T79 - Introduction to the Allen-Bradley® Integrated Safety System

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Agenda

Evolution of Functional Safety

Simple, Configurable, and Integrated Safety Systems

Simplifying with Integrated Safety

What’s Next
Smarter
Machines & Equipment

Real-time Data
- Running Time,
- E-stops, Guard Status

CONTEXTUALIZATION
- Quality, OEE, Safety

Information

Knowledge
- Analytical
- Safety System use/abuse

Wisdom/Action
- Optimize
- More safe & efficient process workflows

State of the Art

State of Confusion
Safety = Stop?
Safety and Productivity

Investment in establishing a positive safety culture and using contemporary methods and technologies will have a significant contribution to profit.

### Defining Best-In-Class Performance

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<th>Definition of Maturity Class</th>
<th>Mean Class Performance</th>
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| **Best-in-Class:** Top 20% of aggregate performance scorers | • 90% OEE  
• 0.2% Repeat Accident Rate  
• 0.05 Injury Frequency Rate  
• 2% Unscheduled Asset Downtime |
| **Industry Average:** Middle 50% of aggregate performance scorers | • 85% OEE  
• 2.4% Repeat Accident Rate  
• 0.9 Injury Frequency Rate  
• 6% Unscheduled Asset Downtime |
| **Laggard:** Bottom 30% of aggregate performance scorers | • 76% OEE  
• 10% Repeat Accident Rate  
• 3.0 Injury Frequency Rate  
• 14% Unscheduled Asset Downtime |

Source: Aberdeen Group, September 2010

### “Top Two” Pressures Driving Focus on Safety

- Need to be in compliance with regulatory and safety requirements: 97%
- Reduce the risk of an adverse event: 92%
- Corporate sustainability mandates: 90%
- Minimize the cost of avoiding: 60%
- Need to improve/maintain brand reputation/value: 57%

Source: Aberdeen Group, September 2010
Evolving Safety Technology

Basic Safety
- Cumbersome
- Difficult to Apply
- Inflexible
- Difficult to Trouble-shoot
- Diagnostics at the relay
- Often Bypassed

Semi-integrated Safety
- Modular
- Easier to Apply
- More flexible
- Easier to trouble-shoot
- Diagnostics at the relay and at local diagnostic screens
- User friendly

Integrated Safety
- Modular & Networkable
- Easiest to Apply
- Most Flexible
- Easiest to trouble-shoot
- Maximum diagnostics
- Task Oriented
- User friendly
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What’s Next
• Provides status for all the 440R safety modules to the Logix controller via Add On Profile
• Eliminates any monitoring/feedback wiring to controller
• Leverage optical link to capture status from all modules
• Support embedded switch technology

440R-ENETR

• Terminal Level Status
• Operation States
• Fault codes for major/minor faults
Configurable Safety, Connected

- Add-On Profile V3.01 for Studio 5000 contains fully functional editor for CR30 safety relay
- Single software/project for configuring and monitoring Logix controller and Guardmaster® 440C-CR30 safety relays.
- Leverage Logix tags & IO for non safety functions
- Provides status and diagnostics information via EtherNet/IP connection.

440C-CR30

440C-ENET

- I/O Terminal status
- Verification ID
- Faults
- Logic function status
GuardLogix Controllers

- **GuardLogix - Integrated Safety**
  - Dual Processor Solution (1oo2 Architecture)
  - Up to Cat 4, SIL 3 Certification per IEC 61508
  - ISO 13849 Performance Level e (Category 4)
  - Certified Safety Application Instructions
  - CIP Safety over DeviceNet and EtherNet/IP

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1oo2 Architecture
SIL3 (IEC61508)
PLe (ISO13849)

Compact GuardLogix
1766-L30ERMS
1769-L33ERMS
1769-L36ERMS

GuardLogix Controllers: 1756-L71S, L72S, L73S
GuardLogix Safety Partner: 1756-L7SP

Compact GuardLogix 1768-L43S & 45S
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Simplifying with Integrated Safety

What's Next
Simplifying with Integrated Safety
Simplifying with Integrated Safety

Data & diagnostics can be displayed on one HMI.

Safety relays & contactors may not be required.

Benefits
- Information enabled.
- Fewer components.
- Less training.
- Streamlined maintenance.
- Optimal connectivity with multiple networks.

