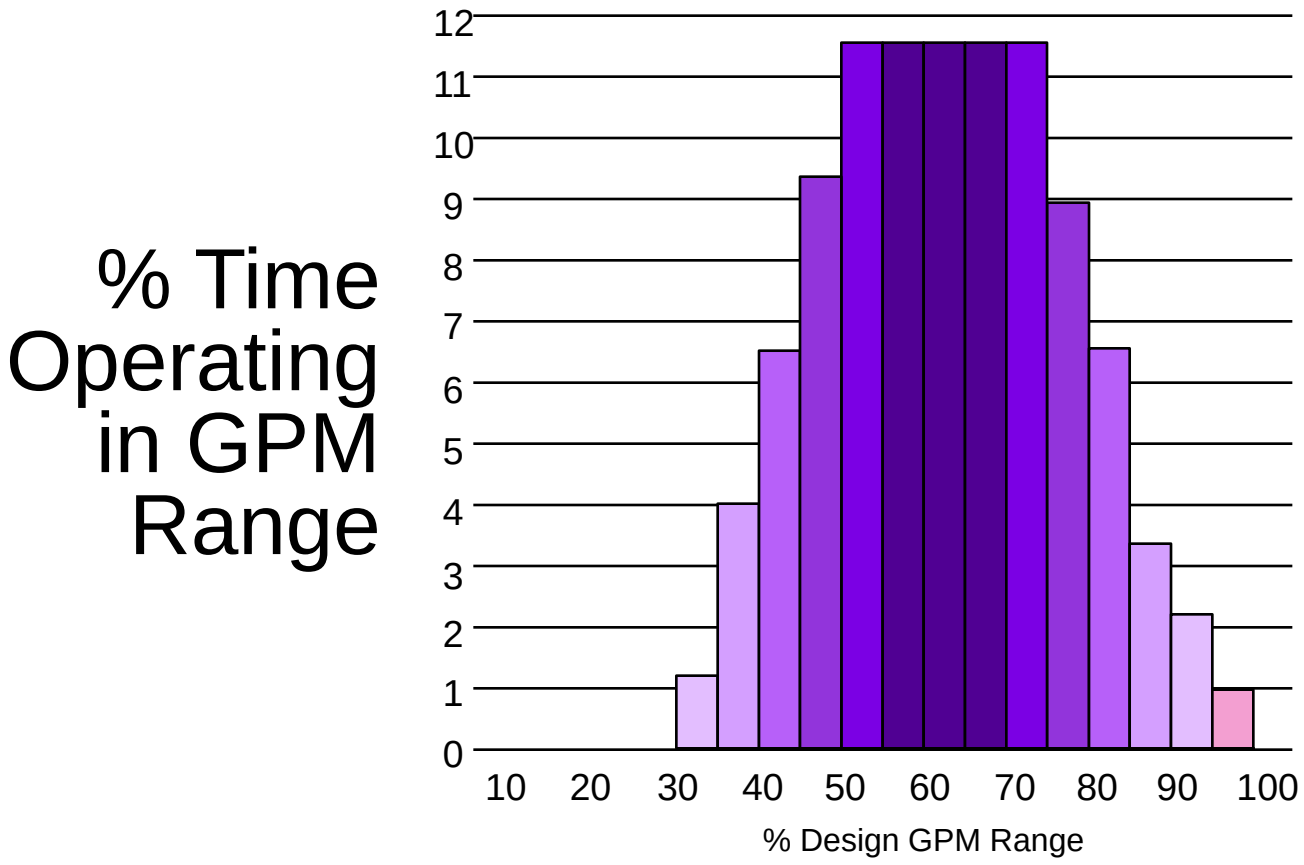
- Variable speed AC drives
- Packaged & pre-engineered solutions
- Turnkey motor control solutions
- Asset management



Typical Flow Requirements

Key Element is Defining the Average Flow Requirement

Typical LOAD PROFILE in Process Flow Fan (or Pump)



Traditional Flow Control Methods

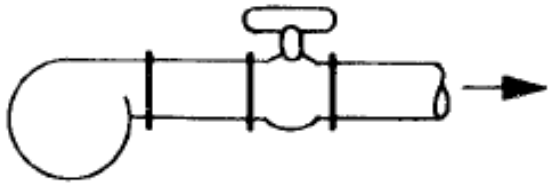
- When Fluid Capacity is fixed but the demand is variable Lowest 1st Cost solutions were:

Control Valve- Restriction of Flow, with a resulting INCREASE in pressure. Pressure is increase until desired flow rate is achieved

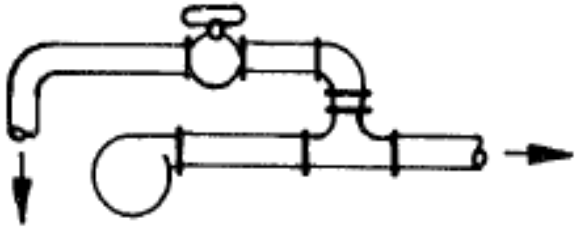
Bypass valve- A valve diverts required flow to process, and excess flow is re-circulated through the pump again

ON-OFF control- pump motor is started until setepoint is reached then shut off

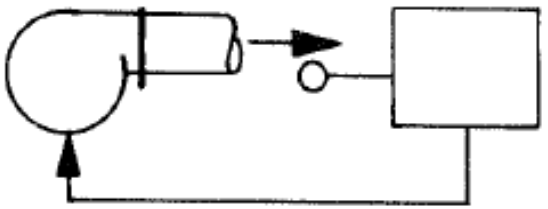
THROTTLE



BYPASS



ON/OFF



ROI Ex - VFD for Electronic Throttling

Rockwell Automation

25 HP Induction Motor

100% Speed
100% Load

25 HP 0.08 $/kWh 12 H/Day 360 D/Year

$6785 per year!

