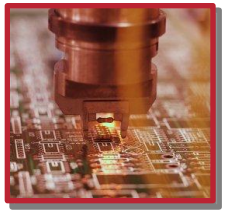
Solar Manufacturing & Assembly Solutions

Customer Presentation

OEM Business Drivers


Global opportunity & increased competition

Faster time to market

Advancements in technology & knowledge

Lower total cost to design, develop, deliver

Improved machine productivity / differentiation

Innovation, throughput, performance

Reduced risk & improved service

Cooperative business partnerships

Efficient use of resources

Sustainable production

Global opportunity & increased competition

Trends & Impacts:

- New opportunities outside home market
- Increased competition appearing from other global regions
- Users demand shorter delivery times

You Need: *Faster Time to Market*

- Products, solutions and services to shorten design, test and commissioning cycles while providing custom machinery within standard build cycles to defend market share and increase opportunities

Rockwell Automation Response:

- Ability to use different languages: HMI and development
- Solutions that reduce wiring, system costs and machine build time
- Products designed for global compliance
- Integrated Architecture™ helps improve time to market with its unparalleled functionality, flexibility, and scalability

Advancements in technology & knowledge

Trends & Impacts:

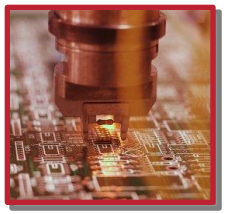
- Reuse of technology for many different applications due to standards adoption
- Proliferation of development and software tools
- More readily available training and access to knowledge and skills

You Need: ***Lower Total Cost to Design, Develop and Deliver℠***

- Standard components, reusable engineering content and outsourcing to help reduce costs involved in machine development continuum

Rockwell Automation Response:

- Integrated Architecture eases application of standardization methodologies
- Mechatronics Design Tools make it easier to select, size and optimize motion control systems
- Software library of code and faceplates follows Foundations of Modular Programming
  - Increases design efficiency
  - Creates scalable systems using the same code base



Improved machine productivity / differentiation

Trends & Impacts:

- Greater requests to access and use available information to maximize machine performance
- End users demand increased machine efficiency and productivity
- Longer warranties, up to 5 years, being offered to differentiate

You Need: *Innovation, Throughput, Performance*

- Technology that can give you a competitive advantage

Rockwell Automation Response:

- Improved productivity through integrated safety and On-Machine approach
- “Stay home” - respond to critical situations with remote diagnostics
- Information-enabled solutions for MES integration, OEE availability and enhanced security

Reduced risk & improved service

Trends & Impacts:

- End users require quicker parts delivery with less lead time globally
- Relationships based on mitigation of risk
- Meeting global standards

You Need: *Cooperative Business Partnerships*

- Partnerships with companies that can provide the right balance of products, expertise, and global support

Rockwell Automation Response:

- Drive out costs and help increase business efficiencies using available services
- Industry-focused OEM team
- Competency Centers provide help optimizing machine development
- Global services and support
  - One number for parts anywhere globally
  - Regional parts management agreements
  - Field service options from start-up support to fabrication to training and othe

Efficient use of resources

Trends & Impacts:

- Rising costs of energy & raw materials – energy conservation & efficiency
- Environmental responsibility & resource management – reduce waste, carbon footprint & costs
- Increased worker safety and equipment protection

You Need: *Sustainable production*

- Cradle-to-cradle machine design – optimize the electrical, mechanical, and environmental requirements and allow flexibility for multiple purposes throughout its useful life
- Improved operating efficiency of your machine
- Energy efficient machines that integrate technologies to minimize energy usage

Rockwell Automation Response:

- Improved productivity and machine uptime with integrated safety, vibration monitoring, OEE metrics
- Drives and motion products that help reduce energy consumption and eliminate
- Remote diagnostics to troubleshoot equipment in the field and reduce travel
- Machine flexibility and scalability with Integrated Architecture

OEM challenges for Solar Manufacturing & Assembly Machines

Faster time to market

Machine Builder Efficiency:

- Reduce lead time to build, test, and ship machines
- Reduce time to market of new machine designs

Machine/Equipment Optimization:

Built to accepted standards and easily integrate with other equipment

End User:

- Seamless integration & support with rest of production line
- Eliminate custom one-off tools with flexible equipment

Lower total cost to design, develop and deliver

Machine Builder Efficiency:

Reduce integration of components from various suppliers

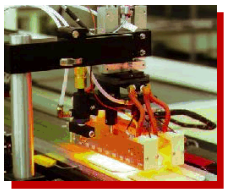
Machine/Equipment Optimization:

- Designed-in flexibility to run multiple recipes
- Designed-in state machine to drive OEE calculations

End User:

- Ease of operator setup and use
- Ease of technician maintenance
- Actionable information when downtime events occur
- Flexible/scalable designs that adjust to process technology evolution

OEM challenges for Solar Manufacturing & Assembly Machines



Innovation, throughput, performance

Machine/Equipment Optimization:

- Smooth motion; eliminate jerk leading to substrate breakage or material defects
- Reduce waste and increase throughput with precise tension & position control modules
- Process consistency & line stabilization with APC and closed loop process control
- Designed-in data structures supporting track and trace requirements and OEE calculations

End User:

- High first-pass yields
- OEE - Increased equipment utilization; reduced unplanned downtime
- Access to equipment data for process optimization
- Access to panel manufacturing details to support warranty
- Remote support from OEM and controls vendor
- Enhanced diagnostics to quicken troubleshooting

OEM challenges for Solar Manufacturing & Assembly Machines

Cooperative business partnerships

Machine Builder Efficiency:

- Partners capable of delivering the right service and support on-time
- Teaming with other OEMs to supply integrated lines

End User:

- High reliability, rapid serviceability, and parts availability when failures do occur
- Joint development with OEM for new equipment
- Align required equipment functionality to meet the process technology roadmap

Sustainable production

Machine/Equipment Optimization:

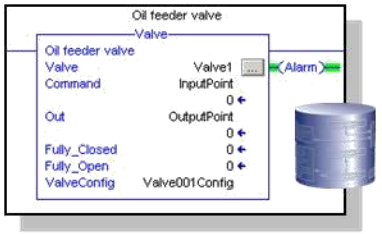
- Reduce/eliminate use of toxic materials
- Reduce raw material waste
- Reduce energy consumption during processing

End User:

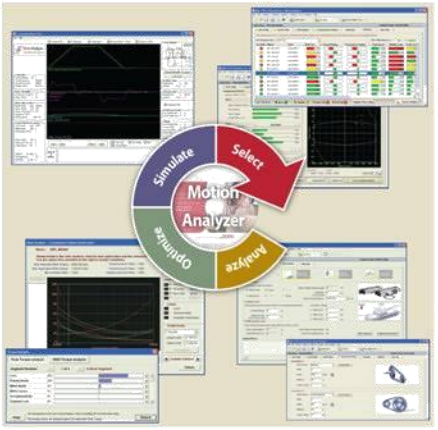
- Reduce substrate waste
- Recover raw materials from slurries, water, etc.
- Recycle panels after useful life

Rockwell Automation Solution Capabilities for Solar Manufacturing & Assembly Machines

Machine Builder Efficiency



- Design productivity tools reduce engineering time
  - Standard, reusable software modules and Add-on-Instructions (AOIs)
  - Motion Analyzer
  - Integrated state machine shortens time to implement OEE solutions

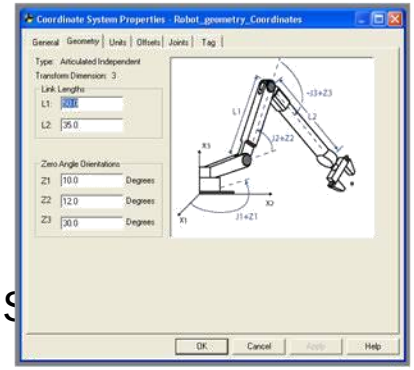


- Integrated Architecture
  - Scalable, multi-discipline Logix platform with single programming environment
  - Seamless connectivity from power and control components to enterprise information systems
- Quick lead time and off-the-shelf components
- Engineering expertise and support to help decrease time to market
  - Meet customer commitments
  - Meet your tradeshow deadlines with new equipment launches
- Supply Chain solutions
  - Kitting, vendor managed inventory, panel outsourcing

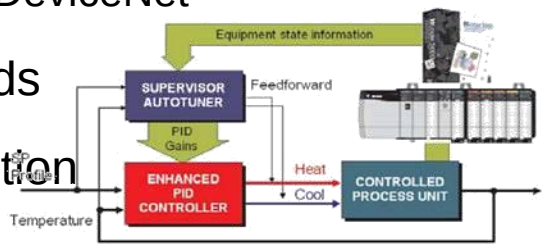
Rockwell Automation Solution Capabilities for Solar Manufacturing & Assembly Machines

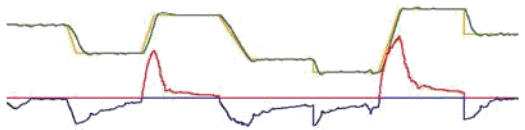
Machine/Equipment Optimization

- Kinetix integrated motion
  - Smooth motion operation & precise tension/position control modules
- High-speed linear motors, actuators, and gantries for increased machine throughput



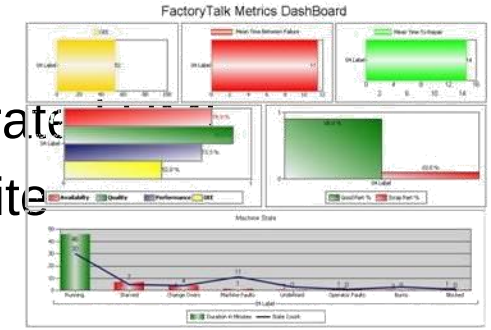
- Logix control and integrated motion
  - Quickly adapt to process technology evolutions
  - Advanced Process Control (APC) functionality
- Robotics integration with Kinematics
  - Supports variety of robot configurations (e.g. Scara, Delta, H-bot, S bot)
  - Integrate with 3rd Party robot controllers on EtherNet/IP or DeviceNet
- Modular code compliant with industry accepted standards
- Pre-configured information-enabled code for data collection needs
- Remote connectivity/diagnostics/troubleshooting



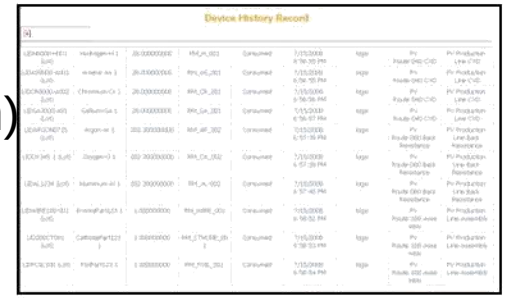


Rockwell Automation Solution Capabilities for Solar Manufacturing & Assembly Machines

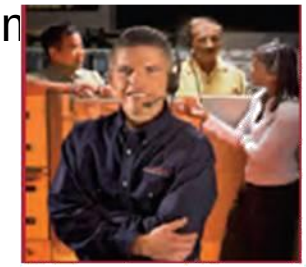
End User



- Easier operation and setup with Logix platform and integrate
- Actionable data provided with context via FactoryTalk Suite
  - Lot tracking and panel genealogy
  - Understanding why unplanned downtime events occur
  - Improved diagnostics to troubleshoot issues quickly
  - Reporting by role (e.g. manager, operator, technician)



- Scalable and flexible platforms
  - Adjust process recipes quickly
  - Off-the-shelf components eliminate custom one-offs
- Standards compliance of automation allows easier “plug-n-play” into existing line
  - Common code allows equipment to be started up n
- Global service and parts availability



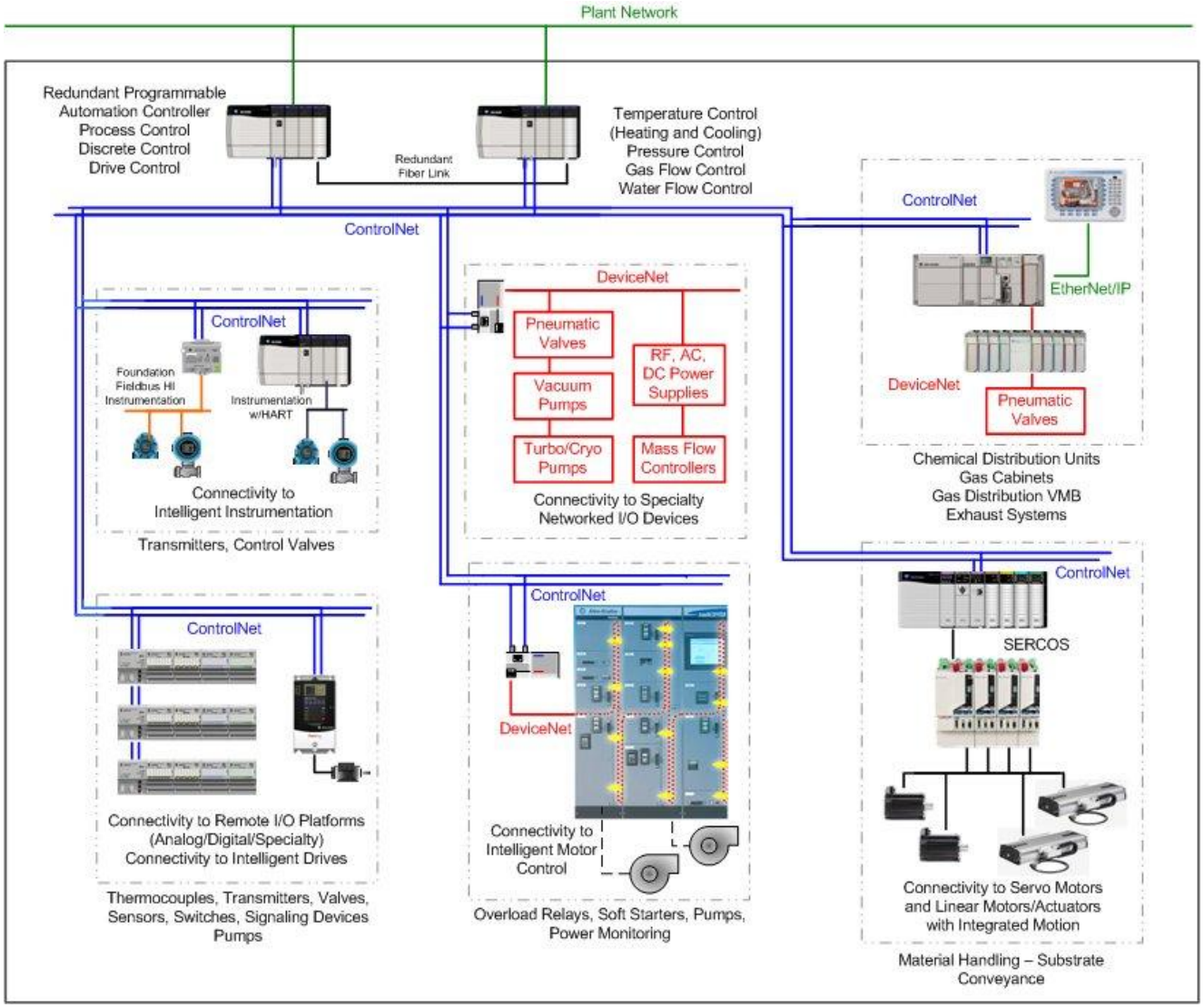
Typical Architectures

- Process Area - High Availability Process Control
- Process Area - Process and Motion Control
- Assembly Area - Discrete Control
- Assembly Area - Discrete and Motion Control