DeviceNet
EtherNet/IP
POINT I/O

Safety System
PowerFlex 755

Safety Relay

ControlLogix chassis

Armour Block I/O

Kinetix 6000

Safety Relay

POINT I/O

Safety System
PowerFlex 755

Safety Relay

Safety System
PowerFlex 755

Safety Relay
Simplifying with Integrated Safety

- Provides the same functionality as:
  - 16 rungs of logic
    - 2 Timers
    - 5 Latching coils
    - 3 One shots
    - Significant glue logic

- Results
  - Significant reduction in memory usage
  - Much easier maintenance
Simplifying with Integrated Safety

GuardLogix™ Data Flow Capabilities
1. Standard Tags and logic behave the same as ControlLogix.
2. Standard Tag data, program or controller scoped and external devices, HMI, PC’s, other controllers, etc.
3. GuardLogix is an integrated controller, we provide the ability to move (map) standard tag data into safety tags for use within the safety task. This is to provide users the ability read status information from the standard side of GuardLogix. This data MUST NOT be used to directly control a SIL 3 output.
4. Safety Tags (Controller Scoped) can be directly read by standard logic.
5. Safety Tags can be read or written by safety logic.
6. Safety Tags exchanged between GuardLogix controllers over EtherNet.
7. Safety Tag data, program or controller scoped can be read by external devices, HMIs, PC’s, other controllers, etc. Note, once this data is read, it is considered standard data, not SIL 3 data.
Simplifying with Integrated Safety
High Integrity AOI Within Safety Routines

- If Signature in place, AOIs cannot be edited, as indicated by wax seal
- Only safety tags / instructions are allowed
- Safety Signature added to easily verify that AOI downloaded properly.
- Signature ID represents CRC of binary code in memory
- Reduces test and validation effort
- Test once and then simply verify signature on each re-use.
Simplifying with Integrated Safety
GuardLogix and CIP Safety

- CIP Safety on EtherNet/IP
- Standard EtherNet/IP
- CIP Safety on DeviceNet
- Standard DeviceNet
- Discrete Hardwiring

POWER

OK to Run

OK to Run

OK to Run

EtherNet/IP

DeviceNet

CIP Safety

Clear

LC

Clear

LC

Clear

LC

Clear

STOP

MSG

Std.
Simplifying with Integrated Safety
Guard I/O

- Guard I/O is the safety rated I/O for GuardLogix
- Three versions:
  - Point Guard I/O (IP20)
  - CompactBlock Guard I/O (IP20)
  - ArmorBlock Guard I/O (IP67)
- Common benefits of all Guard I/O
  - Reduce engineering requirements
  - Use existing network infrastructures
  - Flexibility
  - SIL3 / PLe rated and TÜV certified
Simplifying with Integrated Safety
CIP Safety to Servo (or VFD)

CIP Safety on EtherNet/IP
Standard EtherNet/IP
CIP Safety on DeviceNet
Standard DeviceNet
Discrete Hardwiring
Agenda

- Evolution of Functional Safety
- Simple, Configurable, and Integrated Safety Systems
- Simplifying with Integrated Safety
- What's Next
Safety System – What’s Next?

The Connected Enterprise

GuardLogix 5580S
SIL2, PLd and SIL3, PLe

Compact GuardLogix 5380S
SIL2, PLd

5069/5094 Safety IO

Logix Designer V31

Design Visualization Information

Safety Relay
GuardLink enabled

GuardLink with smart taps

Emergency Stop
Non-Contact Switches
Guard Locking Switches
Key Interlock Switches
Cable pull Switches

Laser Scanner
Light Curtain
Multifunction Access Box
Kinetix 5500
PowerFlex 527
PowerFlex 755/755T
Kinetix 5700

5069 Safety IO
“If I am going to protect someone from something really dangerous, and I am going to use a circuit...

...It better be a damn good circuit!”
Safety System – What’s Next?
Scalable Safety Level

• First in scalable Safety Performance Levels (PLs) and Safety Integrity Levels (SILs) for machine safety

• The risk assessment is the key to defining the safety requirements

• “Right Sizing” can create compliant designs
  • Optimized for cost and performance
  • Help ensure that safety, cost and timing targets are achieved for projects

• Just the right amount of safety – not too little, not too much.
Compared to the existing GuardLogix® 5570S, the new GuardLogix® 5580S in V31+ will support a new set of safety instructions in the safety task to perform Advance Safety Functions for the new Kinetix® 5700 ERS4 drive.

- SFX- Safe Feedback,
- SS1- Safe Stop 1,
- SS2- Safe Stop 2,
- SOS- Safe Operation Stop,
- SLS- Safe Limited Speed,
- SLP- Safe Limited Position,
- SBC- Safe Brake Control with external brake, and
- SDI- Safe Direction.
Safety System – What’s Next?
Better Connections and Information from Safety End Devices

GuardLink™
Safety Relay

442G Multifunctional Access Box
CIP Safety over EtherNet/IP

SIL 2 Rated VP Motors

SafeZone™3 CIP Safety over EtherNet/IP
## SMART Machines & Equipment

### Performance
- Production Forecasting
- Downtime Tracking / Root Cause
- Diagnostics to improve MTTR
- Cycle Time Analysis
- Energy Optimization

### Quality
- Inline Quality Analysis – 100%
- Quality Alerts / Limit Tracking
- Real-Time SPC
- Recipe / Parameter Tracking

### Safety
- Procedural Compliance
- Safety Audit process
- Safety Event tracking
- Safety System Monitoring

5. Maintain & Improve
Thank You!