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2015 BSEE Domestic and International Standards Workshop

May 8, 2015

ASME Overview

- Established 1880
- >35 conferences conducted annually
- >400 ME/MET degree programs accredited via ABET
- >500 consensus standards
- >3,600 online groups
- >7,000 certified companies
- >10,000 individuals trained annually
- >140,000 individual members
- >160,000 technical papers in digital collection
- >280,000 monthly readers of *Mechanical Engineering*

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ASME Boiler and Pressure Vessel Code

Construction Sections | Service Sections | Nuclear Sections

12 Sections
32 volumes
16,500 pages
Updated every 2 years

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ASME Code for Pressure Piping – B31

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Some ASME Standards Relevant to Off-Shore Oil & Gas

- B31 Piping and Pipeline Codes:
  - B31.3 (Process Piping)
  - B31.4 (Pipeline Transportation Systems for Liquids and Slurries)
  - B31.8 (Gas Transmission and Distribution Piping Systems)* – need identified to extend to higher pressures
- Boiler and Pressure Vessel Code (B&PVC) Sections:
  - V (Nondestructive Examination)
  - VIII, Division 1 (Pressure Vessels)*
  - VIII, Division 2 (Alternative Rules)*
  - VIII, Division 3 (Alternative Rules for High Pressure Vessels)
  - IX (Welding, Brazing, and Fusing Qualifications)
- Post-Construction Codes:
  - PCC-1 (Guidelines for Pressure Boundary Bolted Flange Joint Assembly)
  - PCC-2 (Repair of Pressure Equipment and Piping)
  - PCC-3 (Inspection Planning Using Risk-Based Methods)
- API 579-1/ASME FFS-1 (Fitness-For-Service)

** Currently referenced in 30 CFR Part 250*

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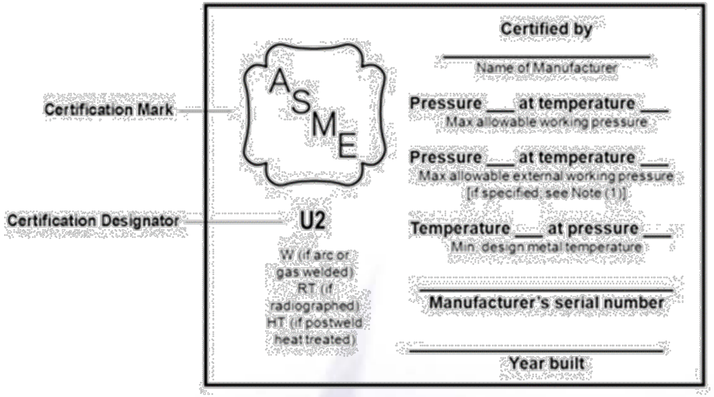
Conformity Assessment

- 6 product certification programs
- Scope of activities covers boilers, pressure vessels, nuclear components, quality, bioprocessing equipment
- ASME Certificate Holders
  - Total BPV Certificate Holders: 7,224
  - Total BPV Certificates: 12,942
  - ~50% International
  - ~25% from Asia



Sample ASME Product Certification Nameplate

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Global Safety Culture

- What happens anywhere in the world affects the entire energy industry
- Global industries can strengthen a safety culture that:
  - Meets public safety, health and environmental objectives
  - Provides confidence in the technical integrity of engineering advances
  - Establishes global connections that support industry responses to issues
  - Considers socio-political and economic disruptions

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Quality Considerations

- Implement a strong safety and quality culture
- Use qualified personnel and suppliers
- Fully understand the standard that is specified for design, manufacturing, construction, and examination
- Apply conformity assessment programs based on consensus standards:
  - Components and processes conform to internationally relevant, recognized, and accepted standards
  - Standards have proven reliability
  - Third party oversight
- Apply risk-informed inspection and test programs

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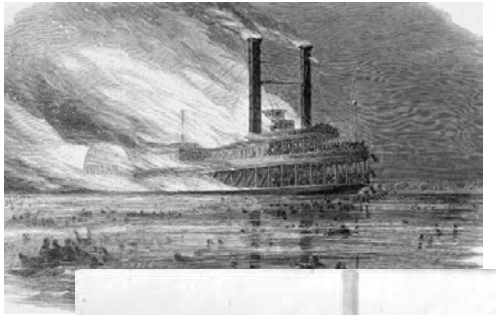
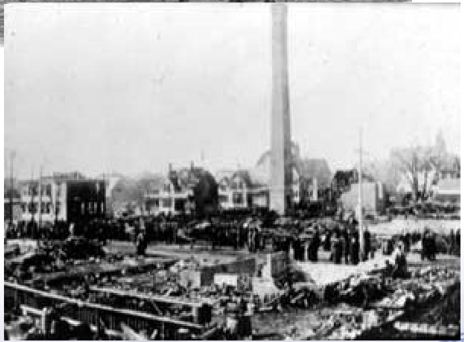
Case Study 1 – Boiler Code History