Process Area Architecture Example
High Availability Process Control

Example Applications:

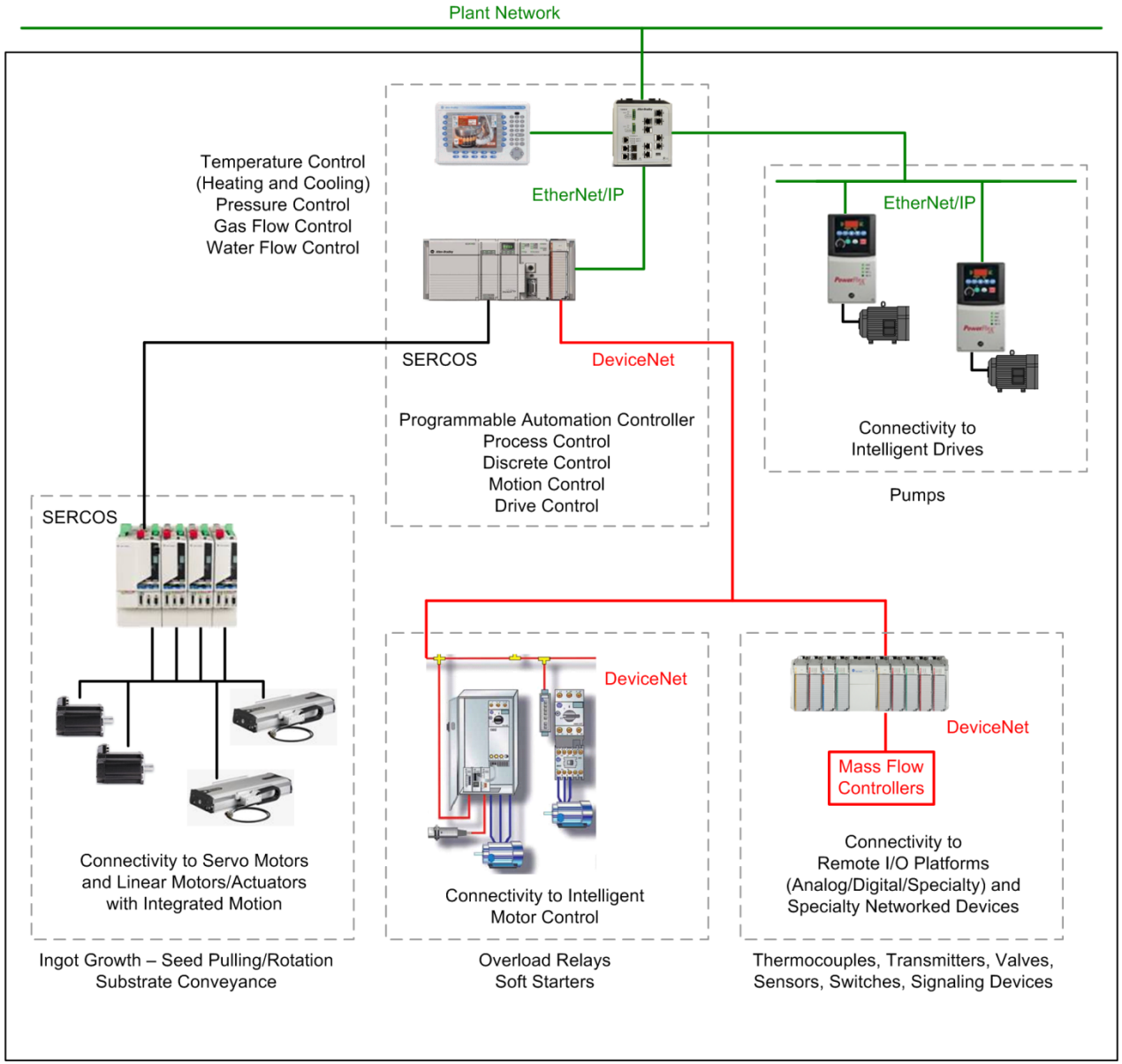
- Deposition Tools
- Wet Chemical
- Glass Coating
- Screen Printing



Process Area Architecture Example
Process and Motion Control

Example Applications:

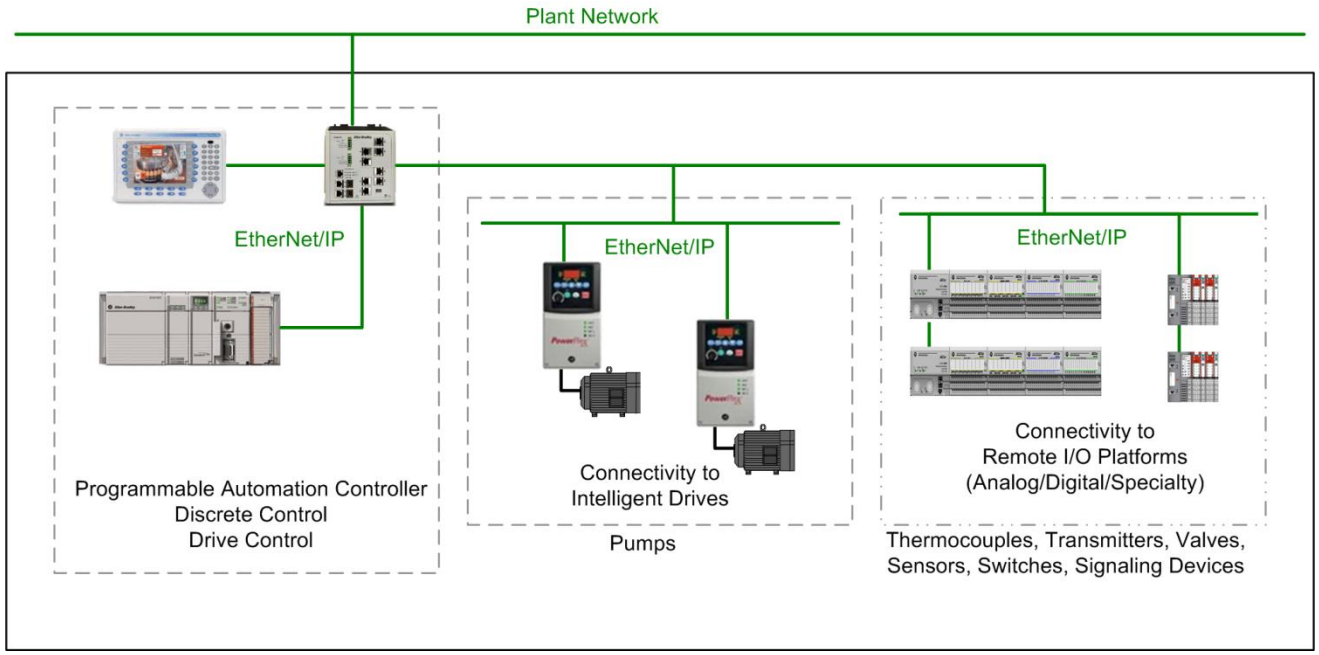
- Ingot Growers
- Glass Washer
- Wire Saws
- Shaping Saws
- Stringer
- Drying Furnace
- Bussing Station
- Laminator



Assembly Area Architecture Example Discrete Control

Example Applications:

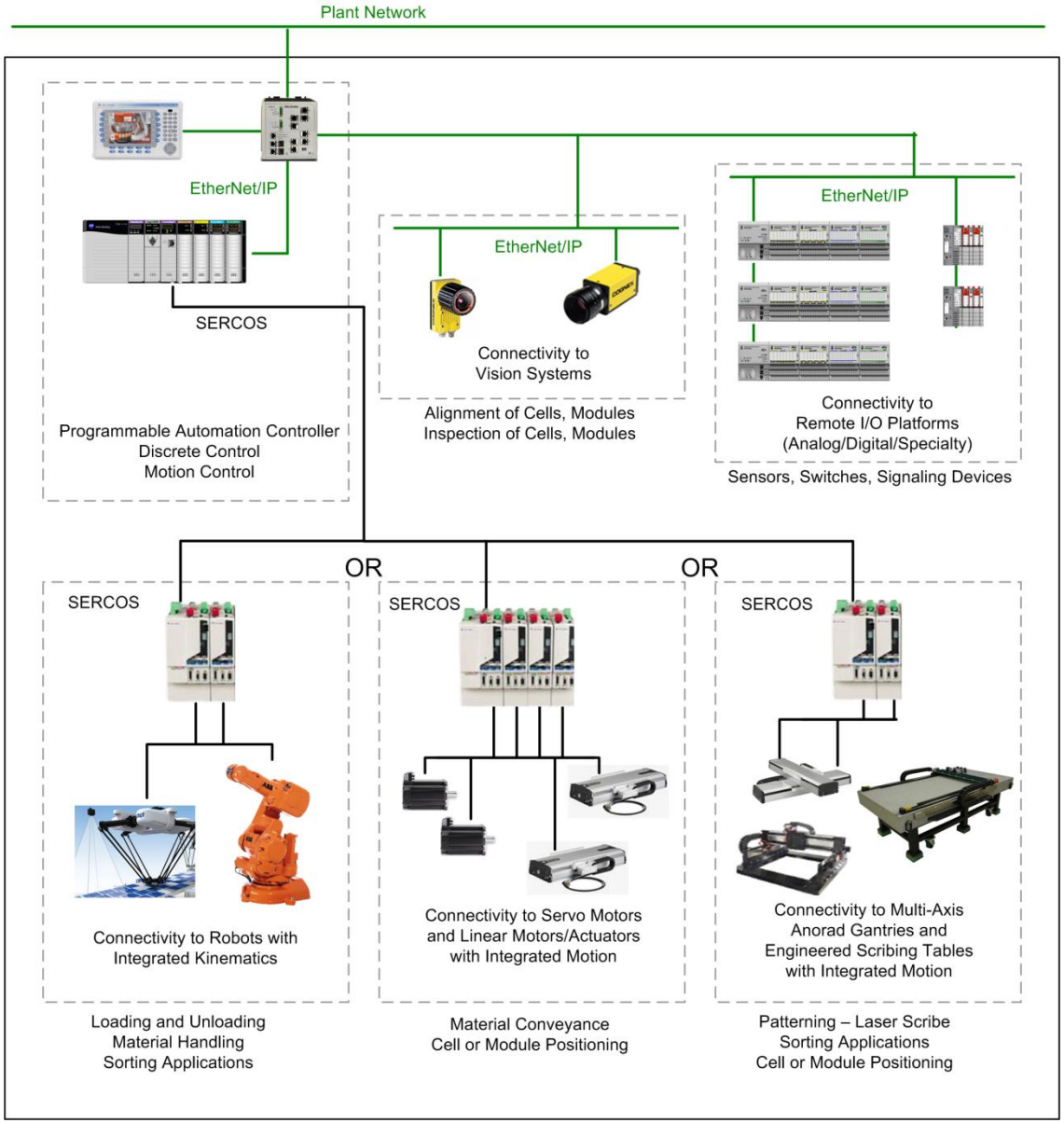
- Conveyor Control
- Glass Washer



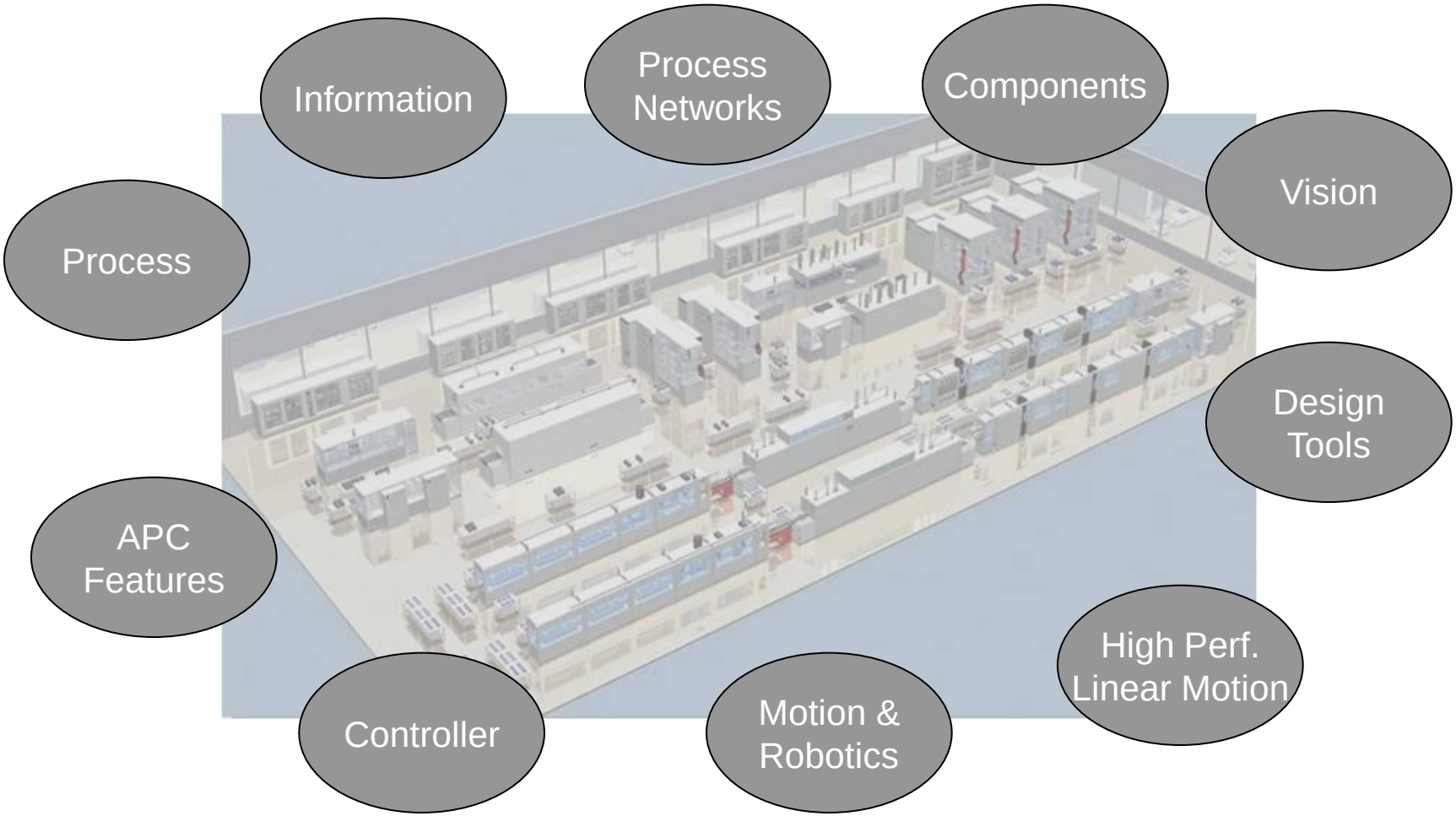
Assembly Area Architecture Example Discrete and Motion Control