ROI Ex - VFD for Electronic Throttling

Rockwell Automation

25 HP Induction Motor with VFD

60% Speed
22% HP

25 HP 0.08 $/kWh 12 H/Day 360 D/Year

$1493 per year!

ROI Ex - VFD for Electronic Throttling

Simple Payback:

Drive Cost / Annual Savings

(3350) / ($6785 - $1493)

3350 / 5292 = **0.63 years**

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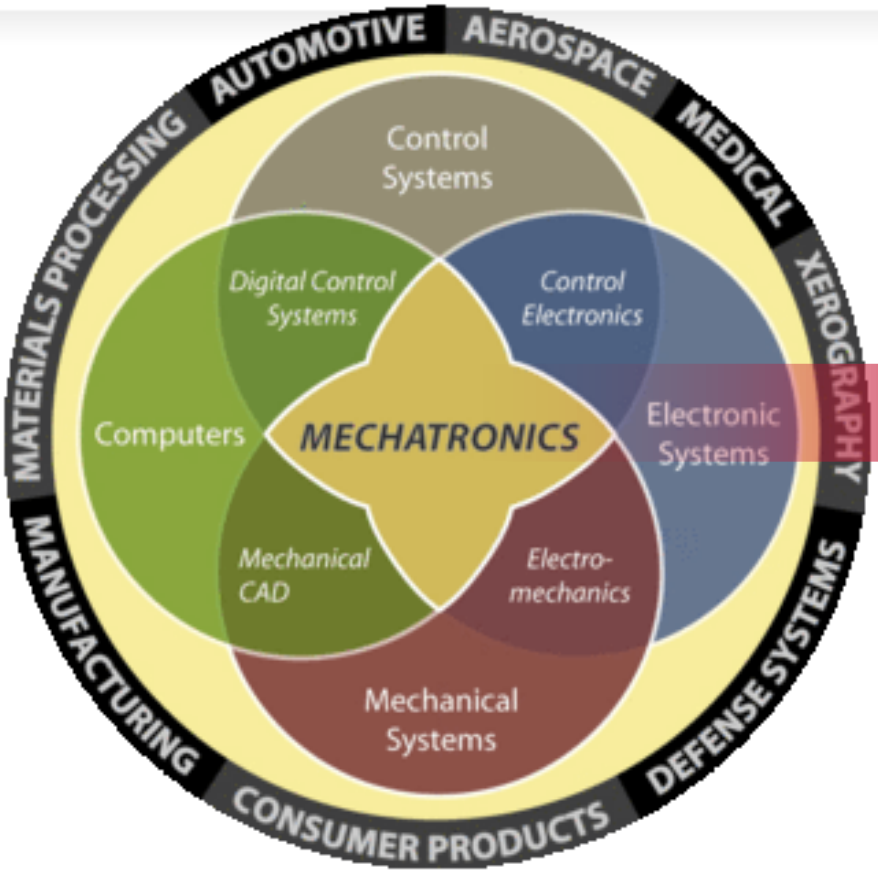
Mechatronics

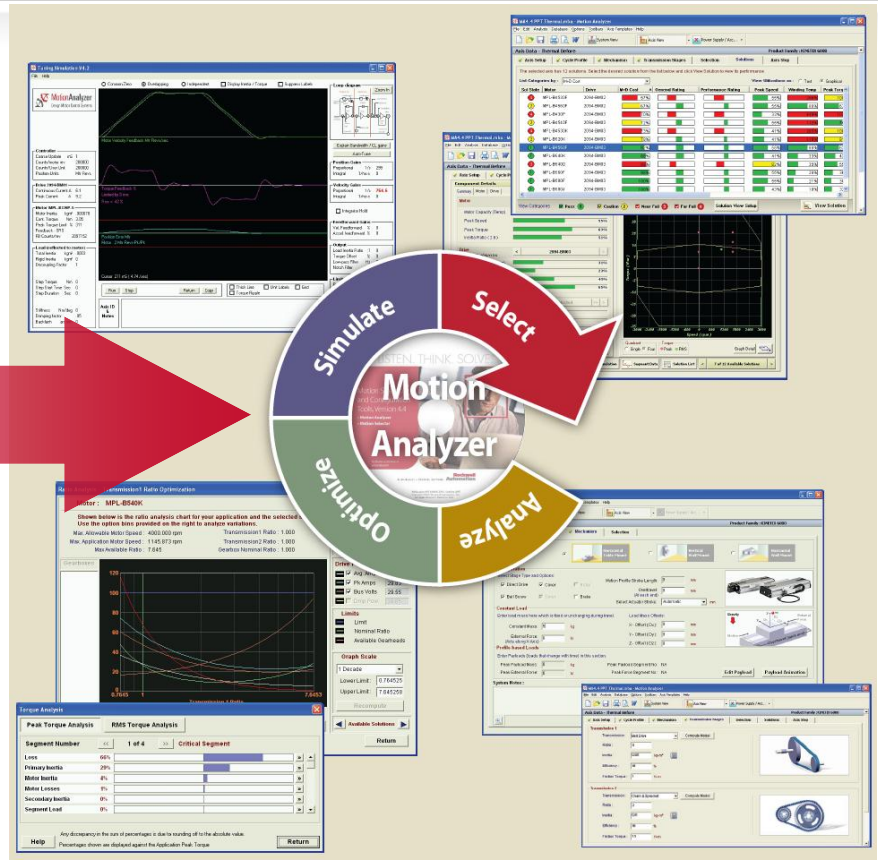
Integrated Mechanical and Electrical Design