- During the 100 years following the invention of the steam generating boiler there were over 10,000 boiler explosions
- Between 1898 and 1903 alone, over 1,200 people were killed in the U.S. in ~1,900 separate boiler explosions
- At the end of the 19th Century there were no boiler laws to protect the public
- States began to adopt laws that were not uniform
- Key problem: Lack of understanding, consistency, and safety features in boiler design and operation



Sultana, 1865



Grover Shoe Factory, 1905

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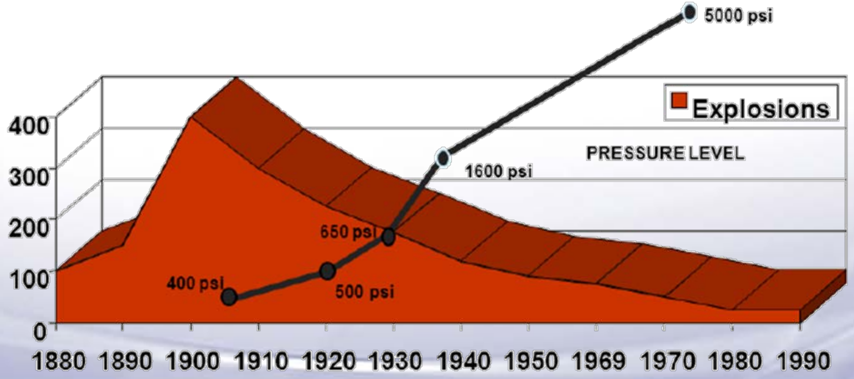
Case Study 1 – Boiler Code History

- 1914 - First Edition of ASME Boiler and Pressure Vessel Code
- Today ASME BPVC is adopted in part by all U.S. States and Canadian Provinces
- Referenced in U.S. Federal Regulations
- Recognized and accepted in over 100 Nations
- Boiler explosions decreased while design pressures have increased



Case Study 2 – Nuclear Risk-Informed Standards

- ASME B&PVC Section XI, OM, and RA-S include rules for risk-informed inservice inspection, inservice testing, and probabilistic risk assessment (PRA)
- Relevant regulations
  - 10 CFR Part 50 (.55a, .69)
  - Regulatory Guides (1.174, 1.175, 1.176, 1.177, and 1.178)
  - Standard Review Plans (NUREG-0800 Chapters 3.9.7, 3.9.8, 16.1, and 19)
- Baseline prescriptive requirements called for general 25% inspection at 10-year intervals
  - Typically ~750 randomly sampled piping locations to examine per plant using volumetric UT methods

Case Study 2 – Nuclear Risk-Informed Standards

- Alternative risk-informed approach:
  - Identify most risk-significant structures, systems, and components (SSCs)
  - Relate inspection and test requirements to potential degradation mechanisms, failure modes, safety significance and class, failure potential, and consequence
  - Enhance requirements for high safety significant (HSS), reduce unnecessary requirements for low safety significant (LSS)
  - Actively monitor performance and periodically reassess
- Results:
  - Improved safety decision making and regulatory efficiency
  - Enhanced overall plant safety and reliability across the industry
  - Reduced inspection costs, maintenance costs, and worker radiation exposure
- Collaborative effort of standards developers, the regulator (NRC), industry, laboratories, and general interest parties

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Case Study 3 – Pipeline Integrity Management

- Needs were identified relative to pipeline safety and integrity management
  - Aging infrastructure of natural gas transmission and distribution pipelines
  - High profile accidents highlight the need and force the issue
  - Resulted in development of ASME B31.8S (Managing System Integrity of Gas Pipelines)
- Relevant regulations
  - 49 CFR Part 192 (Transportation of Natural and Other Gas by Pipeline)
- Integrity Management Programs
  - Integration of design, construction, operating, maintenance, testing, inspection, and other information about a pipeline system
  - Prescriptive vs. performance based methods

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Case Study 3 – Pipeline Integrity Management

- Risk-informed approach:
  - Identify and classify threats
  - Gather, review, and integrate data
  - Risk assessment
  - Integrity assessment
  - Response, mitigation, and management
- Collaborative effort of standards developers, the regulator (DOT PHMSA), industry, and others

For Additional Consideration

- ASME standards typically aligned by technology rather than application
- "You get what you INSPECT, not what you EXPECT"
- Apply a risk-based approach to inspection and maintenance
- Emerging transformative technologies (e.g., Internet of Things) have potential for real-time component health monitoring
- Apply lessons learned from other industries - technical solutions to similar challenges may have already been found
- Risk management plays a key role in full life cycle integrity for pressure equipment
- Utilize third party inspections and testing
- Quality assurance and control programs are vital to success

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Join us

- Participate as a volunteer subject matter expert on ASME consensus standards committees
- Help identify standards-related needs for off-shore oil and gas applications
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