Example Applications:

- Laser Scribe
- Load/Unload Stations
- Inspection Test & Sort
- Singulation Equipment
- Lay-up Station
- Framing Station

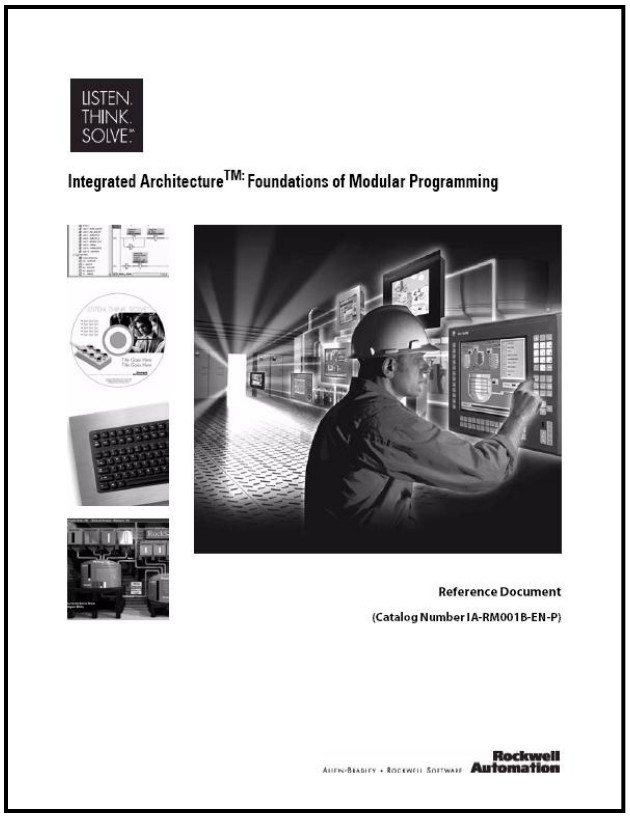


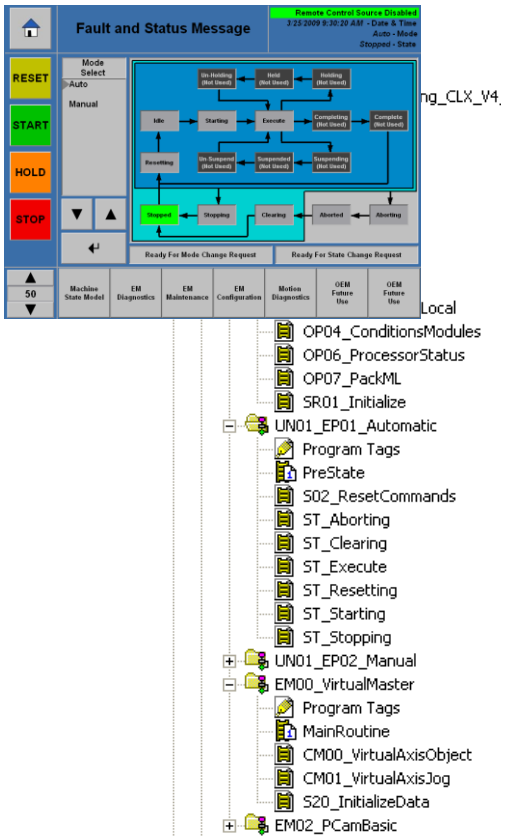
Integrated Architecture for Solar Manufacturing



Proven Solutions and Industry Experts

- Modular Programming and Power Programming methodologies that follow industry standards
- Templates for quick code development while allowing creativity for machine uniqueness
- Technical Consultants can support in applying correct solution





Technical Consultant

- Senior engineers with extensive field experience
- Focus: technical support and cost reduction
- Machine innovation
- Best practice sharing
- Training, examples, side by side engineering, experience, knowledge

Value for Solar OEMs

- **Machine Performance and Differentiation**
  - Scalable process control capabilities to solve the most demanding process applications
    - Closed loop control with PIDE to model predictive control with Pavilion software
  - Vision integration
  - Robot (SCARA, Delta) integration using Kinetix and Kinematics
  - High speed linear motion – including engineered tables
  - OEE for yield tracking

- **Reduced Manufacturing Lead Time and Cost**
  - Re-usable, modular engineering code speeds engineering effort
  - Scalable architecture to match control system to machine requirements
  - Reduced wiring and fabrication time
  - Reduced troubleshooting and commissioning time

- **Lower Supply Costs**
  - Broad portfolio from single source helps you find what you
  - Distributor kitting for single part number orders
  - Globally available off-the-shelf replacement parts
  - Remote diagnostic capability

Rockwell Automation Solar Manufacturing & Assembly Experience

Application Profiles of Solar Manufacturing & Assembly Equipment with Rockwell Automation Solutions:

Wet Processing

- Wet Processing Equipment

AR Coating

- Anti-Reflective Coating Equipment

Stringer

- Stringer Equipment

Glass Washing

- Glass Washing Equipment

Wafer Slicing

- Wire Saw/Wafering Equipment

Laser Scribe

- Laser Scribe/Patterning Equipmer

Solar Manufacturing/Assembly – Takeaway

- Broad portfolio of control system components to maximize your machine's performance
- Tools, training and experience to reduce your manufacturing time and cost
- Technology and domain expertise to help differentiate your machines
- Global support and business partnering to help you remain competitive

Rockwell Automation has the broadest solutions and the expertise to help you optimize your Solar Manufacturing & Assembly machine

Helping You Differentiate Your Machines

- Scalable architecture – from component to highly integrated machines
- Modularized design capability – reuse of code
- Standardized programming – reduce design, development, and troubleshooting time
- Machine templates – quick implementation of machine solutions
- RSLogix code protection – secure your intellectual property
- Consultants – experts familiar with the industry, machines and solutions

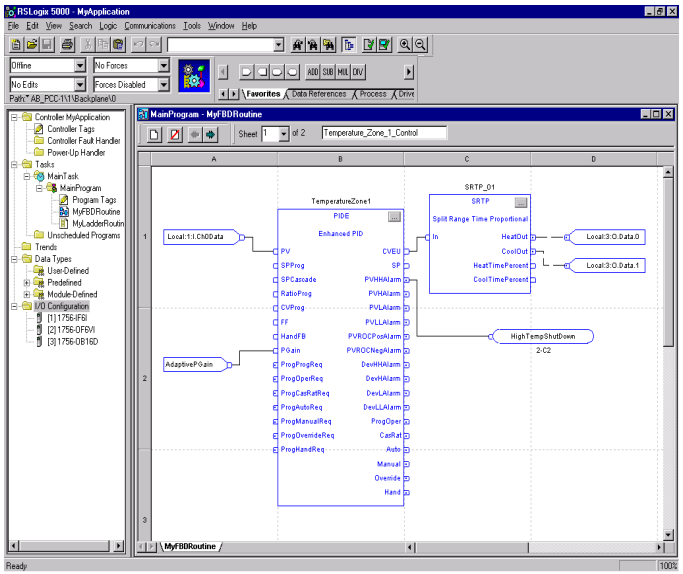
Global OEM Team Resources

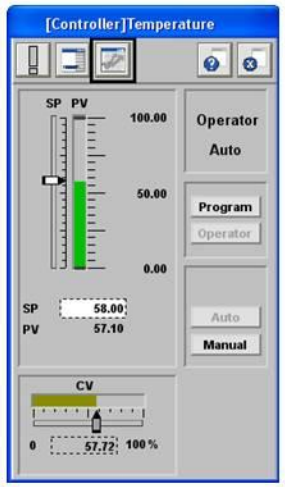
- Global Consulting Team
  - Resources: 150
  - Extended team: 220
- OEM Team Success
  - Over 1600 OEMs engaged
  - Help machine builder be more successful by reducing total cost
- OEM Competency Centers
  - Northern Europe - Hamburg, Germany
  - Southern Europe - Bolgona, Italy
  - Shanghai, China
  - Singapore
- Industry Leadership
  - OMAC / ISA
  - SEMI
  - PMMI
  - VDMA
  - UCIMA
  - MHIA
  - AIMCAL
  - PRIMIR
  - SGIA
  - CEMATEX
  - International Standards Groups
- OEM Tools
  - Modular Programming Guidelines
  - Power Programming - compliant with ISA-88 standards
  - Add-on Instruction (AOI) library
  - Sample Code and HMI Face Plates

Backup / Hyperlinked Slides

Closed Loop PID Control

Process

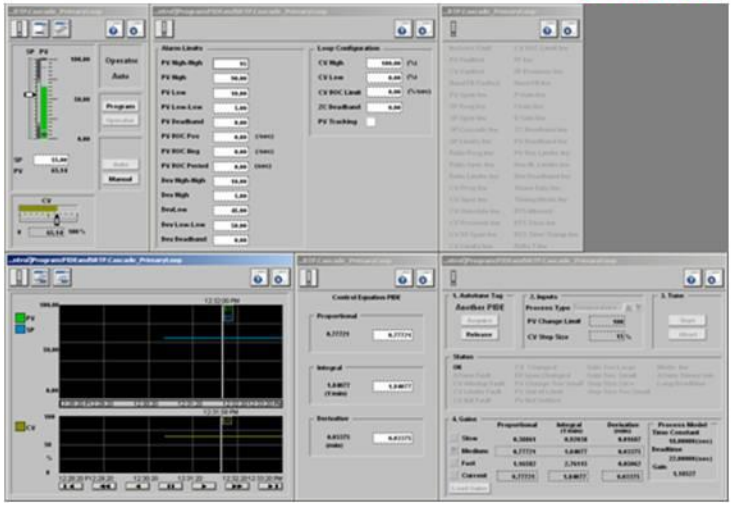




HART COMMUNICATION PROTOCOL

PROFIBUS PROCESS FIELD BUS

FOUNDATION

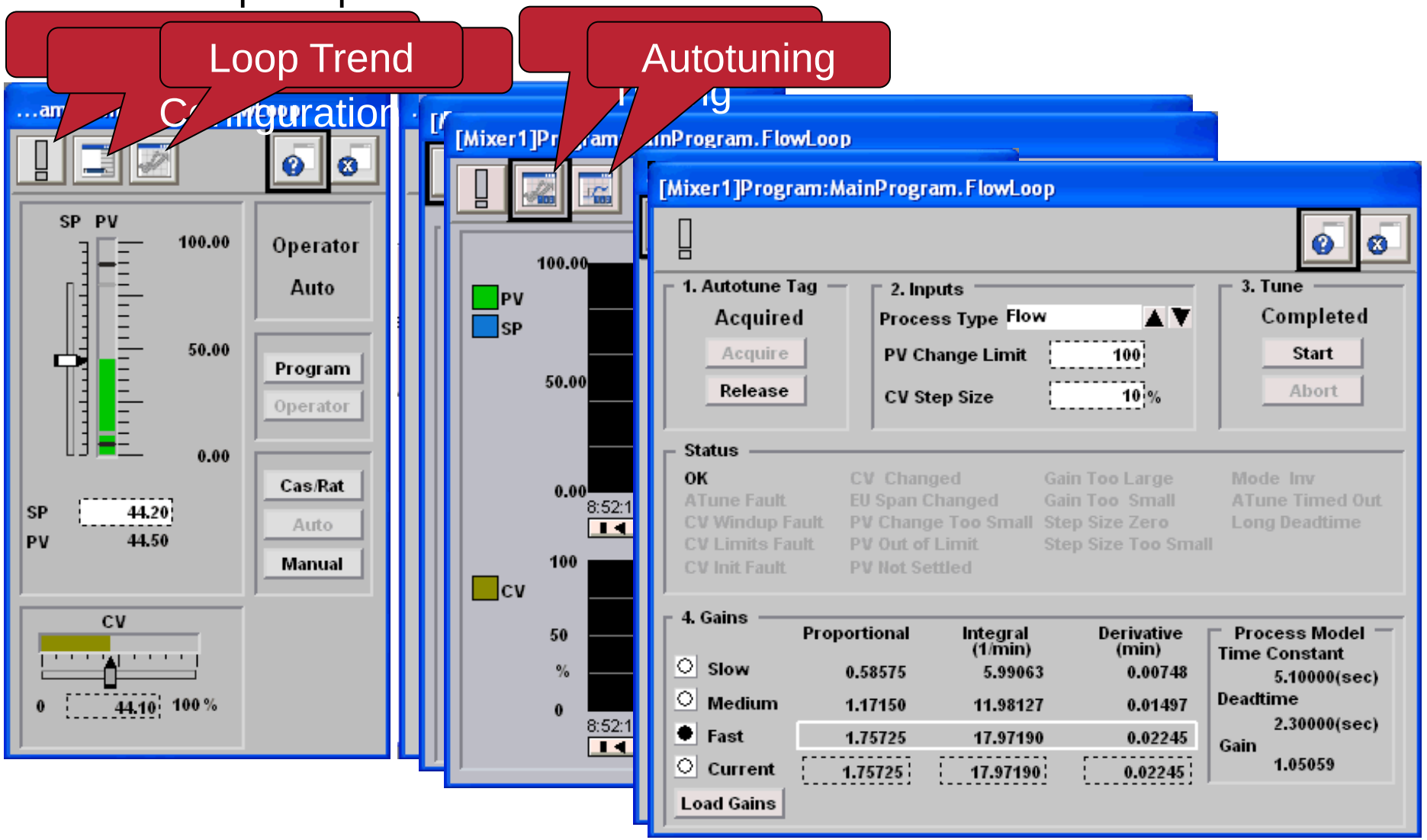


Function Block Diagram for AutoTune PID control with Analog Out, Split Range, or Split Range Time Proportioned