Allen-Bradley • Rockwell Software

Rockwell Automation

Mechatronics and Machine Design





"synergy of several engineering disciplines…"

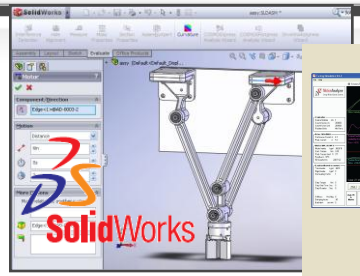
Mechatronic design is a collaborative venture between mechanical, electrical, and control design engineers – the outcome is a machine design optimized for high performance controls

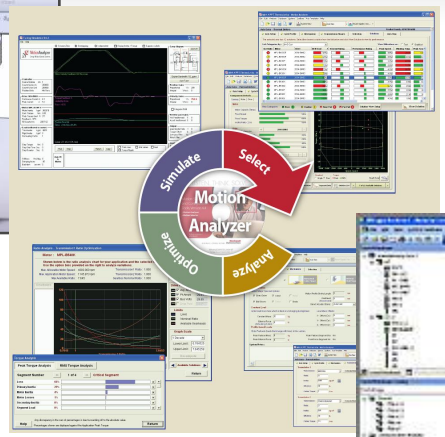
Optimized Design - Mechatronics – Mechanical, Electrical, and Control

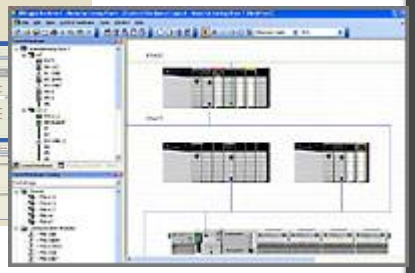
Rockwell Automation

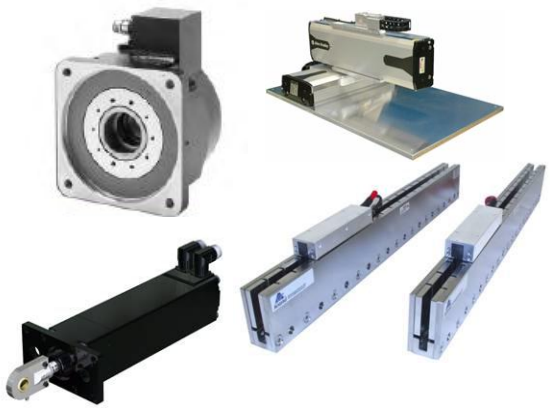
Virtual Design Tools

Motion Analyzer links mechanics with controls. Analyze, optimize, simulate, and select in a virtual environment before committing to a final machine design









Products

Comprehensive motion offering including direct drive motors, linear stages, stacked stages and electric servo actuators that deliver an excellent mechatronic outcome

Expertise

Mechatronic support and services to augment your existing design team

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Energy Management

Achieving Results through Measurement

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Rockwell Automation

Validated Savings

Rockwell Automation

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Industrial SPP / Partner Teaming Profile

Service/Product Provider

Rockwell Automation
6400 West Enterprise Drive
Mequon, WI 53092

Business: Control Products & Solutions
Joshua J. Olive
Sr. Product Specialist
Phone: 262-512-2095
Email: jjolive@ra.rockwell.com

Industrial Partner

General Mills
9000 Plymouth Ave. North
Minneapolis, MN 55427

Business: Food Processing
David Spryshak
Facilities, Control, & IS Engineer
Phone: 763-764-7091
Email: Dave.spryshak@genmills.com

Rockwell Automation helps General Mills save $2.6 million annually through a standardized energy management system for air handling units

Project Scope

Rockwell Automation partnered with General Mills to develop a standardized energy management system (EMS) for controlling air handling units (AHU) and has installed the system at 14 General Mills facilities.

Project Summary

The project was to design an EMS for dramatically different AHUs. Rockwell Automation worked with General Mills to develop a new standardized EMS system that would seamlessly integrate with any type of AHU. The new system utilizes outdoor air versus air conditioning in autumn, winter, and spring to cool a plant, and also uses excess heat from the plant's equipment to heat buildings as needed.

- **Energy Savings**
  $2.6 million (approximate annual energy cost savings)
  Investment
  $6 million (approximate investment to generate the recorded savings)
- **Financial Return**
  1.5 to 3 year payback (depending on the facility)
- **Other Benefits**
  No additional training was required as General Mills is leveraging the same user-friendly

Industrial GreenPrint™ Load Profiling – Monitor / Analyze

Rockwell Automation

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Industrial SPP / Partner Teaming Profile

Service/Product Provider

Rockwell Automation
1201 S. Second Street
Milwaukee, WI 53204

Business: Industrial Automation
Nigel Hitchings
Marketing Manager
Phone: 508-357-8404
Email: nehitchings@ra.rockwell.com

Industrial Partner

Owens Corning
247 York Road
Guelph, Ontario N1E 3G4

Business: Textile / Fiber
Frank Peel
Electrical Support Specialist
Phone: 519-823-7208
Email: frank.peel@owenscorning.com

Owens Corning partners with Rockwell Automation to retrofit fans with VFDs, saving $67,000 annually

Project Scope

Owens Corning and Rockwell Automation installed Variable Frequency Drives (VFDs) on one 125HP cooling fan and three 40HP recirculation fans at the Owens Corning Guelph Glass Plant. The VFDs were integrated with the existing Rockwell Automation programmable automation controller to collect data on motor kilowatts, speed, and torque.

