



# Technical Sessions

## An Overview of Applicable ISA Standards to the Water and Wastewater Sectors

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## About Your Speaker



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- System Integrator with Eramosa Engineering
- Director-elect of the ISA Water/Wastewater Industries Division
- General Chair for the 2012 & 2013 ISA Waster/Wastewater Symposiums
- Member of the ISA18, ISA101 and CSC/IEC/TC 65 standards committees
  
- In 2011 received Control Engineering magazine's "Leaders Under 40" award
- Recipient of ISA Keith Otto Award for best InTech magazine article of the year for his "SCADA Standardization" article in the May/June 2011 issue.
- Background in various industry sectors including municipal water/wastewater
  
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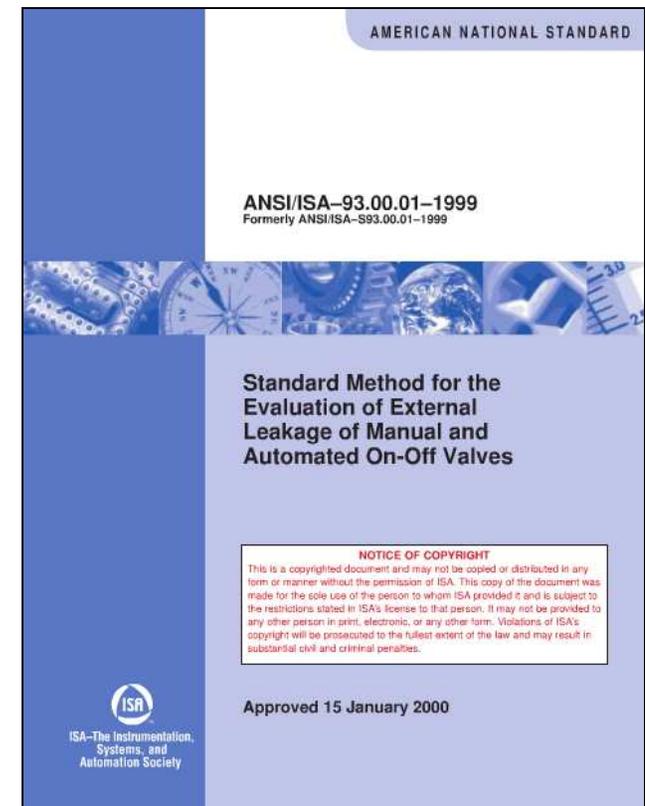


# Presentation Outline

- What is a Standard?
- How Standards Are Developed
- Standards & Standards Body Accreditation
- Benefits of Standards
- ISA Standards
- ISA Standards Committees
- List of some major ISA Standards for Water and Wastewater Sectors
  - ISA5 – P&IDs, Tagging, Drawings, Documentation
  - ISA18.2 – Alarm Management
  - ISA20 – Instrumentation & Valve Specification Forms
  - ISA95 – Enterprise Integration
  - ISA99 – Cyber Security
  - ISA100 – Wireless Systems
- Summary
- More Information

# What is a Standard?

- A set of characteristics, quantities, or procedures that describes features of a product, process, service, interface, or material
- Standards provide numerous benefits in automation and production
- A “standards series” can often include Standards, Recommended Practices, and/or Technical Reports
- Format can be printed documents, PDFs, downloadable files, or templates



# A Practical Standards Example

- The IEC 60320 standard defines the “C13” power plug/socket
- Standardized power inlet cord for computer equipment

Accommodates all these “weird” country-specific plugs



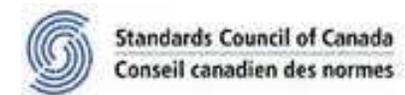
# How Standards are Developed

- Standards are generally developed by standards committees
- Need to look at the terms of reference for the committee and what organization it is associated with
- Some “standards committees” are better than others
  
- Characteristics of a “good” standards committee / organization:
  - Openness
  - Lack of Dominance
  - Balance
  - Consensus
  - Right of Appeal