Auto tune advanced PID with automatic generation of faceplates and operator interface screens with your choice of Fieldbus or Analog I/O

Process Faceplate Detail Displays

- The main faceplate display links to several detail displays. For example, a PIDE faceplate provides details for:



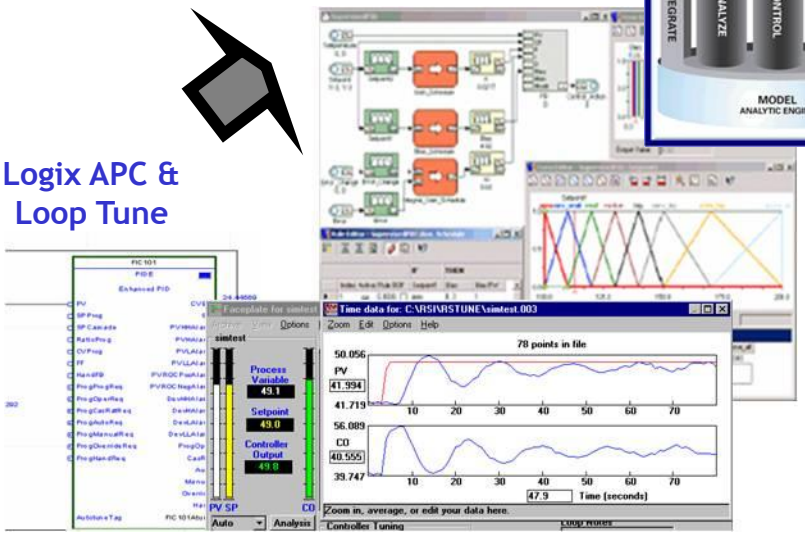
Powerful Process Control

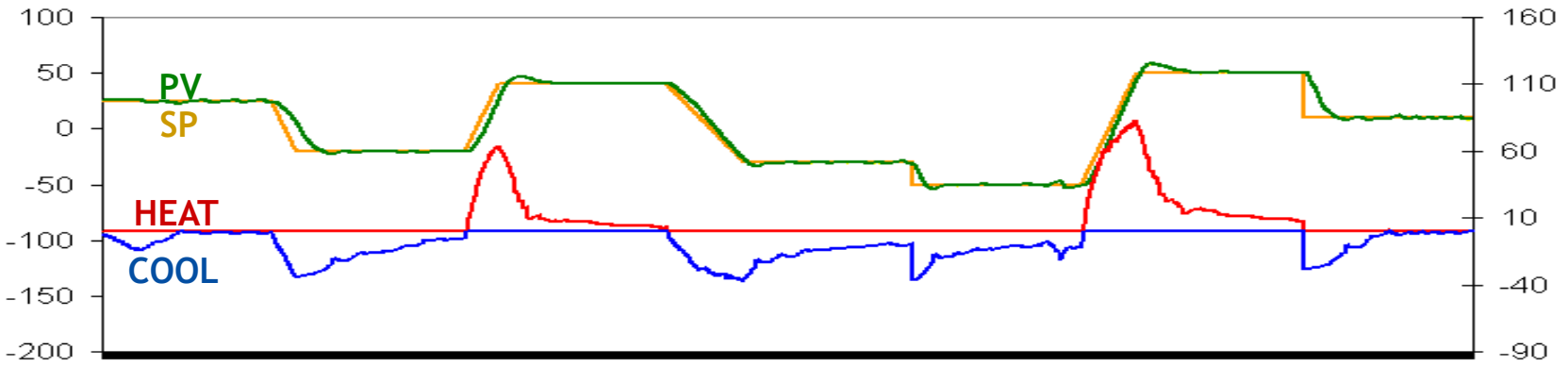
- Production Optimization
  - Portfolio of process optimization capabilities
  - Open & closed loop auto-tuning
  - Advanced regulatory and unbounded Fuzzy Logic supervisory control
  - Linear & non-linear multivariable model-predictive control, real-time economic

Supervisory Model-based Control

Fuzzy Logic

Logix APC & Loop Tune

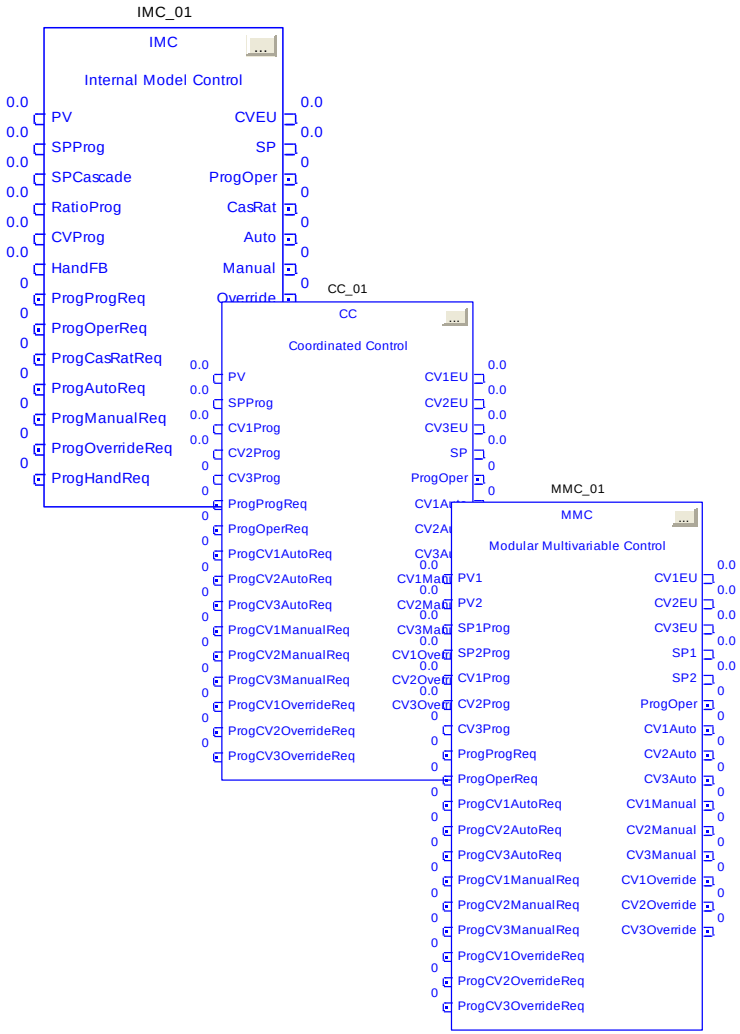




Logix Based Advanced Instructions

APC Features

- Advanced Process Control (APC) instructions
  - Internal Model Control (IMC) – Compares actual process error against error calculated by an internal first order lag plus deadtime model
  - Coordinated Control (CC) - Controls a single process variable by manipulating as many as three different outputs
  - Modular Multivariable Control (MMC) - Controls two process variables to their setpoints using up to three controller outputs
- APC Instructions yield
  - Tighter Control
  - Better Responsiveness to process upsets



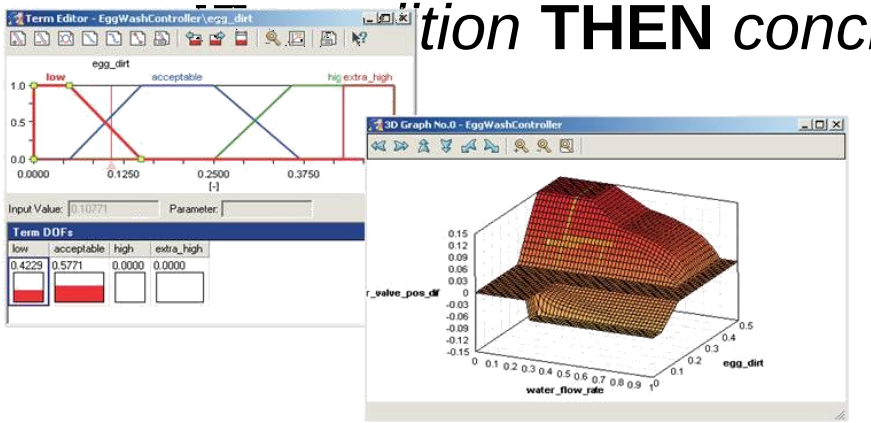
Model Based Functions to replace PID controller for loops with long lags and dead times

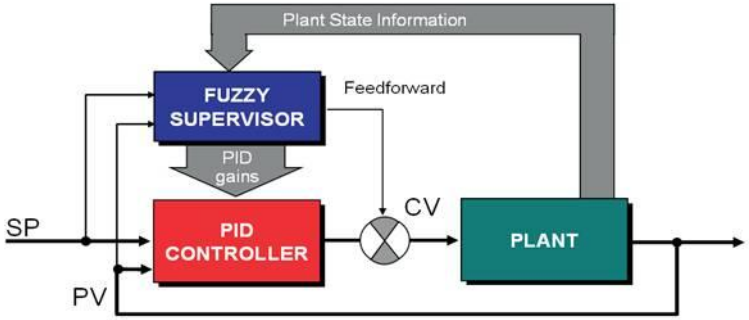
Fuzzy Logic Capabilities: FuzzyDesigner

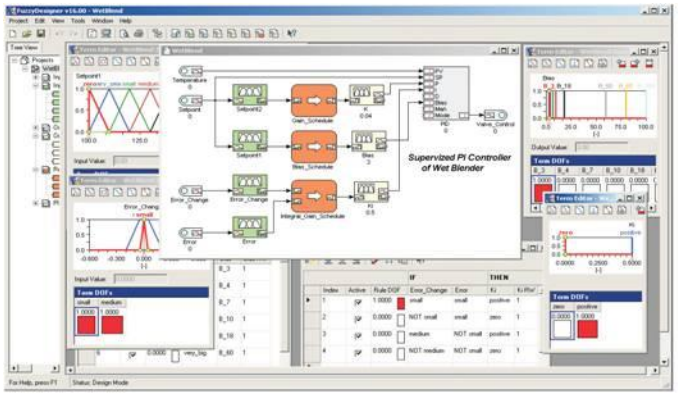
APC Features

Expert Knowledge is transformed using Fuzzy "if/then" rules to describe a relation between input and output variables in the following form:

IF *condition* **THEN** *conclusion*

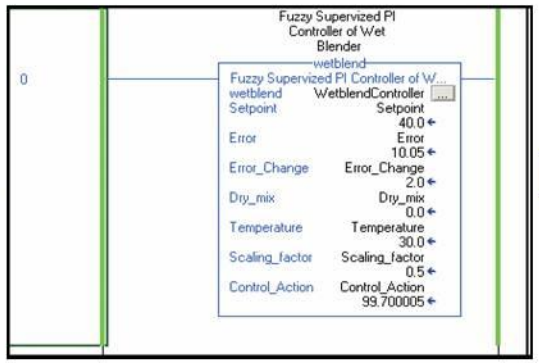






Fuzzy Designer

Generates



Add-On Instruction

For

Control Systems
- controller
- supervisor
- process model

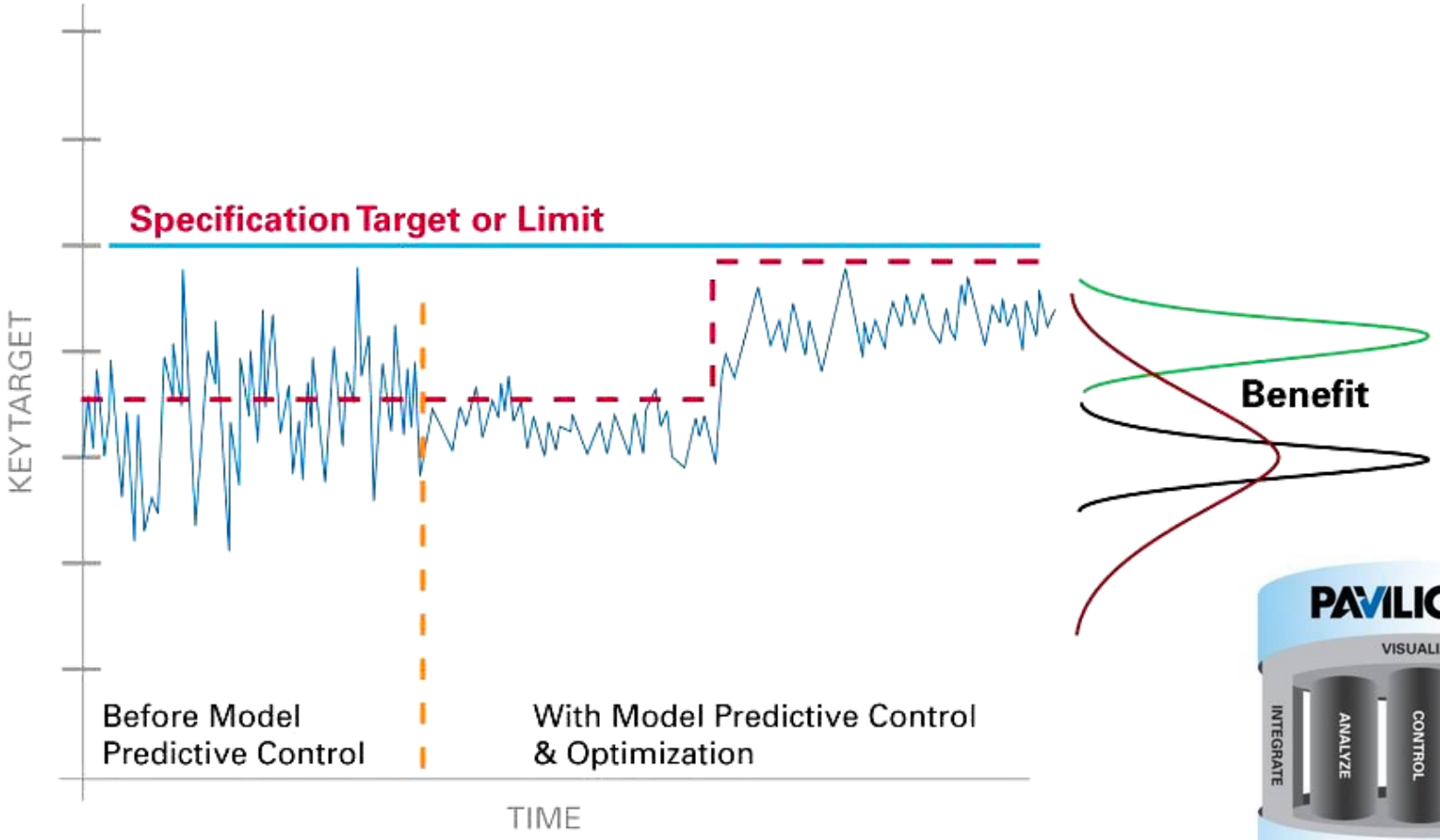
Process Diagnosis
-process state classification

