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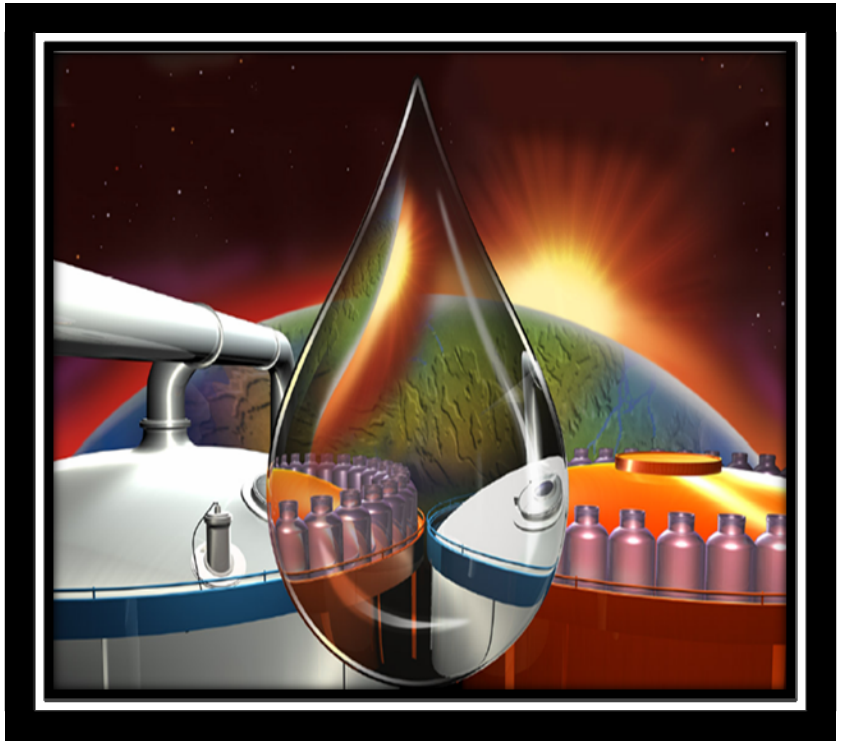

# ISA106 – Standards and Practices for Continuous Process Applications

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# Agenda

- ISA88 – Birthplace of Procedural Control
  - Overview
  - Key Concepts
  - Benefits
- ISA106 – Who, What, When, Where, Why and How
  - Why It Is Needed
  - Official Purpose and Scope
  - Status
  - Key Objectives
  - Differences From ISA88
- Getting Involved – Benefits and Opportunities

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# Introduction

- ISA recently approved a committee ISA106 to develop standards on procedural automation for continuous process operations
- The ultimate goals of ISA106 is to provide generic, cross-industry standards for procedural automation in continuous industries, in the same way that ISA88 has done for the batch industries
- ISA88 has made progress in applying procedural control successfully to discrete, semi-continuous and continuous processes
- ISA106 will build upon this progress and develop a standard that will address issues that are unique to continuous process industries
- Control systems engineers have an opportunity to get involved as part of the ISA106 standard development committee, and with WBF - a proponent of the new standard

Your involvement will provide benefits to you and your employer, as well as the organizations themselves

# ISA88 Overview

Prior to ISA88 batch control had significant issues:

- Too complex
- Wide variety of proprietary control solutions
- Little consistency in the documentation, design and implementation
- Programming typically was monolithic and complex, not lending itself easily to modification and reuse

# ISA88 Overview

- Developed as the Batch Standard in the early 1990's
- Revolutionized batch control
- Provided a defined set of models and terminology for procedural operations in batch processes
- Created a common language and mindset for all to use
- Allowed open sharing of ideas and concepts, while allowing complete flexibility in how to implement the standard
- It has been universally accepted by the batch industry, including vendors integrators and end users
- Implementation strategies are shared and discussed by organizations such as WBF and Rockwell Automation's PSUG
- Its benefits have also been well documented through these groups

# ISA88 Key Concepts

- Separation of equipment capabilities from formulas and recipes
- Modularization of Operations and Equipment
- State-Based Control
- Procedural Control