# Standards Accreditation

- Accreditation of a standards producing organization by a recognized national or international standards body is a good sign
- In the USA:
  - American National Standards Institute (ANSI)
- In Canada:
  - Standards Council of Canada (SCC)
- Two major international standards bodies:
  - IEC = International Electrotechnical Commission
  - ISO = International Organization for Standardization



The ISA is accredited through ANSI and is associated with the IEC internationally

# Key Benefits of Standards

- Direct return on investment
  - Lower installation and startup costs
  - Reduce need to maintain large inventories
  - Enable interchangeability of components
  
  - Improve design with less "custom" effort
  - Increase safety
  - Increase security



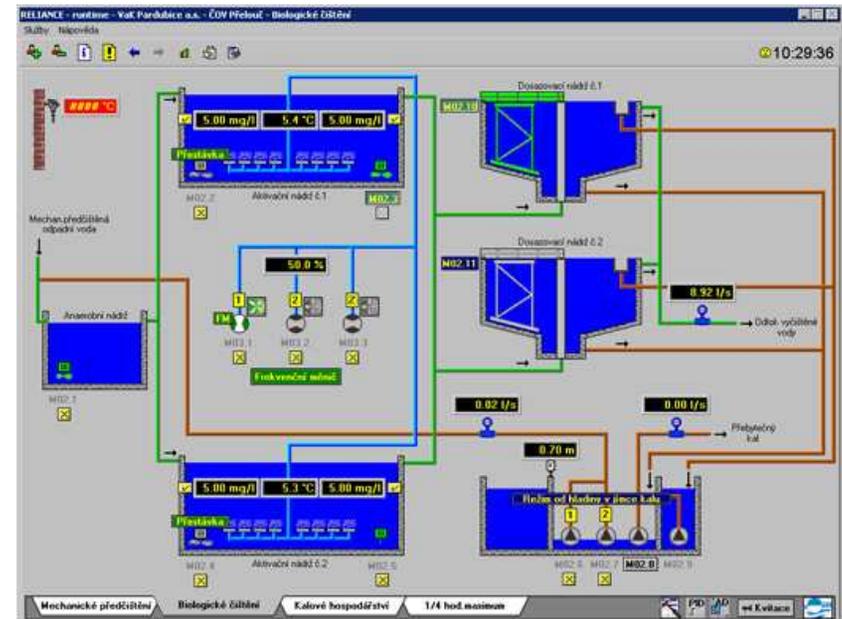
# Key Benefits of Standards (cont.)

- Use of standards in the Water and Wastewater Sectors
  - Improves communication
  - Provides practical application of expert knowledge
  - Harnesses years of experience and avoids the need to start each project from the ground up



# Key Benefits of Standards (cont.)

- Standards help achieve operational excellence by
  - Improving performance
  - Lowering maintenance costs
  - Reducing downtime
  - Enhancing operability



# ISA Standards

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Accredited by the American National Standards Institute (ANSI) to develop industry standards following approved procedures to ensure openness and fairness in considering the views and needs of end-users, suppliers, regulators, and others involved in each topic area.

- 162 published standards, recommended practices and technical reports
- 133 committees and subgroups
- More than 3500 participating individuals  
....from over 40 countries,  
....and representing more than 2000 companies and organizations.
- In person committee meetings 1-2 times per year as needed
- Extensive use of teleconferences and web meetings

# ISA Standards Committees

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- ISA Standards are developed by volunteer standards committees
  
- For individuals involved in standards development:
  - Expand your knowledge base
  - Identify resources for your work
  - Network with other professionals
  
  - Enhance your leadership skills
  - Ensure that your ideas and viewpoints are considered in the development of standards that could impact your work and/or your company's operations
  - Have fun

## ISA Has Published Standards in Key Areas for the W & WW sector Including:

- Symbols and Diagrams (ISA5)
  - P&IDs, Tagging, Loop Diagrams, Functional Specifications, etc.
- Electrical Equipment for Hazardous Locations (ISA12)
- Alarm Systems (ISA18)
- Instrumentation Specification Forms (ISA20)
- Electrical Signal Compatibility (ISA50)
  
- Control Valves (ISA75)
- Functional Safety (ISA84)
- Batch Control (ISA88, formerly “S88”)