Decision Making
-decision support system

Forecasting
- prediction model

Pavilion: Maximizing Operational Performance

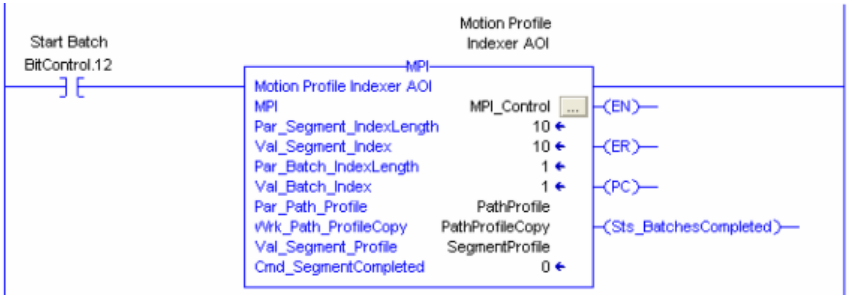
- Maximum profitability is realized by operating a process as close to its constraints as possible while maintaining an appropriate margin of

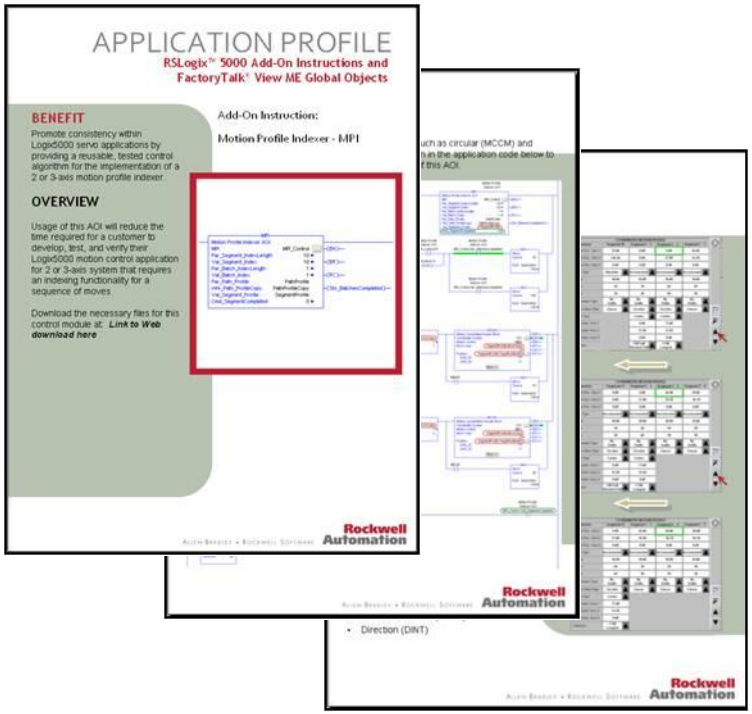


Motion - Execution Simplification

Motion & Robotics

- Canned Application Code
  - Application code and user interface allows easy setup and operation of 2-3 axis indexing applications
  - Streamlines programming and setup when using multi-axis MP-Series linear stage systems and RSLogix 5000 kinematic features
  - Includes application profile instructions, faceplates, and ACD file





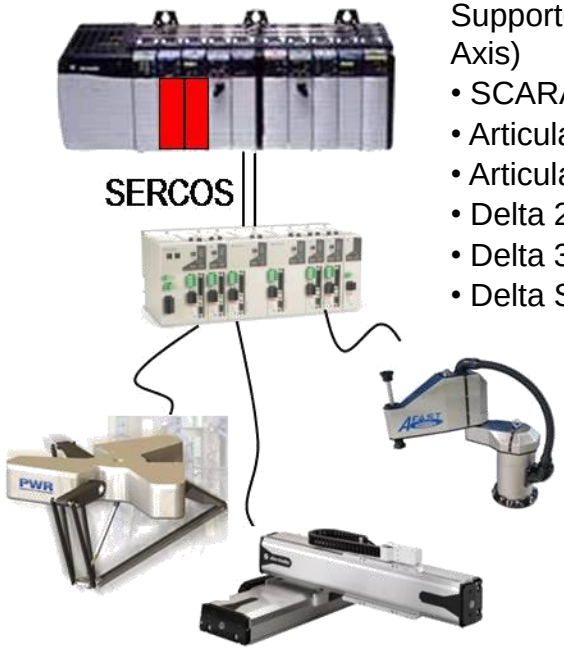
Robot Integration

Integration via Networks

EtherNet/IP

DeviceNet

OR



Integration via Logix/Kinetix

Logix

Kinetix
the new science of integrated motion

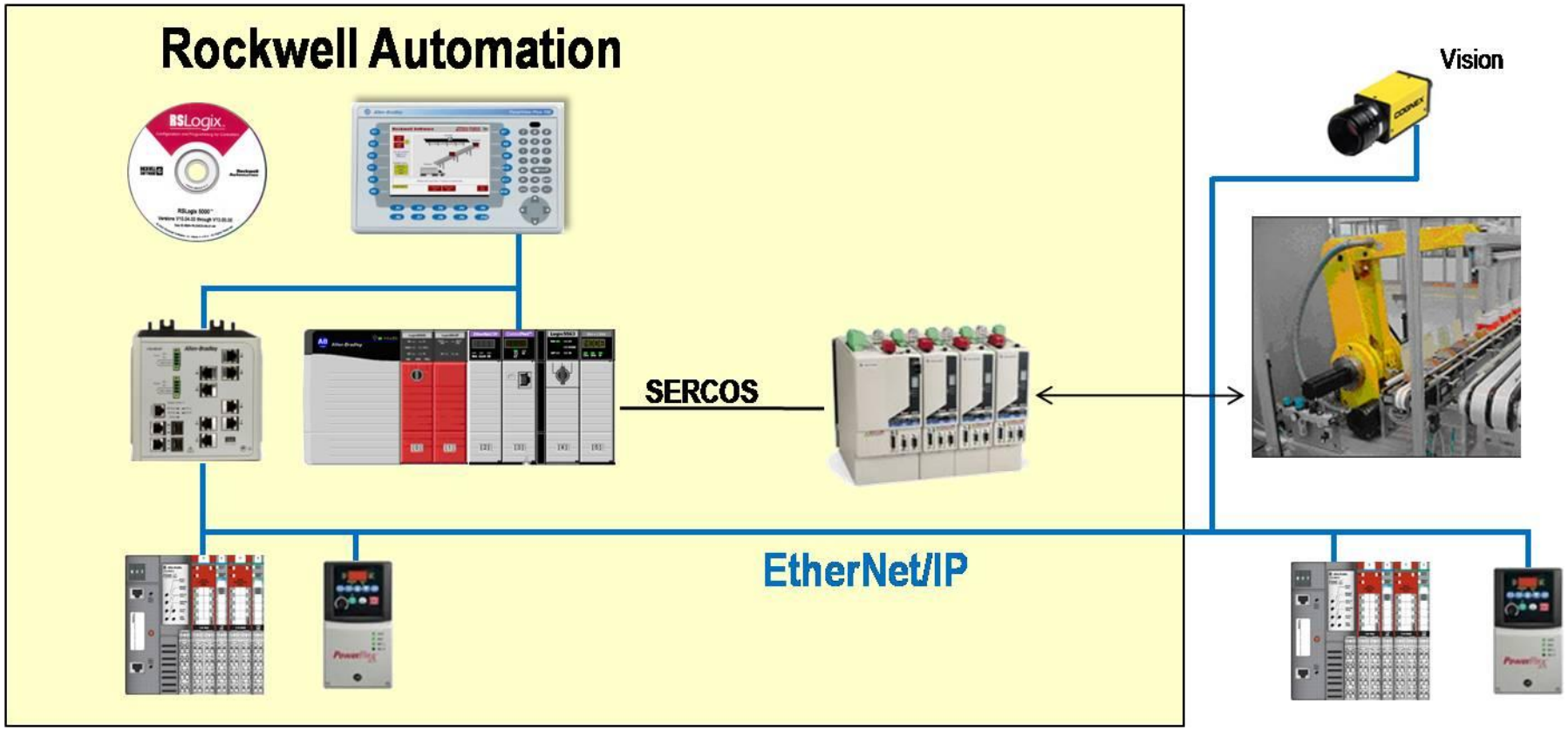
Supported Robot Geometry (4-5 Axis)

- SCARA
- Articulated Independent
- Articulated Dependent
- Delta 2 Axes
- Delta 3 Axes
- Delta SCARA

Flexible options for robot controller connectivity or utilize the Kinematics integrated solution with the Logix platform

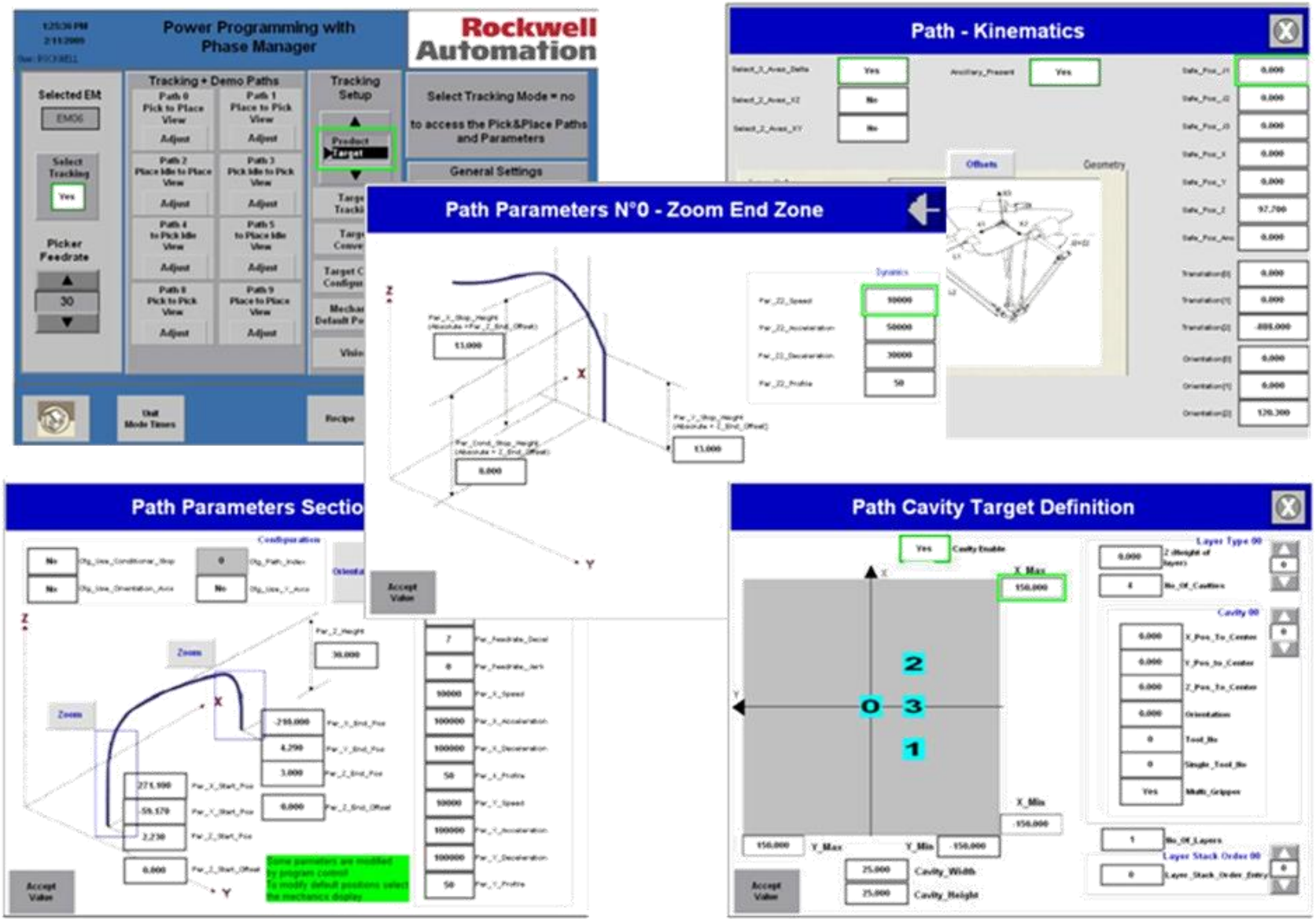
Robotics Integration
Kinematics feature integrated in Logix Platform

Motion & Robotics



One hardware platform and fewer networks = reduced panel space and cost/complexity