Project Summary

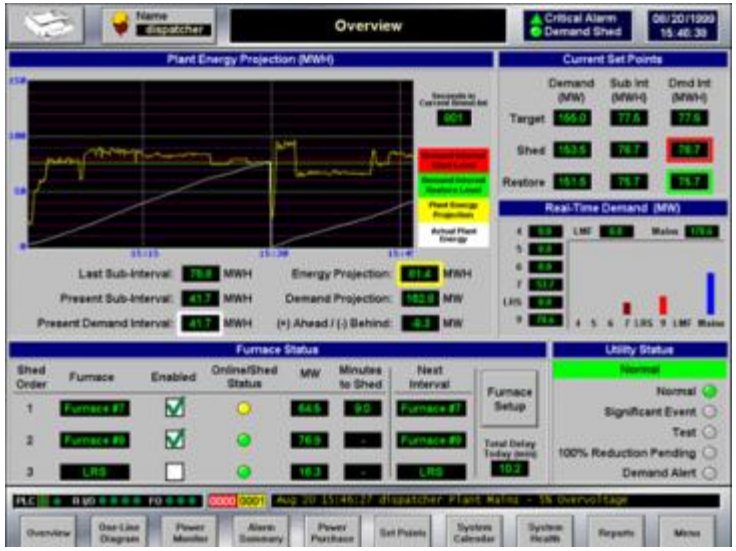
By using real time data collected by the Rockwell Automation controller, Owens Corning was able to reduce the speed of the fans without affecting volume and quality of the fiberglass mat produced. Reducing fan speed yielded the added advantage of reducing natural gas use in the oven; with less air circulating, there was less heat loss, resulting in less gas needed to maintain the temperature.

- **Energy Savings**
  $67,000/yr (500 MWh), or nearly 50% improvement

Success Story:
Demand Response – Steel Mill

Rockwell Automation

- Challenge
  - 90,000 MWh / month
  - Electric bill = $2.7M / month
  - Unreliable & obsolete
  - Demand control algorithm very inefficient
- Solution replaced existing system
  - Reduced manpower
  - Efficiently shed loads
  - Improved power factor
  - Reduced voltage sags
- Benefits
  - Installed cost $300k
  - System payback < 5 mo
  - Ongoing savings of $70k / mo from reduced demand levels



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APC and Modeling

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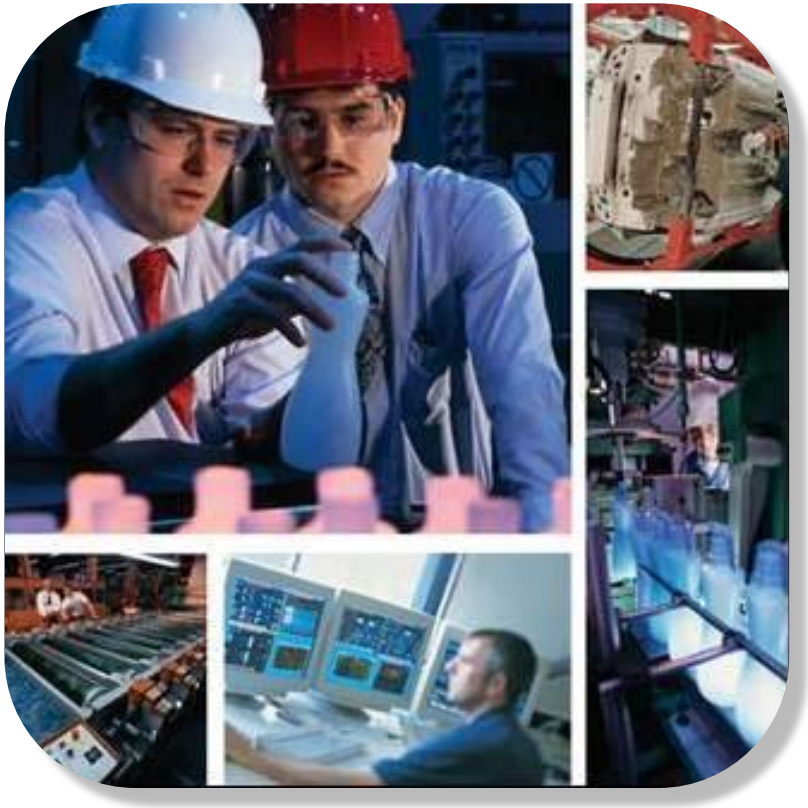