## ISA Has Published Standards in Key Areas Including:

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- Enterprise Control System Integration (ISA95)
- Valve Actuators (ISA96)
- Personnel Certification, CCST & CAP certifications (ISA98)
- Industrial Automation & Control System Security (ISA99)
- Wireless Systems for Automation (ISA100)
- Procedural Automation (ISA106)

### *To be published soon:*

- Human Machine Interfaces (ISA101)
- Commissioning, Loop Checks, FAT and SAT Testing (ISA105)

# Examples

## Examples of Applicable ISA Standards to the Water & Wastewater Sectors

ISA5.1, ISA5.4, ISA5.6 Drawings & Documentation

ISA18.2 Alarm Management

ISA20 Instrument Specification Forms

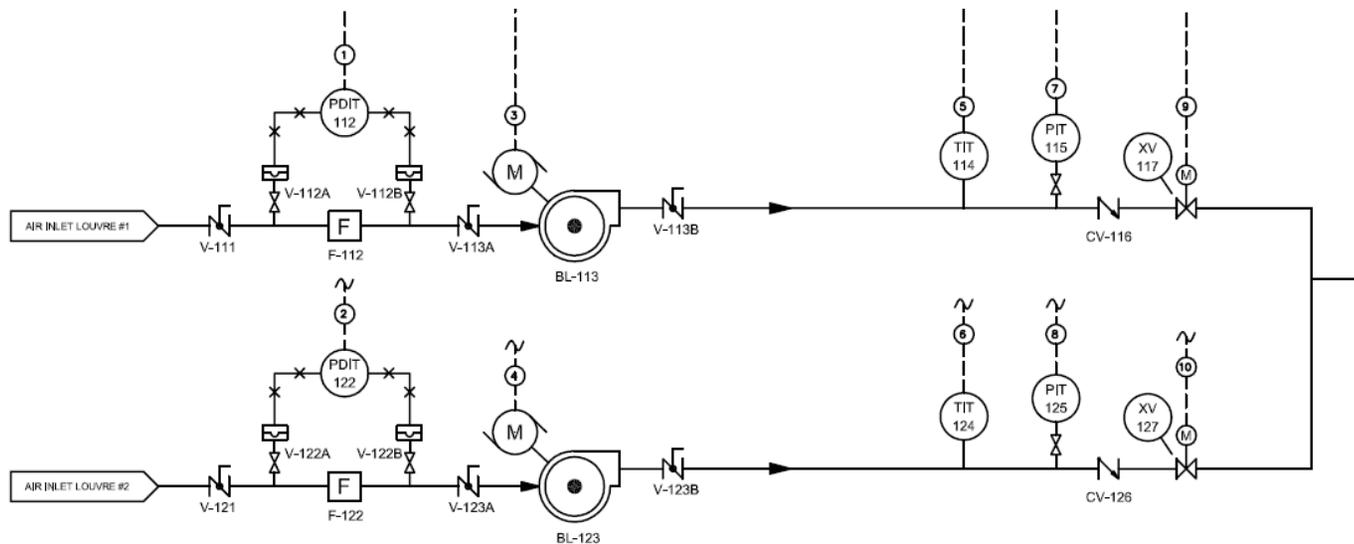
ISA95 Enterprise Integration

ISA99 Cybersecurity

ISA100 Wireless

# ISA5: Symbols and Diagrams

- ISA 5.1 defines P&ID symbols,
  - P&ID = Piping & Instrumentation Diagram
- ISA 5.1 defines basis of ISA-style tagging
  - LIT101 = level indicating transmitter #101
  - PAHH103 = pressure alarm high high on pressure loop #103
  - ZSC205 = “fully closed” position switch for valve #205
  - etc.