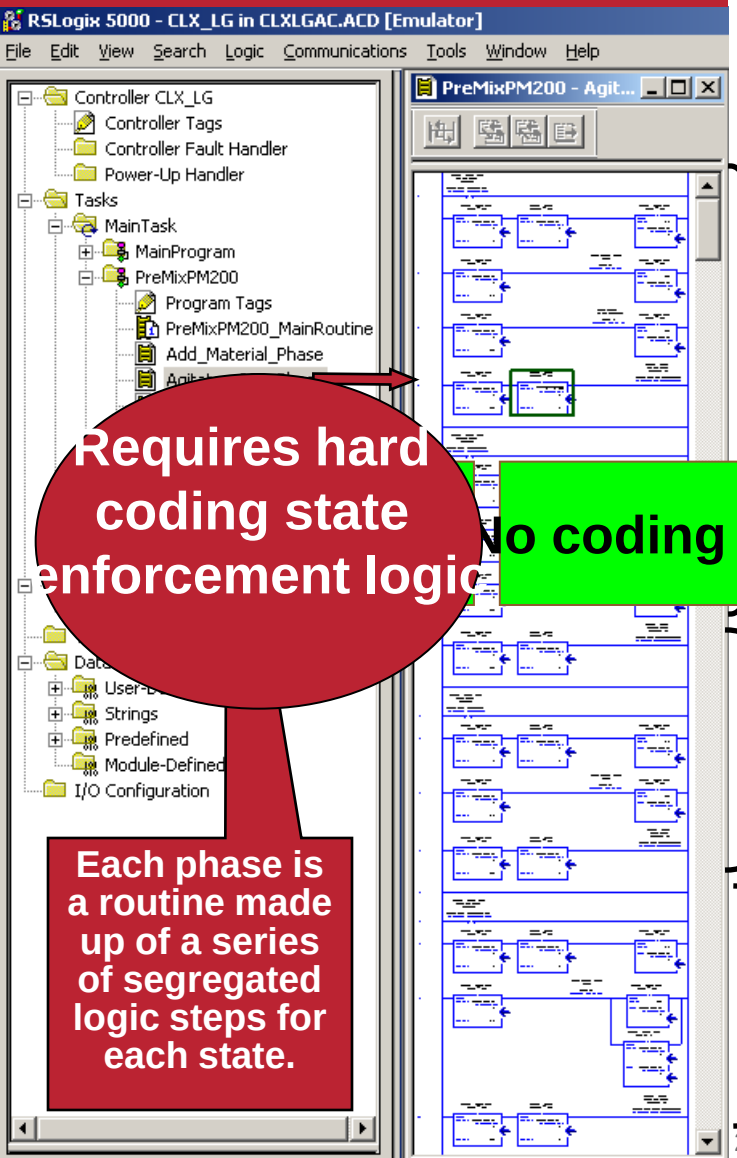
Robotics Integration
FactoryTalk View ME project comes with the template



Standards Option - ISA-88/Phase Manager/State Model

Design Tools

Classic Design



Requires hard coding state enforcement logic

Each phase is a routine made up of a series of segregated logic steps for each state.

Each phase built is an equipment phase which contains a set of state routines.

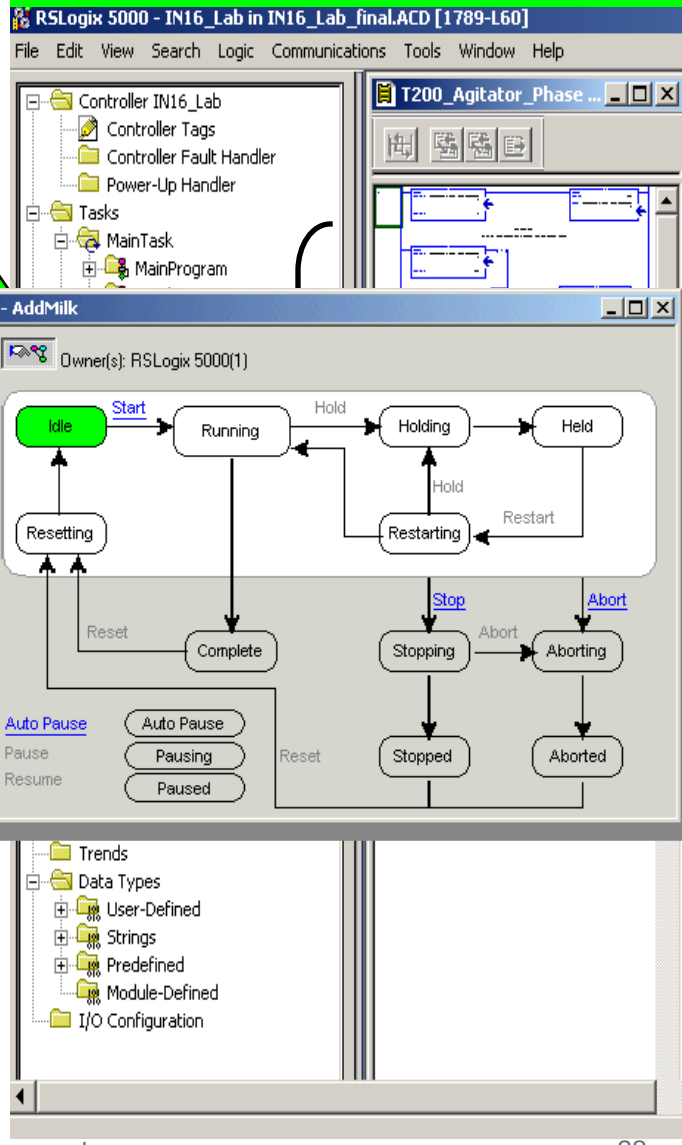
No coding necessary here

Running Logic

Holding Logic

Stopping Logic

With PhaseManager

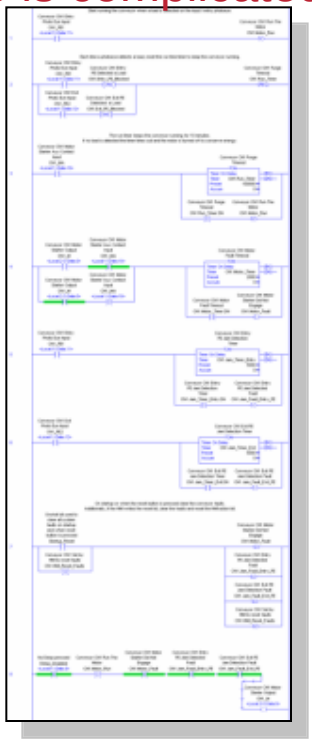


Using Add-On-Instructions (AOIs)

Design Tools

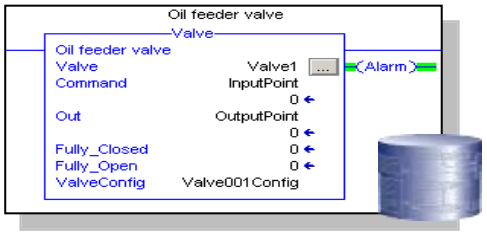
Classic Design

- Multiple rungs/instructions
- Multiple copies = error prone changes
- Difficult to version control and synchronize with documentation
- Reuse is complicated



With AOIs

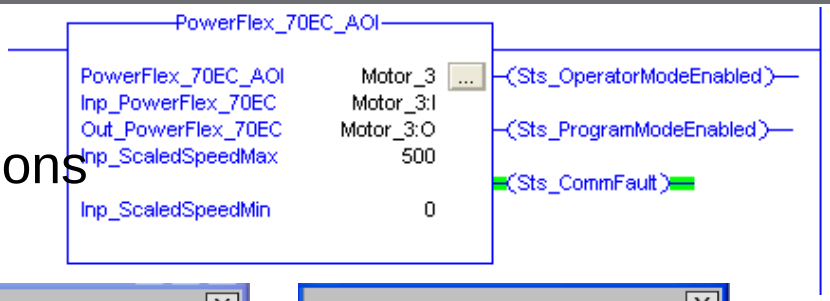
- Single instruction
- Multiple instances inherit all changes
- Version controlled and locked to synchronize with documentation
- Import/export instruction to XML files to create libraries of reusable objects



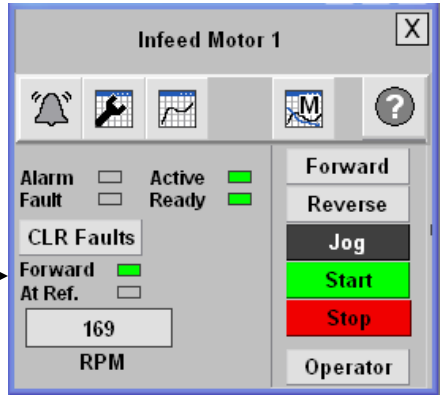
Integrated Drive Control - HMI Drive Faceplates

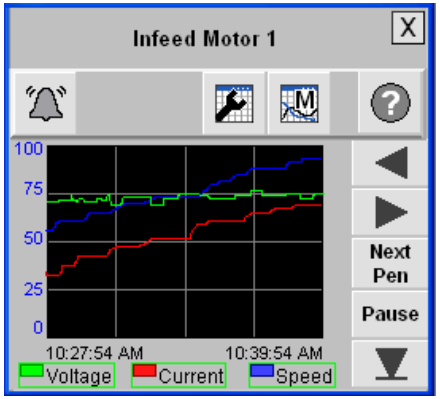
Design Tools

- PowerFlex Faceplates
  - Uses Drive Add-On-Instructions

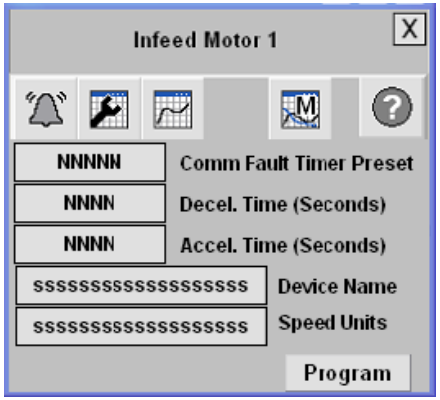


Preconfigured Goto Display Buttons

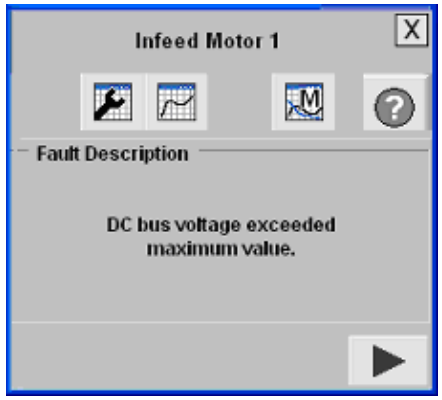


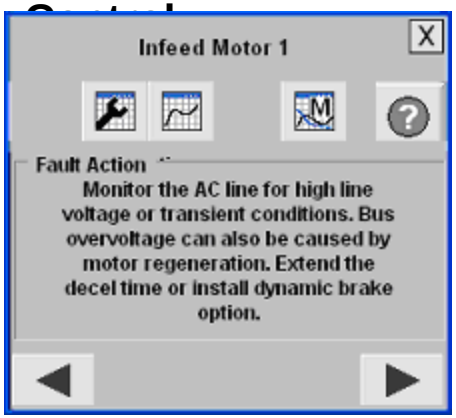


Status and Operator Control

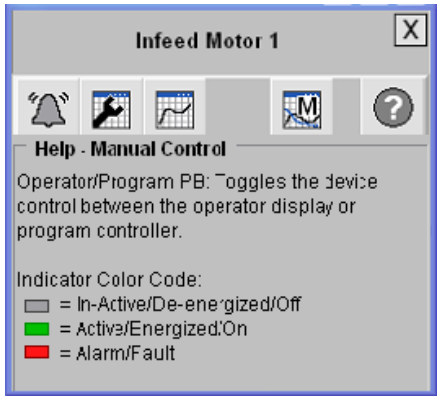


Device Configuration





Device Diagnostics



Operator Help

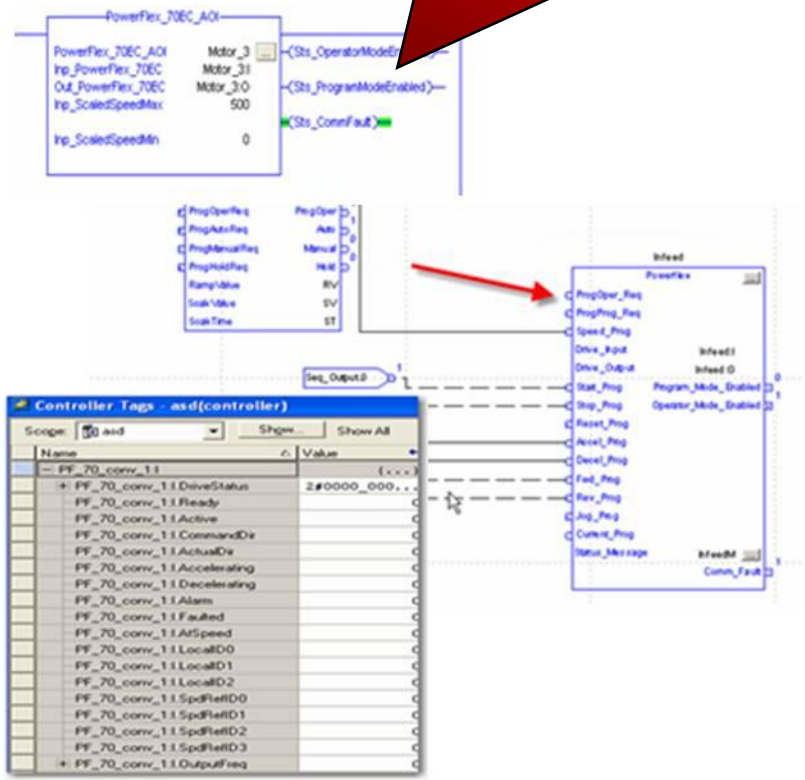
Faceplate and AOI Sets

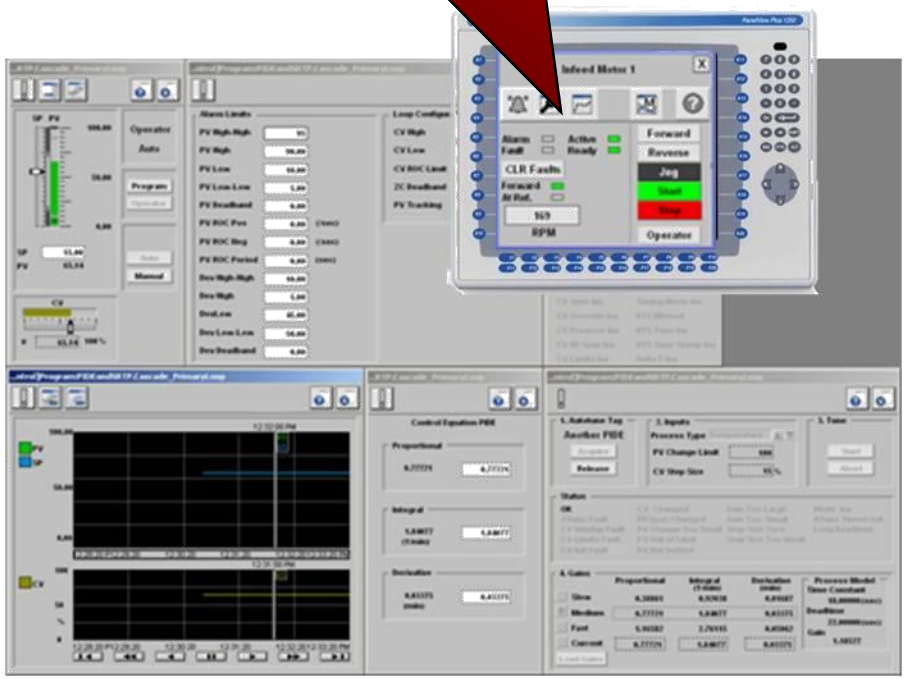
- Leveraging the tools to maximize results
- Easily integrate PowerFlex or Kinetix drives with Logix and PanelView Plus (or FTView)