# Separation of Equipment From Formulas and Recipes

- ISA88's most powerful concept is the separation of product definition (formulas and recipes) from intrinsic equipment capabilities
- Allows for ongoing changes to the product without changes to the control programming
- The equipment model defines the equipment available for a process and its capabilities
- The recipe defines information required to manufacture a product
- Recipes become independent of the specific equipment available, including the control system itself
- Recipes can be shared among different production systems and sites

# Modularization of Operations and Equipment

- Procedures and Equipment are broken down into small modular entities which are grouped and organized in hierarchies of levels
- Recipes Include:
  - Procedure
  - Unit Procedure
  - Operation
  - Phase
- Equipment Entities Include:
  - Enterprise
  - Site
  - Area
  - Process Cell
  - Unit
  - Equipment Module
  - Control Module

# Modularization of Operations and Equipment

- ISA88 provides the flexibility to use some or all of the hierarchy levels based on the application
- Allows recipe for a product to be reapplied on multiple process equipment configurations
- Modularized entities can be fully tested and validated independently, reapplied as needed, creating a library of reusable building blocks of code

# State-Based and Procedural Control

- State-Based Control:
  - Procedural entities (procedures, operations, phases) have a state-based control matrix that defines its current condition (starting, running, stopped, paused, etc.)
- Procedural Control:
  - Procedures are a set of tasks that are conducted in a set way time after time to achieve a goal, such as starting or stopping a process or making a certain product
  - Procedural control is the movement of a process from one defined step (task) to another defined step using transitional logic to control movement between steps
  - Batch processes are procedural in nature, but typically involve sets of procedures running in parallel on varying process units and almost always need to have built-in flexibility

# Benefits of Implementing ISA88 Concepts

- Reduced batch cycle time
- More efficient scheduling
- Increased throughput
- Increased capacity of existing facilities
- Reduced engineering effort
- Reduced startup time
- Increase in product quality
- Conformance with regulatory record keeping

# ISA88 Benefits Reported by WBF Members

- Eli Lilly
  - Improvement in process cell throughput up to 20 percent
  - Standard deviation of batch cycle times reduced by 50 percent
  - Operator actions decreased by 80 percent
  - Overhead reduced by 33 percent
- BP Chemicals
  - 2 to 3 percent increase in capacity
- Biotech
  - Project startup time reduced by 33 percent over conventional methods
  - Total project savings over $1.2 million
- Genentech
  - Project efficiencies realized for validation activities

# ISA88 Benefits Reported by WBF Members

- Cabot Corporation
  - Increased throughput of treated silica unit by 30 percent
  - Better production record keeping
- DuPont
  - 50 percent capacity increase of $100 million/year fluorochemical operation
- Chevron
  - 30 percent reduction in implementation cost
  - 10 percent reduction in batch cycle times
- Eastman Chemical
  - 20 percent reduction in batch cycle times
  - Production yields increase by 5 percent
  - Conformance to specification increased from 96 to 100 percent

# Rapid Batch Recipe Development

- Significant benefit to users is, ISA88 allows for development of a recipe without the services of a control system engineer
- McEnery Automation has implemented a Rockwell Automation based ISA88 batch control system where the plant operators have maintained the recipe list for the past 10 years
- Customer has 200 products with modifications made on a weekly basis

# ISA106 – Procedural Automation for Continuous Process Operations Standard

- Need for Continuous Process Operation Automation Standard is increasing due to:
  - Loss of skilled workers due to retiring workforce
  - Leaner operating staffs require operators to do more
  - Competitive pressure on domestic manufacturing:
    - Reduce downtime
    - Increase quality
    - Increase throughput
  - Increased focus on safety and environmental incidents

# ISA106 – Procedural Automation for Continuous Process Operations Standard

- Loss of skilled workers due to retiring workforce
  - A large number of skilled operators will be retiring over the next 5 to10 years
  - Skilled operators possess much of the knowledge of executing procedures, which are frequently documented inadequately
  - Continuous process industry needs to capture this information and apply it in a manner to make procedures repeatable
- Leaner operating staffs require operators to do more
  - Plant staffing reductions are typical at nearly all facilities
  - Operators are covering larger areas of the plant and performing wider ranges of tasks
  - The result is less time to focus on each task, creating more opportunity for error