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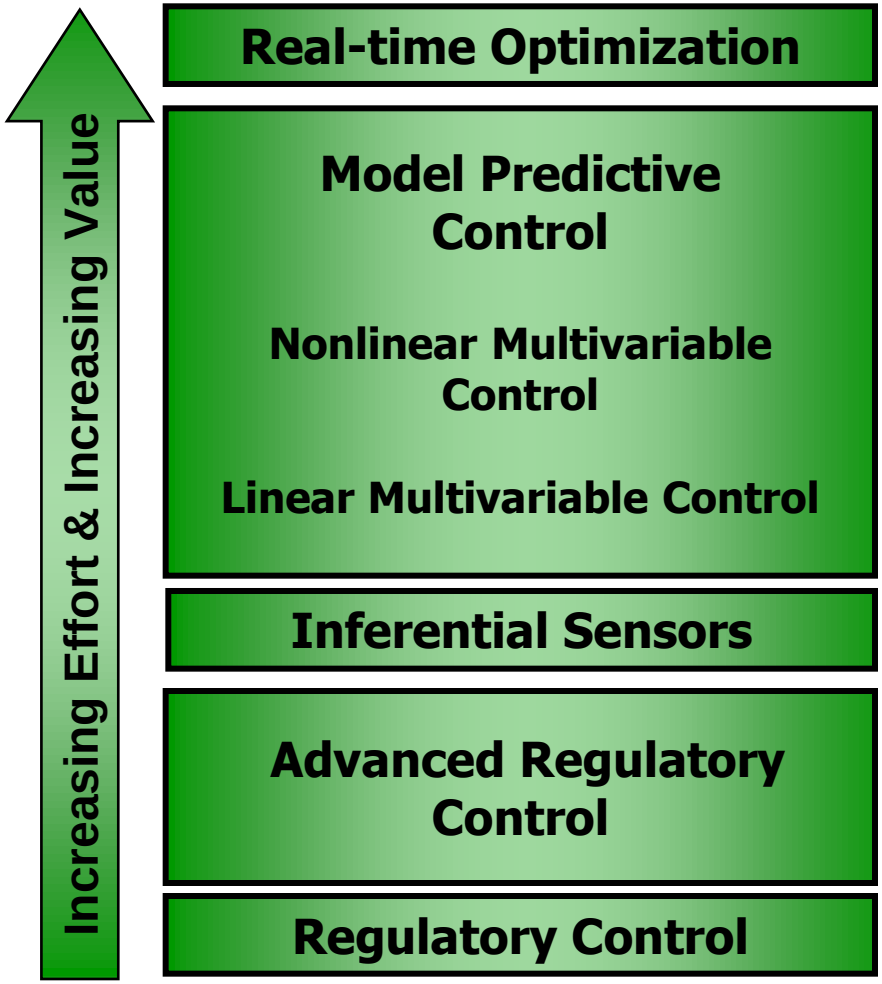
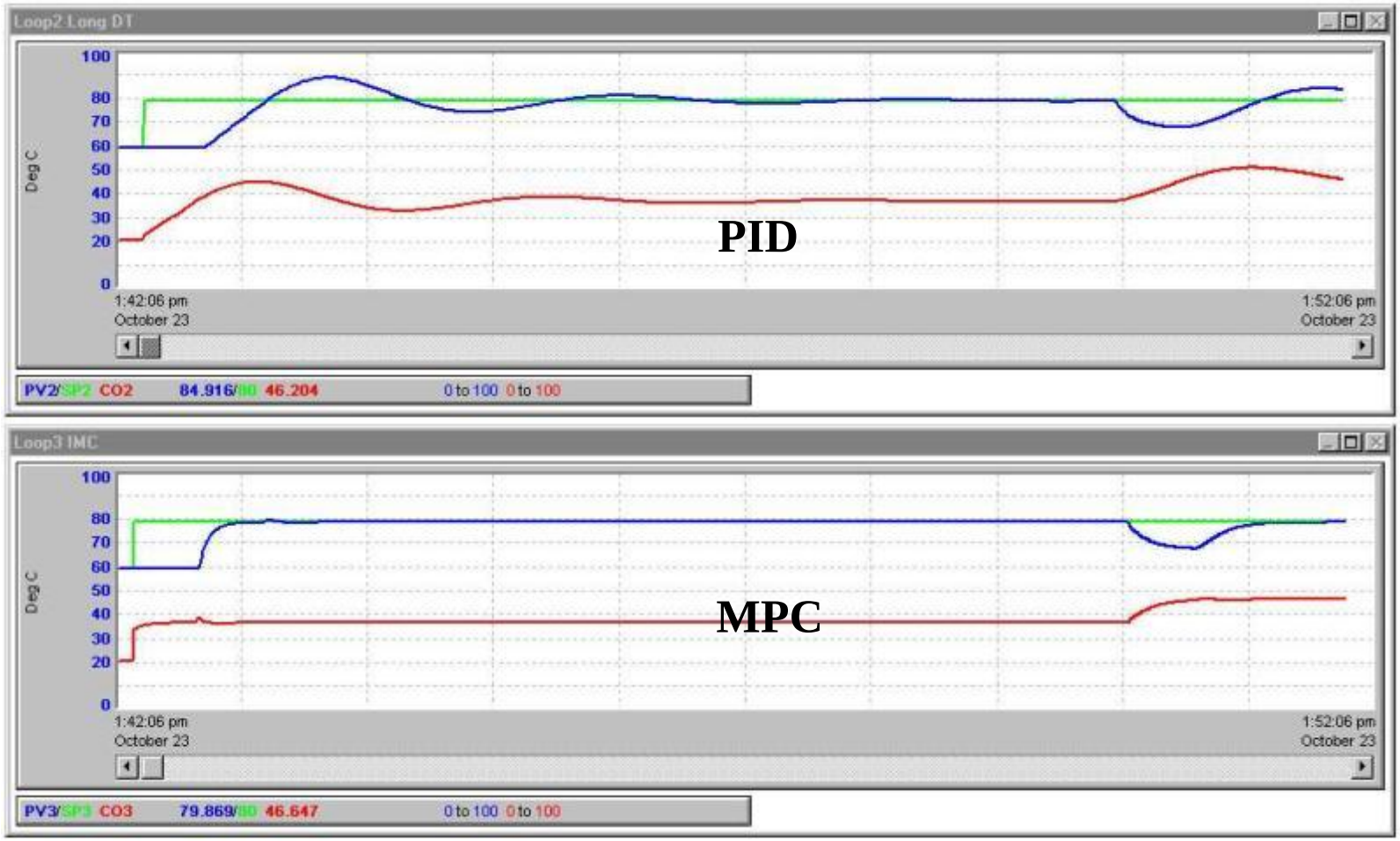
Typical Advanced Process Control Portfolio