# ISA5: Symbols and Diagrams (cont'd)

ANSI/ISA-5.1-2009,  
Instrumentation Symbols and Identification

- ISA's most widely used American National Standard
- Establishes a uniform means of depicting and identifying instruments or devices and their inherent functions
- Intended for P&IDs, PFDs, UFDs, EFDs, MFDs, technical papers, specifications, and many other types of engineering documents

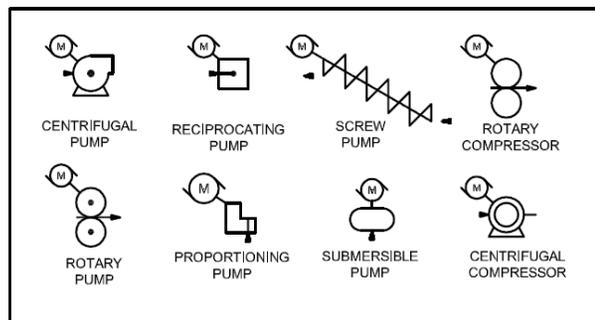


Figure 5 - Pumps are shown using simple line drawings

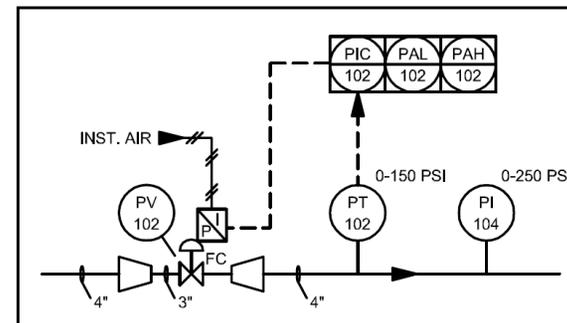
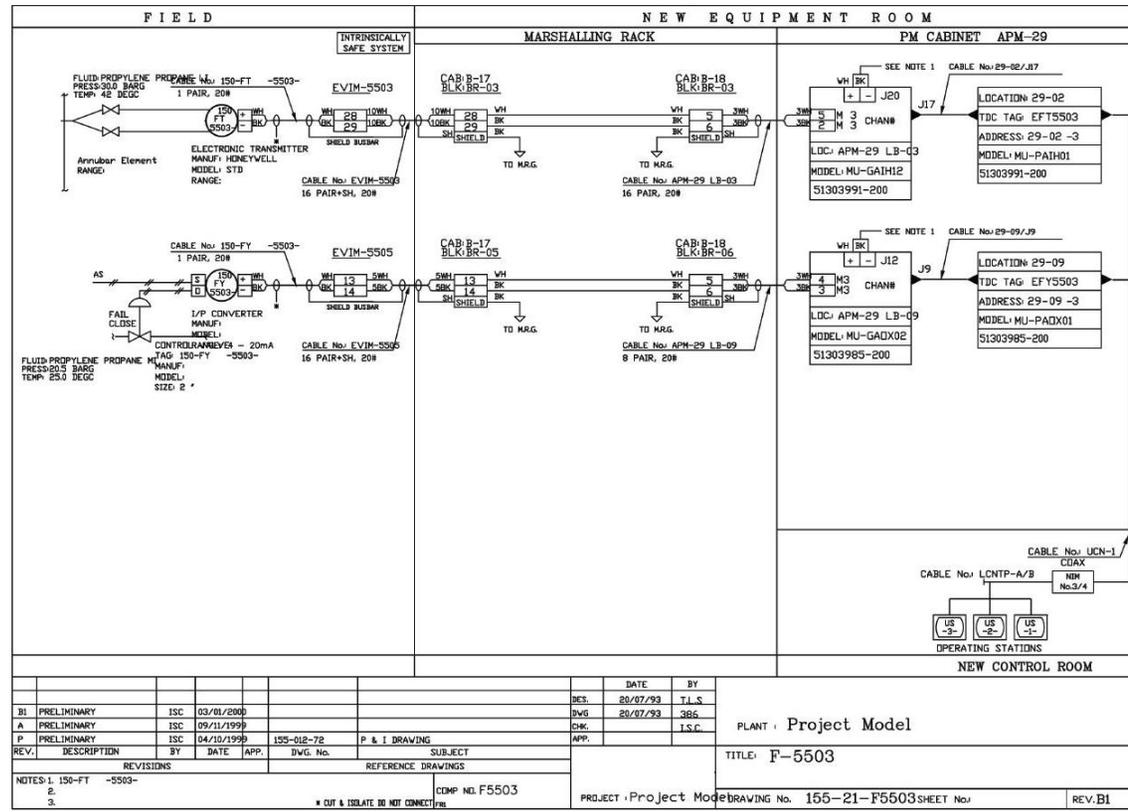