# ISA106 – Procedural Automation for Continuous Process Operations Standard

- Competitive pressure on manufacturing
  - Global price competition
  - Increased costs for energy, labor and material
  - Reduced capital available for new facilities or major expansions of existing facilities
  - Investments being made to increase productivity of existing facilities through:
    - Reducing downtime
    - Increasing quality
    - Increasing throughput
- Increased focus on safety and environmental incidents
  - Increased safety and environmental regulations
  - Increased public awareness of incidents
  - Increased cost of fines, lawsuits and cleanup

# Procedural Automation

Procedural Automation can help:

- Capture the expert knowledge of skilled operators and provide a mechanism to keep it updated
- Increase productivity by optimizing startup/change over/shutdown procedures and providing shift to shift consistency
- Increase productivity by driving processes to “acceptable” or “reduced” conditions during abnormal situations in place of full shutdown
- Reduce incidents and losses by reducing the number of actions required by operators and opportunities for operator error
- Reduce incidents and losses by automating abnormal situation control

# Procedural Automation

Procedural Automation can help:

A 2008 survey by ARC Advisory Group indicated that continuous manufacturers see that effective and repeatable transition management, along with sequence-based operator procedures can provide a competitive advantage.

However, as with batch automation prior to ISA88 there is no consistency in the documentation, design and implementation of procedural operations for continuous processes.

# ISA106

- Purpose:
  - Develop standards, recommend practices and technical reports on the design and implement procedures for automating continuous process operations
- Scope:
  - Models and terminology
  - Modularization of procedural steps
  - Exception handling for abnormal situations
  - State mode procedural logic
  - Process unit orientation with operational perspective
  - Recommended best practices
  - Implementation of start up, shut down, abnormal situations, hold states and transition logic
  - Recommended target platform
  - Lifecycle management, training, and certification best practices

# ISA106

- ISA106 Status
  - New committee was approved by ISA in May, 2010
  - First meeting held June, 2010
  - Second meeting held October, 2010
  - Goal is to have a technical report issued in 2011 and the new standard complete by 2012
- ISA106 Committee Leadership
  - Managing Director – Maurice Wilkins, Yokogawa
  - Co-Chair – Marty King, Chevron
  - Co-Chair – Yahya Nazer, Dow Chemical Company
  - Vice-chair and editor – Dave Emerson, Yokogawa
  - Staff Contact – Ellen Fussel Policastro, ISA

# ISA106

- Four Subcommittees:
  - Definitions and Terminology
  - Examples and Use Cases
  - Reference
  - Knowledge Management (Marketing)
- Key Objectives:
  - Focus is at ISA95 Level 2 (controller) with handshakes to Level 1 (instrumentation) and Level 3 (MOM)
  - Focus is on implementation in Safety Instrumentation Systems and Basic Process Control Systems
  - Will include Automated Procedures, which may have manual and semi-automatic components
  - Create a set of generic terms, definitions, and examples that can be understood and accepted by a wide range of industries

# ISA106

- Much of the concepts developed for ISA88 will be a starting point for ISA106:
  - Separation of recipe and equipment
  - Modular entities and hierarchies for equipment and procedure
  - State based control
- ISA106 will also integrate concepts from:
  - ISA95 Enterprise/Control Systems Integration
  - ISA99 Control Systems Security
  - ISA84 Programmable Process Safety Systems
  - ISA18 Alarm Management Standard

# ISA106 vs. ISA88

Anticipated Differences Between ISA106 and ISA88:

- Terminology and models will not be batch specific and may favor ISA95's more generic structure as a starting point
- Reporting executed throughout the step, rather than at its completion, as steps may take weeks or months to execute
- Only one step executing at a time (no parallel paths)
- Monitor process parameters during a step to anticipate and prevent process upsets
- Automation of abnormal situation control
- ISA106 does not need to address how to make the same product on multiple process sizes and configurations.