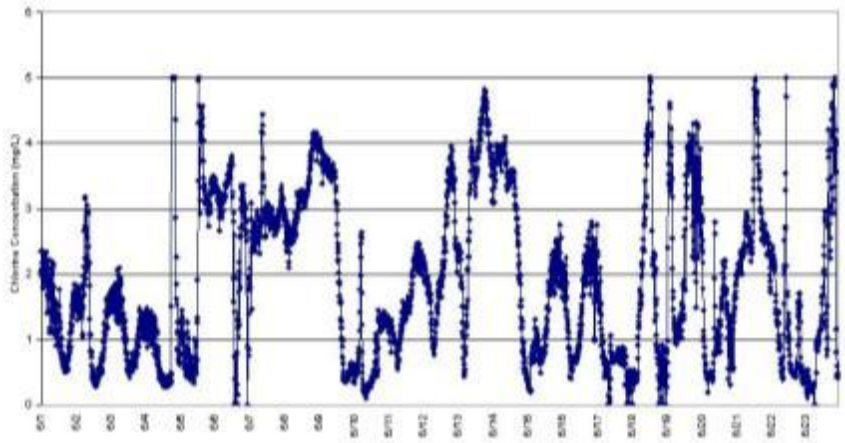
Model Based Vs PID Control



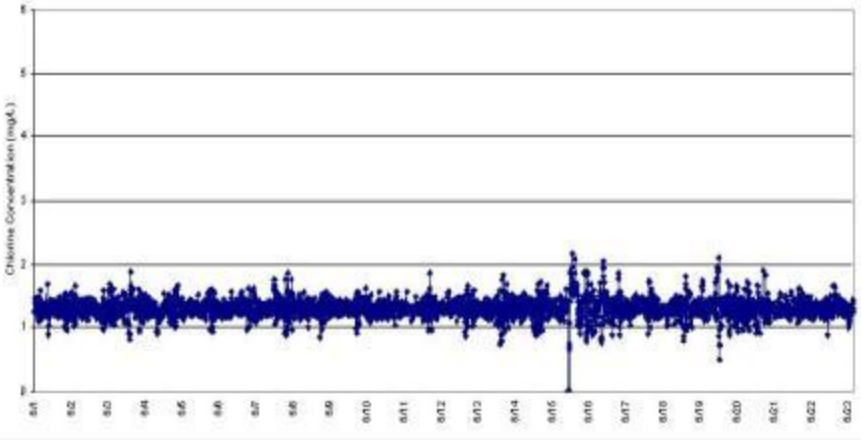
Waste Water treatment plant

Rockwell Automation

Before with PID



After With Advanced



Reduced chlorine variations by 75%

Savings on chemical usage by 60%

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Advanced Process Control

Inferential Sensing

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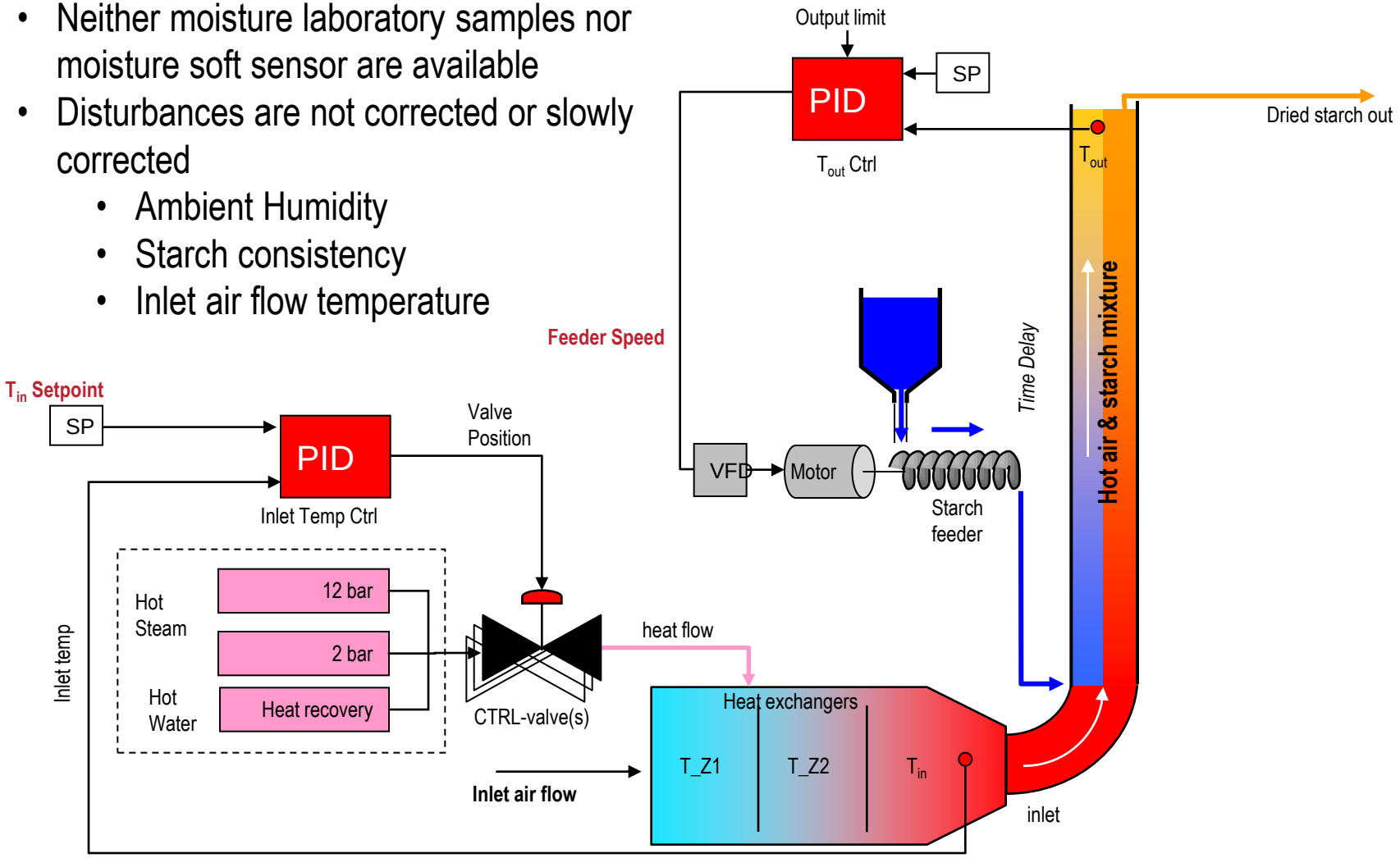
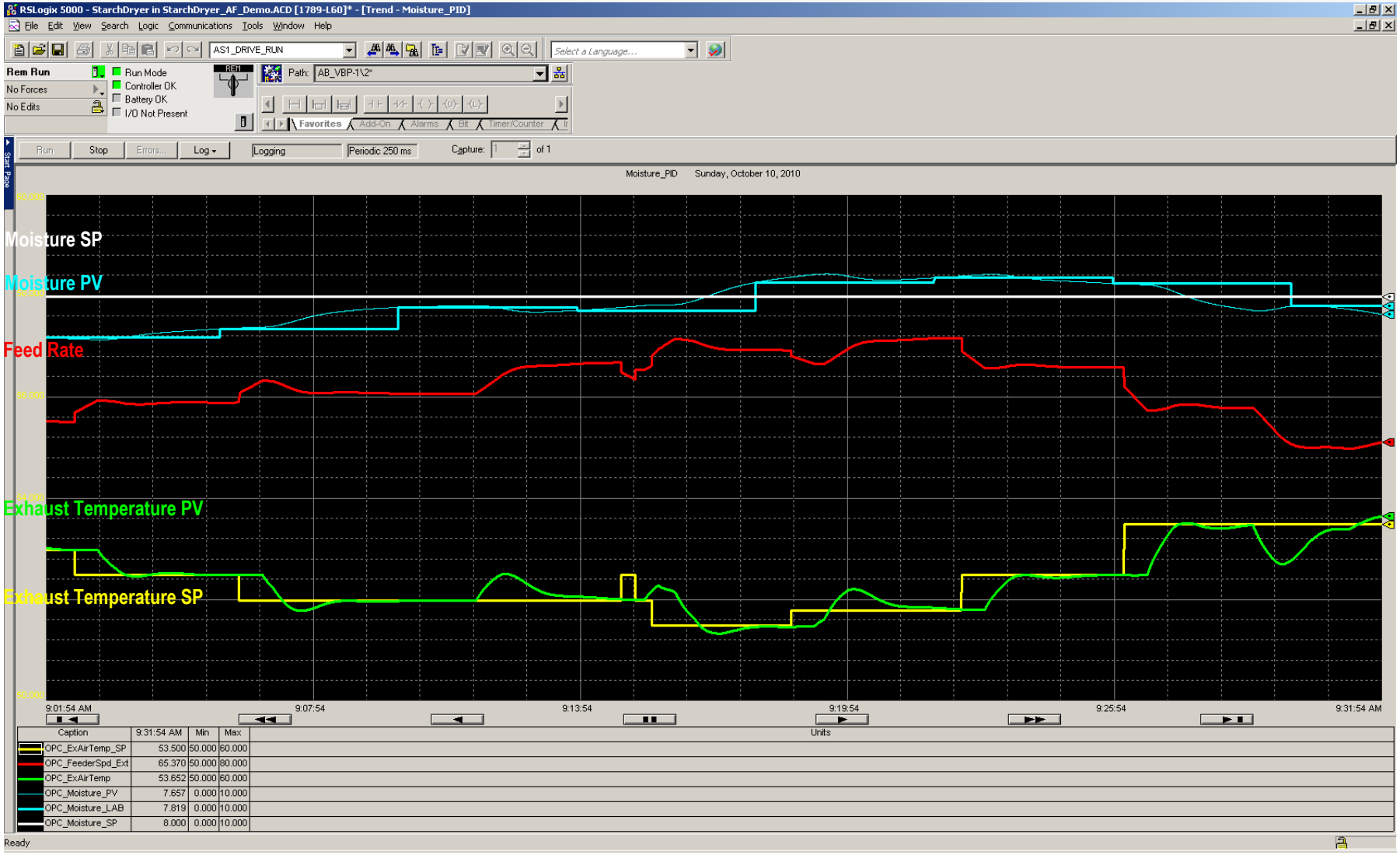
Starch Dryer Example

PID Temperature Control

- Neither moisture laboratory samples nor moisture soft sensor are available
- Disturbances are not corrected or slowly corrected
  - Ambient Humidity
  - Starch consistency
  - Inlet air flow temperature



PID Control Performance



You can't control what you can't measure

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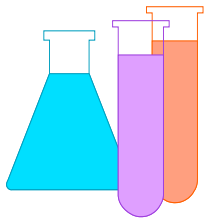
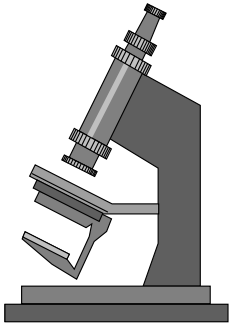
- *What if in-line sensors are unavailable, unreliable, too expensive*

Process Samples

Analysis





Process Adjustments

One hour to one day delay !