RSLogix 5000 Device Integration and Add-On Instructions

Direct Correlation

Preconfigured Device & Application Faceplates

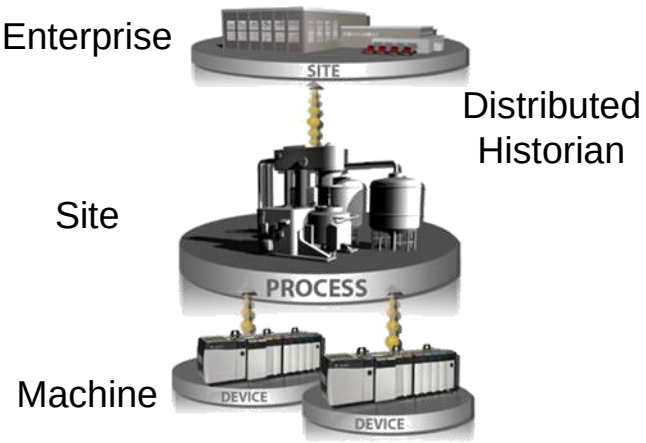




FactoryTalk Historian Machine Edition

Information

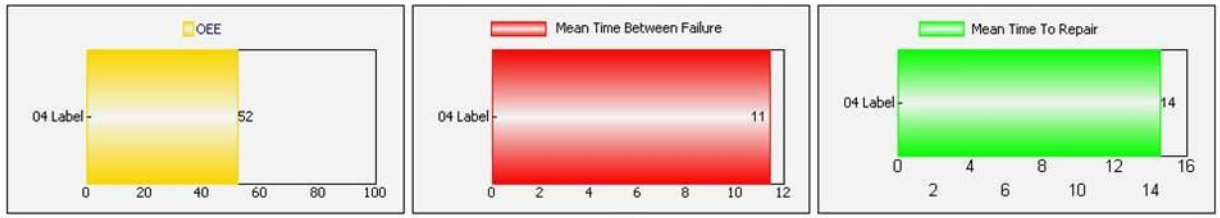
- Based on “OSI PI Inside”
- Module based Historian
- Backplane speed data collection
- More granular data
- Solid State data collection on NAND
- Interfaces with existing PI installatio

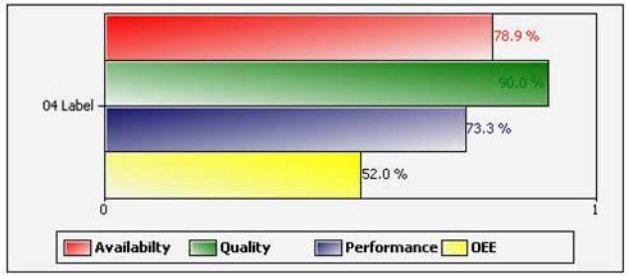


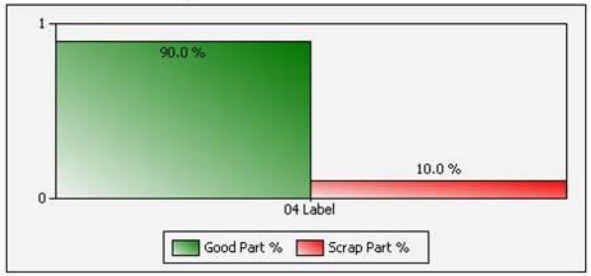
Appropriately Delivered Informa

Why are we not meeting our Production Goals?

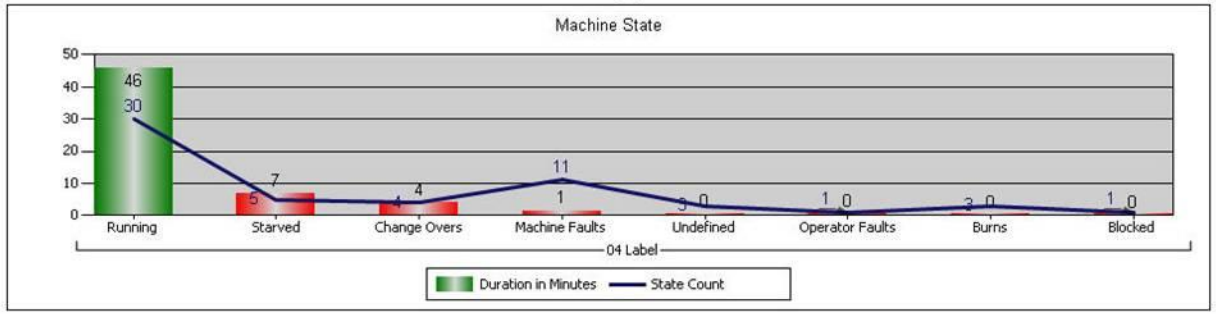
FactoryTalk Metrics DashBoard

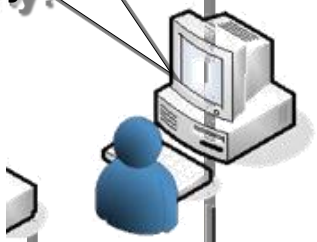




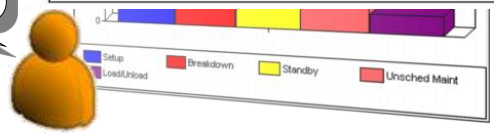


Maintenance is fixing our top breakdown issue.





Fixing that problem.



Information Enabled - Production Results (reporting)

Tracking Data - Genealogy

Serial Number SN3424

2 of 3 | 100% | Find | Next | Select a format | Export

Unit Transactions

TRX Time	TRX Name	Operator	Route	Step	Operation	Production Line	Work Center	Reason
7/15/2008 6:46:46 PM	UnitCreate	logix	PV Route			PV Production Line		
7/15/2008 6:46:46 PM	UnitAddToQueue	logix	PV Route			PV Production Line		
7/15/2008 6:46:46 PM	UnitChangeSerialNumber	logix	PV Route			PV Production Line		
7/15/2008 6:49:14 PM	UnitStart	logix	PV Route	010	Serialize	PV Production Line	Serialize	
7/15/2008 6:49:35 PM	UnitComplete	logix	PV Route	010	Serialize	PV Production Line	Serialize	OK
7/15/2008 6:49:35 PM	UnitAddToQueue	logix	PV Route	010	Serialize	PV Production Line		
7/15/2008 6:55:45 PM	UnitStart	logix	PV Route	020	Front Deposition	PV Production Line	Front Deposition	
7/15/2008 6:55:47 PM	UnitConsume	logix	PV Route	020	Front Deposition	PV Production Line	Front Deposition	
7/15/2008 6:55:48 PM	UnitConsume	logix	PV Route	020	Front Deposition	PV Production Line	Front Deposition	
7/15/2008 6:55:49 PM	UnitConsume	logix	PV Route	020	Front Deposition	PV Production Line	Front Deposition	
7/15/2008 6:55:49 PM	UnitComplete	logix	PV Route	020	Front Deposition	PV Production Line	Front Deposition	OK
7/15/2008 6:55:49 PM	UnitAddToQueue	logix	PV Route	020	Front Deposition	PV Production Line		
7/15/2008 6:56:06 PM	UnitStart	logix	PV Route	030	Laser Scribe 1	PV Production Line	Laser Scribe 1	
7/15/2008 6:56:20 PM	UnitComplete	logix	PV Route	030	Laser Scribe 1	PV Production Line	Laser Scribe 1	OK
7/15/2008 6:56:20 PM	UnitAddToQueue	logix	PV Route	030	Laser Scribe 1	PV Production Line		
7/15/2008 6:56:35 PM	UnitStart	logix	PV Route	040	CVD	PV Production Line	CVD	
7/15/2008 6:56:54 PM	UnitConsume	logix	PV Route	040	CVD	PV Production Line	CVD	
7/15/2008 6:56:55 PM	UnitConsume	logix	PV Route	040	CVD	PV Production Line	CVD	
7/15/2008	UnitConsume	logix	PV Route	040	CVD	PV Production	CVD	

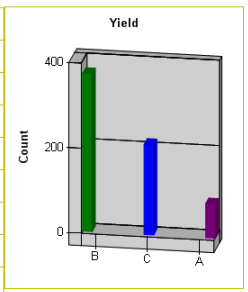
Production Data – Yield Report

Yield Report

Rockwell Automation
LISTEN. THINK. SOLVE.

Total Units	Units Passed	Units Failed
663	80	212
663	371	212

Serial Number	Operation	Pass/Fail	Complete Time
SN2773	Final Test	B	7/15/2008 10:13:37 AM
SN2774	Final Test	C	7/15/2008 10:13:56 AM
SN2775	Final Test	C	7/15/2008 10:14:15 AM
SN2776	Final Test	B	7/15/2008 10:14:32 AM
SN2777	Final Test	A	7/15/2008 10:14:49 AM
SN2778	Final Test	C	7/15/2008 10:58:15 AM
SN2779	Final Test	A	7/15/2008 10:58:53 AM
SN2780	Final Test	B	7/15/2008 10:59:29 AM
SN2781	Final Test	B	7/15/2008 11:00:06 AM
SN2782	Final Test	B	7/15/2008 10:04:43 AM
SN2783	Final Test	C	7/15/2008 10:05:17 AM
SN2784	Final Test	C	7/15/2008 10:05:51 AM
SN2785	Final Test	B	7/15/2008 10:06:23 AM
SN2786	Final Test	C	7/15/2008 10:06:56 AM



Logix Control Platform

Controller

- Multidisciplined
  - Encompasses six control disciplines
  - Common development environment streamlines design, training & mainte
- Scalable
  - Matched to your requirements
  - Built to protect legacy investments
- Information-enabled & Open
  - Designed to integrate easily with information systems
  - Based on open, accepted industry standards

Logix

Driving Productivity With Integrated Control

Controller

Logix

- **Discrete**
  Runs complex systems of digital inputs & outputs
  - Used in the manufacturing of individual products and sub-systems
  - Built for reliability & ease of use

- **Batch**
  Runs systems based on discontinuous steps applied to raw materials
  - Built to drive productivity, quality & flexibility
  - Designed to help ensure consistency & regulatory compliance

- **Motion**
  Provides a simplified method for governing the precise position & velocity of machinery
  - A seamless, high performance solution
  - Integrates sequential, motion, power & mechanics into a single platform

- **Safety**
  Used for hazardous applications where protection of people, the environment or plant equipment is required
  - Designed to improve both safety & productivity
  - Uses same platform & development software as our standard control systems

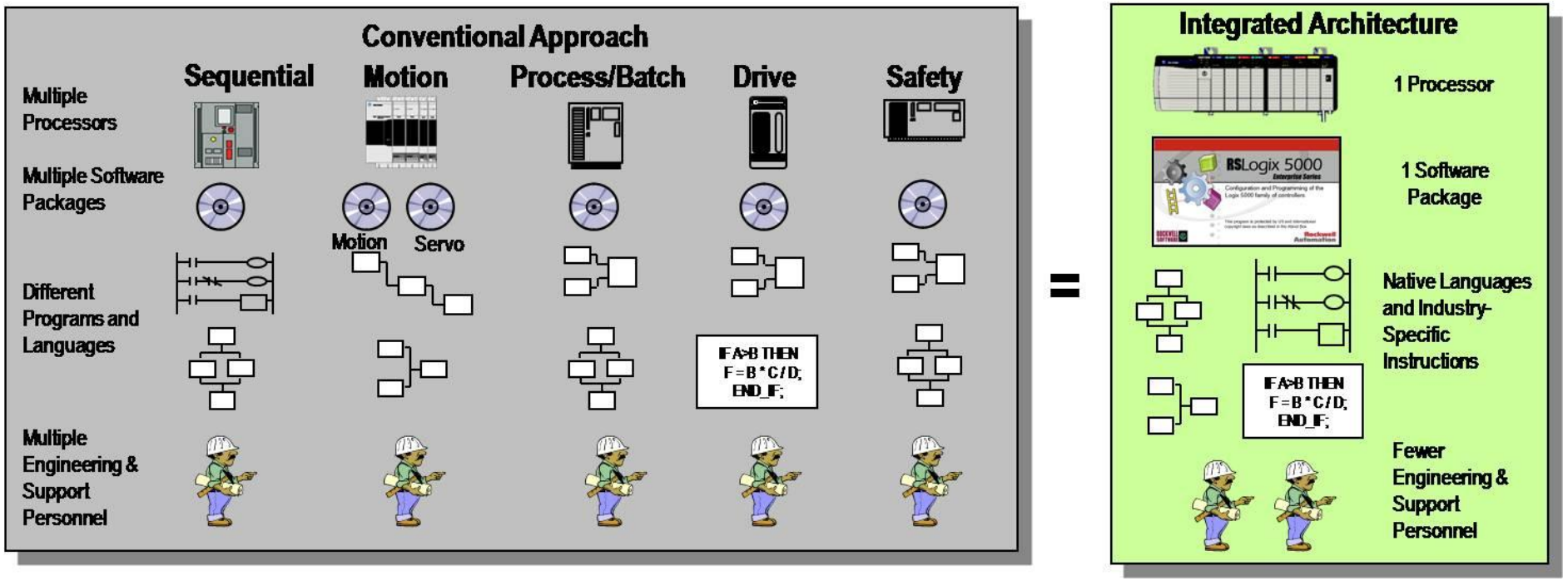
- **Process**
  Runs high-availability systems based on continuous processes applied to raw materials
  - Designed to improve productivity, quality, consistency & flexibility
  - Built to help enable regulatory compliance