# Getting Involved

## The ISA106 Committee Wants You!

- To be successful, ISA106 must be developed in a way to be applied to a wide cross section of industries
- This requires that the committee has representatives from a wide cross section on industries actively participating and providing input
- The committee is actively looking for more members to join and participate in the discussions
- ISA106 will benefit from your perspective and opinions
- You will benefit by increasing your capabilities and expertise in a new area of controls that will make you more valuable to your current and future employers
- Your employer will benefit from your insight and ability to implement control strategies that will save them hundreds of thousands of dollars

# Getting Involved

## WBF is an Excellent Resource For You and Your Company

- WBF – The Organization for Production Technology is dedicated to supporting the process automation and operations needs of the technical and management professions in process manufacturing
- WBF facilitates the interchange and development of information and knowledge in order to help its members succeed and to exert a positive influence on industry
- Members have been implementing the concepts of the ISA88 stadard and procedural control outside of batch applications for years
- At this year's WBF conference, several presentations were given on continuous and semi-continuous process control, state-based control and a paper discussing the need for a new standard for continuous process control

# Getting Involved

- Participating in WBF events will give you insight and real world learning from members who are currently implementing procedural control in the continuous process industry and who will be implementing the ISA106 standard as soon as it is complete (Probably a little sooner)

# Benefits

## WBF and ISA106 Benefits to Individuals

- Increase Job Skills
  - Gain insight into the future direction manufacturing automation
  - Develop an understanding of the “why” and “how” of procedural control and standards interoperability
- Recognition
  - Opportunities to present and publish technical papers
  - Opportunities to participate on committees and working groups
- Networking
  - Meet vendors and consultants and assess their ability to assist with implementation expertise
  - Opportunities to meet and interact with peers in the industry

# Final Thoughts

- ISA88 has not only standardized batch control, but has developed methods applicable to all types of procedural control
- ISA106 will build upon ISA88 and other standards to advance continuous process automation.
- The ISA106 Committee is in need of your input and opinions and welcomes your help.
- WBF is a unique resource to individuals and businesses involved in all types of procedural control, not just batch.
- You (and your boss!) should get involved.

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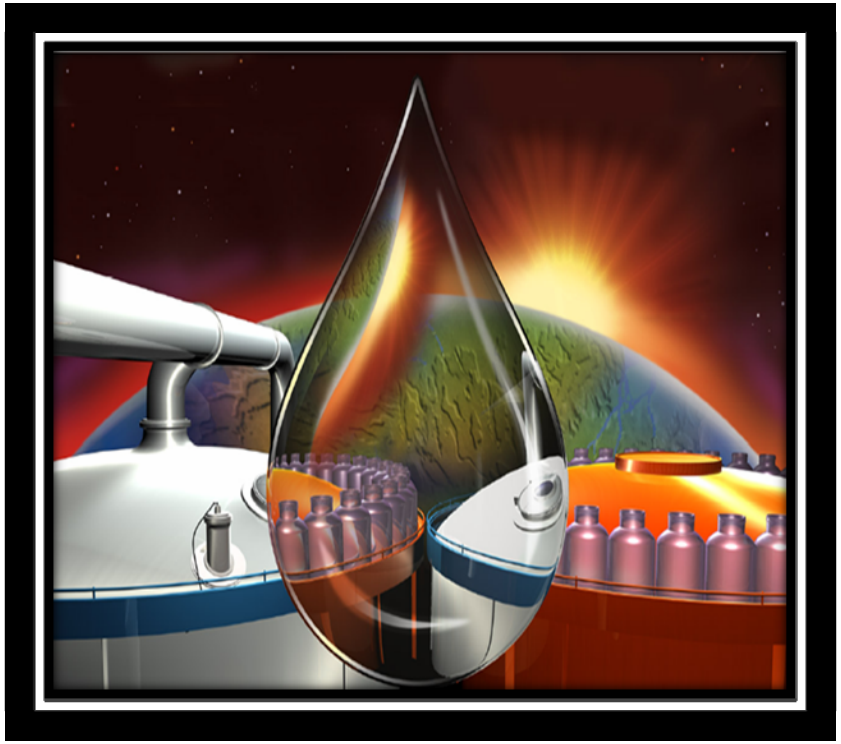

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Questions?

Thank You!

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