Figure 11 - Pressure control loop with high and low alarms

# ISA5: Symbols and Diagrams (cont'd)

- ISA 5.4 defines loop diagrams for instrumentation
- ISA 5.6 provides templates for functional specifications
  - a type of very concisely written process control narrative



Example: ISA Loop Drawing

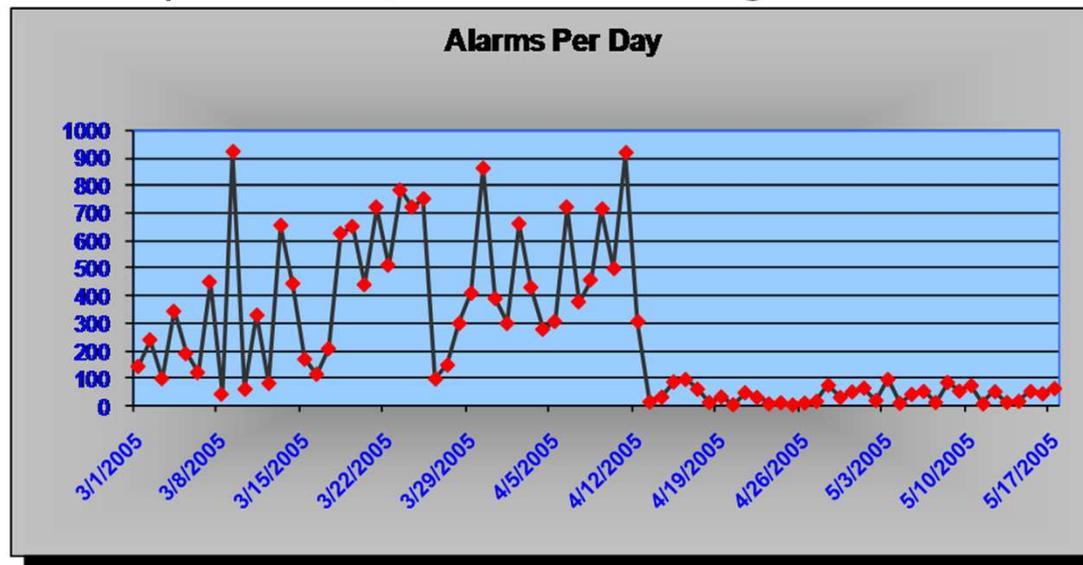
# ISA 18.2: Alarm Management

ANSI/ISA-18.2-2009,

Management of Alarm Systems for the Process Industries

**Alarm:** *An audible and/or visible means of indicating to the operator an equipment malfunction, process deviation or abnormal condition requiring a response.*

Methodology for identifying, rationalizing and designing alarms to be a powerful tool for operations, and eliminating non-useful alarms



# ISA 18.2: Alarm Management (cont'd)

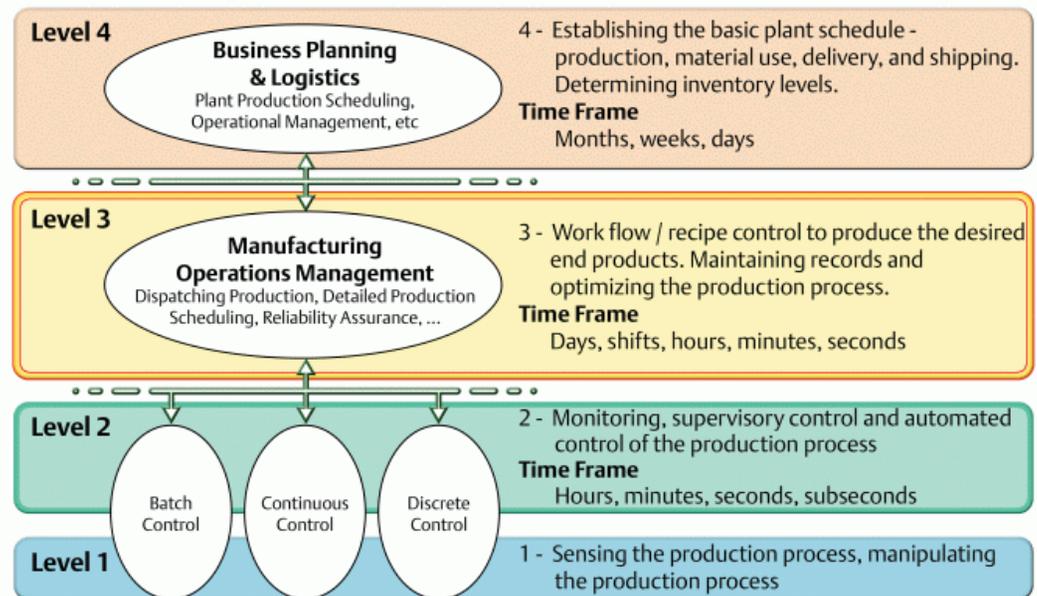
ANSI/ISA-18.2-2009,  
Management of Alarm Systems for the Process Industries

