“The Authorized Inspector - Manufacturer Relationship in a Mass Production Shop”

Michael Pischke – Alfa Laval Inc.

Discussion Topics

• Traditional Vessel Manufacturing
  – The Shop Inspection Process
  – Inspector & Quality Manager Roles

• Pressure Vessel Mass Production
  – Characteristics/History in the ASME Code
  – Code Requirements
  – Quality/Inspection Strategy
  – Everyone’s Roles
Traditional Vessel Manufacturing

The Shop Inspection Process

- Review Design Calculations
- Establish Hold Points
- Verify Material Marking and Documentation
- Witness Weld Joint Fit-Up
- Inspect Final Welds
- Verify PWHT and/or NDE Results and Records, if Applicable.
- Witness Pressure Testing and Final Stamping
- Monitor Quality System
The Authorized Inspector

- Trained by Employer or National Board
- Tested by the National Board
- Follows Inspection Criteria Based on Code
- Works Closely with the Quality Manager
- May Not Want to Wear White!

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The Quality Manager

- Reads the Code Books
- Company Liaison to the Al
- Often a Former Inspector
- Perhaps NDE Experience
- QC vs QA Background
- High School Guidance Counselor Never Warned Him About Such a Job

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Pressure Vessel Mass Production

Characteristics of “Mass Produced”

• Designs are Standardized; Often Modular
• Materials Purchased in Quantities at Limited Sources (Strategic Supply)
• Repetitive Fabrication Processes
• Large Experience Base: Good or Bad
• Requires a Different Quality Approach
History of Vessel Mass Production in the ASME Code

- Originated in the Code in 1962
- Found a Home in Section VIII-1, UG(90)(c)(2)
- Known as “Multiple – Duplicate” for Many Years
- Revised in 08 Addenda with Appendix 35
- Name Changed to “Mass Produced”

Current Code Requirements

Section VIII -1 Appendix 35:
- Minimum Full Time Inspector (40 hr/week)
- Rate of Production that Makes it “Impracticable”
- “Shall be Identical Except”
- Minimum Two Vessels per Shift
- Required Quality Control Procedures
- Provisions for Data Reports
- Special Rules for Pneumatic Testing
Quality Strategy for Mass Production

Custom Vessel (Inspect & Rework)  
Unacceptable  
Acceptable  

Mass Production (e.g. FMEA, Lean Six Sigma, etc.)  
Unacceptable  
Acceptable  
More Acceptable  
The Goal

The Goal

Inspection Strategy for Mass Production

“Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place. “  - W. Edwards Deming
100% Inspection of Mass Production

- How Effective is 100% Inspection?
- Only 80%-85% Effective
- How about 200% Inspection?
- As Low as Only 60% Effective

Mass Production Inspection
What Processes to Inspect?

• Same Critical Elements and Processes:
• Incoming Material Reliability
• Prep and Fit-up Operations
• Welding Processes
• Welding Operators
• Examination and Testing
• Any Other Critical Process Related to Product

How to Inspect?

• Understand the Manufacturing Processes and Know Their Variability
• Develop a Sampling Plan
• Adjust Plan Based on Changes in Materials, Personnel or Processes
• Inspect the Product as a Measure of the Process
Communicate Inspection Needs

The Finished Products
Summary
The Manufacturer and Authorized Inspector Need to Work Together to:

• Identify the Critical Components and Processes that Produce the Vessels
• Shift from Inspecting Individual Vessels to Inspecting Production Processes
• Spot Check the Product at Different Stages of Production
• Focus on Areas of High Variability
• Communicate Changes

Questions?