- **Drives**
  Used to accelerate & run a load at a required rate & determine the braking forces needed to stop it
  - Built to minimize energy costs
  - Designed to extend equipment life & improve throughput

Multidisciplined Control

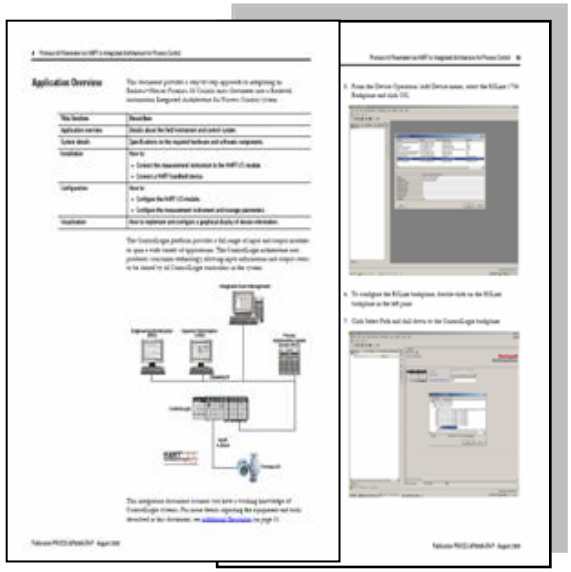
Controller

- Sequential motion, process, batch, safety and drives control within a single control platform (or even a single controller if desired)
- Programmed with one software package - RSLogix™ 5000



Preferred Integration of HART Instrumentation

Process Networks

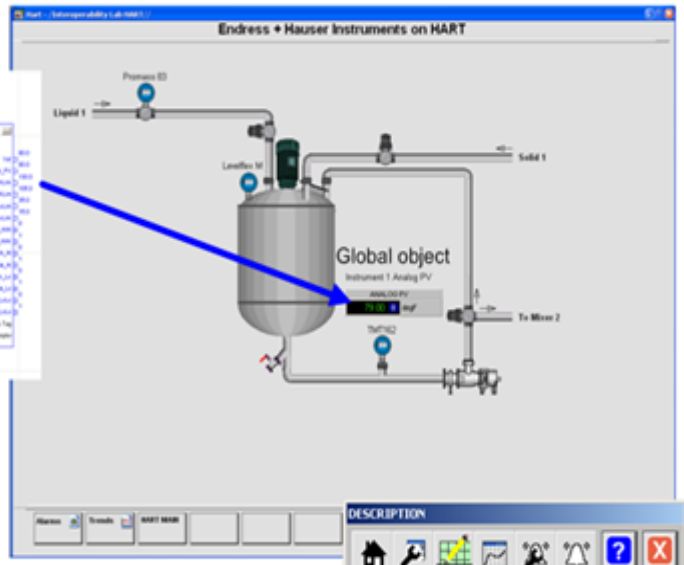


- Documentation for setup and operation
- AOIs for 2-way exchange of data between View and ControlLogix
- View faceplates for instruments connected to ControlLogix HART I/O

Instrument Function Block

Instrument Display & Faceplates

FTView SE Display



Click on global object

Process Network Connectivity & Asset Management

- Application based process network selection
  - HART
    - All the benefits of digital communication without loosing the simplicity of analog
    - Control with all 4 process variables without additional configuration
  - Foundation Fieldbus and Profibus PA
    - Linking Device architecture for maximum flexibility
    - Plant-wide connectivity via EtherNet/IP

HART COMMUNICATION PROTOCOL

PROFIBUS PROCESS FIELD BUS

FOUNDATION

- Device Management
  - Management of intelligent process instrumentation throughout the lifecycle
  - Process device calibration records management from handheld to archive
- Condition Monitoring
  - Predict or prevent impending failures of process instrumentation with centralized device information
- Change Management
  - Safe, secure, and versioned storage of configuration information

FDT

Reduce installation and startup time with wide support of HART and process instrumentation fieldbus technologies

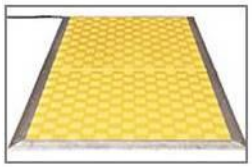
Delivering Exceptional Components for Your Application

Components

- Power
  - Circuit breakers, disconnect switches, contactors & starters…
- Connectivity
  - Terminal blocks, wiring systems, distributed I/O, DeviceNet media…
- Logic
  - Relays, timers, temperature controllers, small controllers…
- Sensing & Switching
  - Photoelectric sensors, limit switches & proximity
- Operator Interface
  - Push buttons, signals & alarms, electronic operator interfaces…
- Safety
  - Safety contactors & control relays, interlock switches…

Quality components increase functionality & last longer – saving you time & money

The Safety Portfolio – ever expanding



Presence Sensing Devices

Light Curtains
- GuardShield
- GuardShield Type 2
- GuardShield Perimeter Access Control
- GuardShield Remote Teach System
- SafeShield Safety
- Perimeter Access Controls
- Area Access Controls
- Corner Mirrors

Light Curtain Interfaces
- Overview
- Safety Relay

Laser Scanners
- SafeZone Multizone

Safety Mats
- MatGuard Pressure-Sensitive
- MatGuard Controllers

Safety Edges
- GuardEdge Sensitive Edge Profiles
- GuardEdge Sensitive Edge Controllers

Operator Interface

Emergency Stop Devices
- 440E Lifeline Rope Tensioner System
- Lifeline 3
- Lifeline 4
- Lifeline 4 Stainless Steel
- Enabling Switches
- Push Buttons

Two-Hand Control Devices
- General Purpose
- Heavy Industrial

Logic

Safety Relays
- MSR100 Single Function
- MSR200 Modular
- MSR300 Configurable

Safety Programmable Controllers
- Overview
- GuardPLC 1200
- GuardPLC 1600
- GuardPLC 1800
- GuardPLC 2000
- GuardLogix
- GuardPLC Distributed I/O
- SmartGuard 600
- RSLogix Guard Programming Software
- Guard I/O

Safety Switches

Tongue Interlock Switches
- Elf Miniature Housing
- Cadet Compact Housing
- Cadet 3
- Trojan 5 Universal
- Trojan T15 and T15-GD2
- MT-GD2
- MT-GD2 Universal with Metal Housing

Guard Locking Interlock Switches
- MT 1600N
- TLS-GD2 Compact Housing with Optional Key Release
- TLS Escape Release
- Atlas 4 heavy Duty with Optional Trapped Key
- CU1 Electronic Timer Relay
- CU2 Stopped Motion Detector
- CU3 Back EMF Detector

Non-Contact Interlock Switches
- Ferrogard Magnetically Actuated
- SensaGuard
- Sipha Sensors and Control Units

Hinge Interlock Switches
- Sprite Miniature Housing
- Ensign Compact Housing
- Rotacam Heavy Duty

Trapped Key Interlock Switches
- Rotary Switch
- Solenoid Release Unit
- Electronic Timed-Delay Unit
- Stopped Motion Unit
- Exchange Unit
- Bolt Interlock
- Access Interlock
- Tongue Interlock
- Miniature Valve Interlock

Limit Interlock Switches
- Bulletin 440P IEC Style Limit
- 802T NEMA-Style Limit
- Imp Postion Limit

Hazardous Location and Pneumatic Switches
- Explosion Proof
- Pneumatic

Power

Safety Drives
- PowerFlex 40P
- PowerFlex 70
- PowerFlex 700S
- DriveGuard™

Safety Motion
- Kinetix with GuardMotion

Motor Control Centers
- Arc-Resistant Control
- CENTERLINE 2100 with ArcShield

Safety Contactors and Control Relays
- 100S-C / 104S-C
- 100S-D
- 700S-CF
- 700S-P

Safety Power Controllers
- Bulletin 2041

Safety Isolation System
- Electroguard

IEC Load Switches
- Overview

Connection Systems
- Overview

Applied Safety Solutions
- Machine Safety Services
- Advanced Burner Management Systems

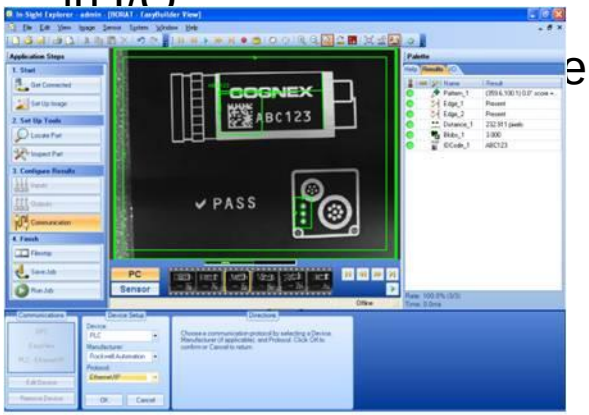
Press Control Systems
- Fixed MicroLogix 1500 Clutch/Brake Only Package
- Fixed SLC 5/02 Clutch/Brake Only
- Omega Configurable Package
- PressMaster Pre-Engineered Control System for Mechanical Stamping Presses

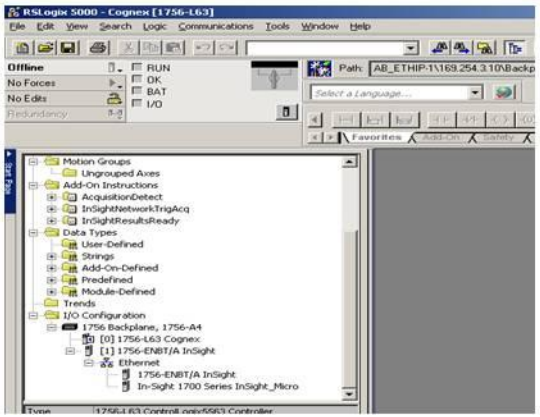
Other Safety-Related Items

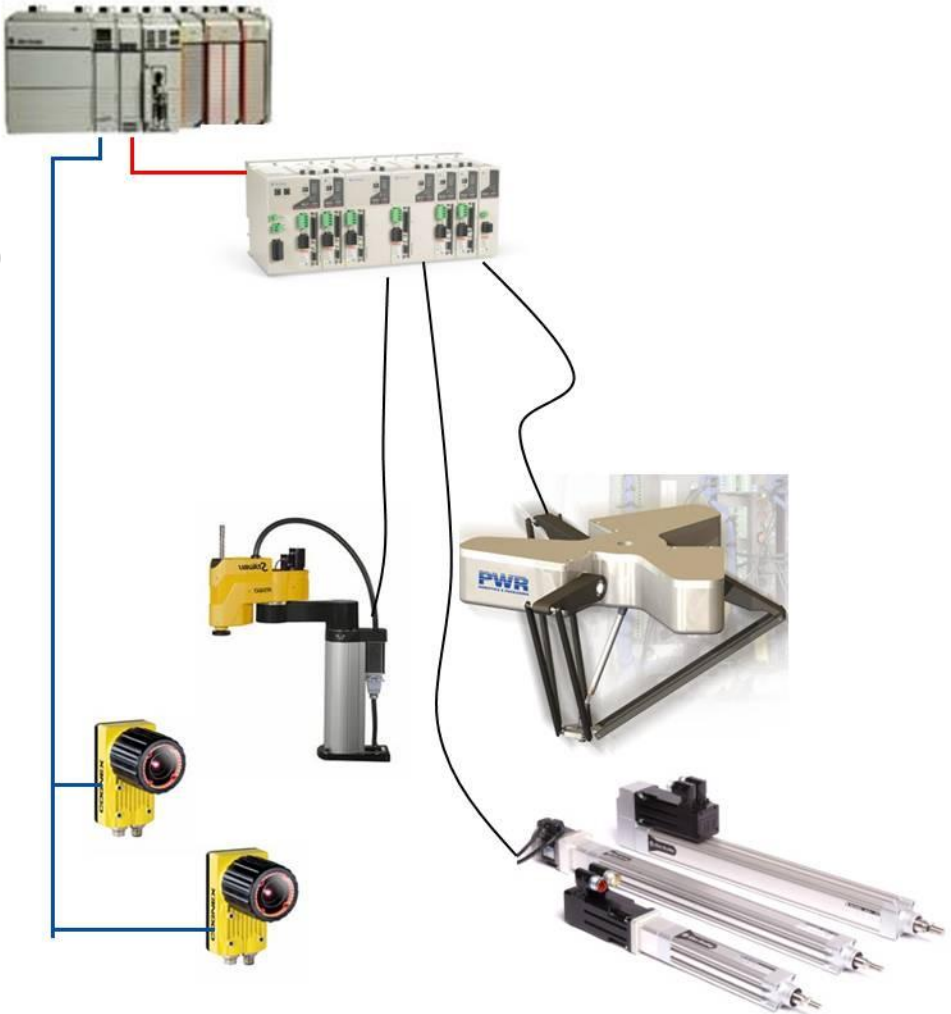
Information and Automation Systems
- Combustion and Temperature Control

Integrated Vision with Cognex

- Ethernet/IP Insite Camera
  - Smart Camera, No PC required
  - Vision Guided/Compensated Motion
  - Built in Ethernet/IP, Tags show up in I/O
  - e to Logix

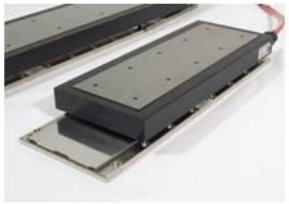






High Performance Linear Motion Solutions

mponent Building Blocks: Loading, Testing & Sorting Applications



LC Series – Ironcore Motor

LZ Series – Ironless Motor

Linear & Ball Screw Stages

Hydraulic/Pneumatic Electro Replacement

dard Multi-Axis Systems: Tabbing, Stringing, Bussing, Taping and Dispensing

Stacked Stages

XY Gantries

Engineered Systems: Scribing

Custom Tables

Optimized Motor Topologies Provide High Performance & Value