- Addresses the development, design, installation, and management of alarm systems in the process industries
- Defines the terminology and models to develop an alarm system – and the work processes to effectively maintain it throughout its lifecycle
- Six technical reports are now in development by ISA18 to explain specific applications in greater detail
- Currently in international development to become IEC 62682



# ISA95: Enterprise Integration

- ANSI/ISA-95.xx.xx family of standards and technical reports
- Defines a framework for doing enterprise integration of automation, SCADA and control systems
  - Models and Terminology
  - Object Model Attributes
  - Models of Manufacturing Operations Management
  - Business-to-Manufacturing Transactions
- Adopted as IEC 62264-X family of standards



# ISA99: Cyber Security

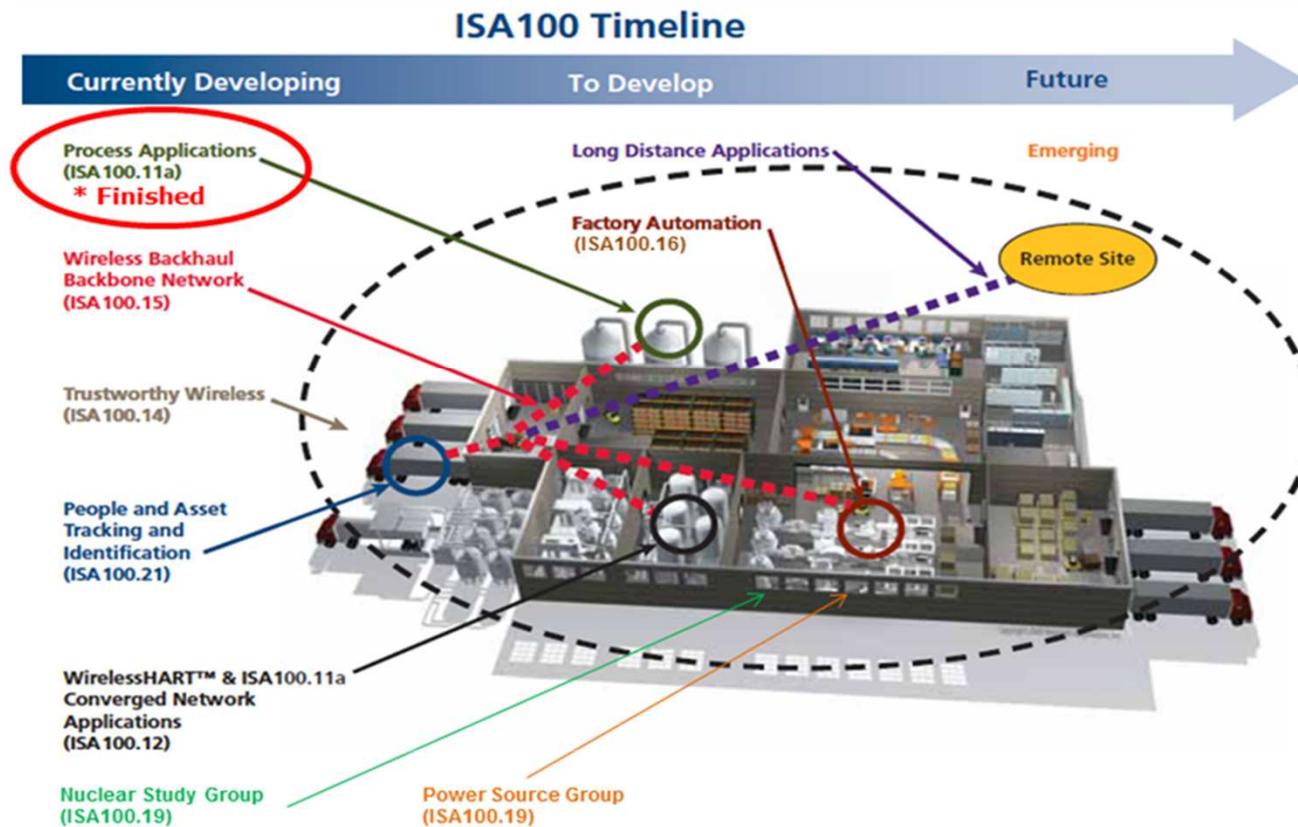
ANSI/ISA-99-xx-xx family of standards and technical reports  
Security for Industrial Automation and Control Systems