Lab Results

Solution: Soft Sensor

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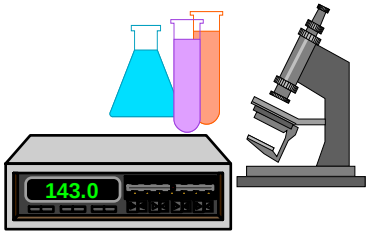
- *Software model that predicts process values based on real-time process data*

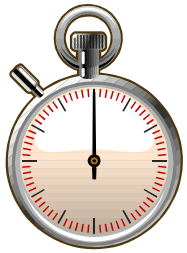
Process Samples

Analysis



Process Adjustments

Real-time measurement!

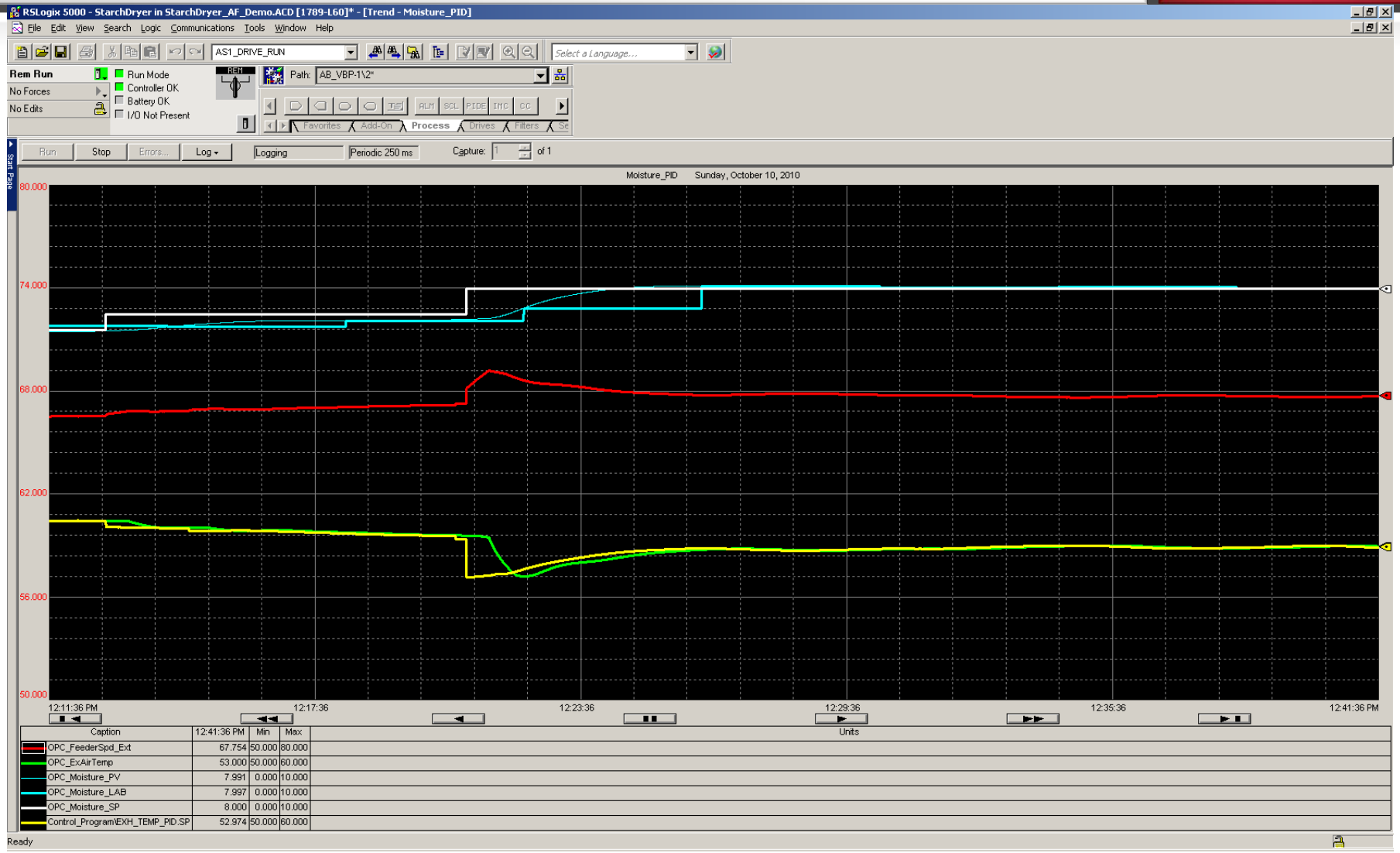


Soft Sensor Prediction

%	rate	temp	thick
0.34	0.34	12.01	5.10
0.45	0.45	12.34	5.34
0.12	0.12	12.67	5.23
0.14	0.14	13.03	6.02
0.46	0.46	13.67	6.70
0.67	0.67	13.69	4.98

Real-time Process Dat

IMC Control with Soft Sensor – SP Change



Summary

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- Globalization and Energy dynamics are mandating efficiency
- Challenges are technical and cultural
- Evolution and Change are certainties
- Leadership will deliver competitive advantage

LISTEN. THINK. SOLVE.®

Thank You

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