- Defining procedures for implementing electronically secure SCADA and automatic control systems and security practices, and assessing electronic security performance.
- Bringing together control system / industrial cyber security experts from across the globe.
- ISA99 standards are being incorporated into government programs on critical infrastructure protection and smart grid development.
- ISA99 has been internationally adopted as IEC 62443 family of standards

# ISA100: Wireless Systems for Automation

- The ISA100 family of standards is under active development
- ANSI/ISA-100.11a.2011 for wireless instrumentation now has IEC approval

## ISA100 Family Overview



# Other Key ISA Standards

## **ISA101 – Human Machine Interfaces**

- Collection of standards and technical reports on HMI design best practices
- The ISA101 standards committee is currently working on its third draft
- To be published soon

## **ISA105 – Commissioning, Loop checks, SAT and FAT tests**

- Standards published and under development in areas including:
  - Commissioning
  - Instrumentation & Electrical Loop Checks
  - Factory Acceptance Tests
  - Integration Testing
  - Site Acceptance Tests
  - Calibration Guidelines

# ISA Standards: Global Impact

In fact, several original ISA Standards are the basis of major IEC (International Electrotechnical Commission) standards:

- IEC 62682: now in development based on, ANSI/ISA-18.2-2009 *Management of Alarm Systems for the Process Industries*
- IEC 62734: recently released based on ANSI/ISA-100.11a-2011, *Wireless Systems for Industrial Automation: Process Control and Related Applications*
- IEC 61511 series: Process Safety (ISA84)
- IEC 61512 series: Batch Control (ISA88)
- IEC 62264 series: Enterprise Control System Integration (ISA95)
- IEC 62443 series: Control Systems Security (ISA99)

# Summary

- Using Standards has many benefits, including:
  - Lower installation, commissioning and start-up costs
  - Improved design with less “custom” effort
  - Lower training costs, improved communication, and more consistent operation
  - Leverages the years of experience that are captured in standards
  - Improved performance, less downtime, and enhanced operability
- ISA has an extensive library of Standards available
  - 162 standards, recommended practices, and technical reports
  - ISA Standards are consensus based and non-commercial in nature
  - Broad applicability to SCADA, automation and instrumentation
- ISA Standards are available at [www.isa.org](http://www.isa.org)
  - For purchase as printed & PDF copies
  - ISA members can view most ISA Standards for free online

## For more information:

- How to get ISA Standards
  - For purchase (print & PDF) at [www.isa.org](http://www.isa.org), click on Standards
  - ISA Members can view most ISA standards for free at [www.isa.org](http://www.isa.org)
- More information of ISA Standards
  - [www.isa.org/standards](http://www.isa.org/standards)
- Other industry standards:
  - [www.nssn.org](http://www.nssn.org) (key word search)
- ISA Water/Wastewater Industries Division
  - [www.isa.org/wwid/](http://www.isa.org/wwid/)