



# **CAN YOU STAND THE PRESSURE?**

Presented by

Peter R. Thompson

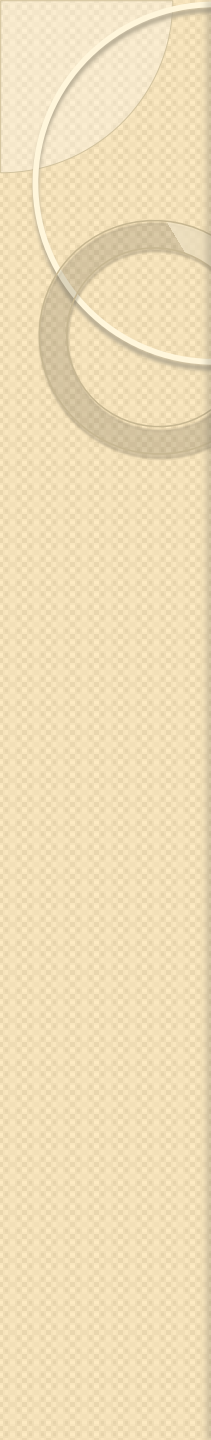
Competent Person – Pressure Vessels and Boilers

# Objectives

- By the end of this seminar you should know:
  - What are pressure vessels
  - What are boilers
  - What are the dangers of these pieces of equipment
  - What are the tests done and why are they conducted

# Pressure Vessels

- What is a pressure vessel?
  - A closed container holding liquids or gases at substantially different pressures than ambient.

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- SHaW Act 2005 defines pressure vessels as
    - "pressure vessel" includes steam boiler, air receiver, steam receiver and any vessel containing fuel for commercial or industrial use, of 91 kilograms or more, stored at a pressure greater than atmospheric pressure;

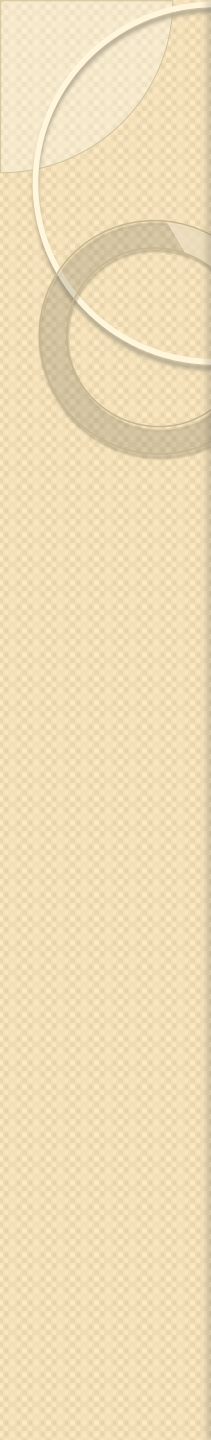


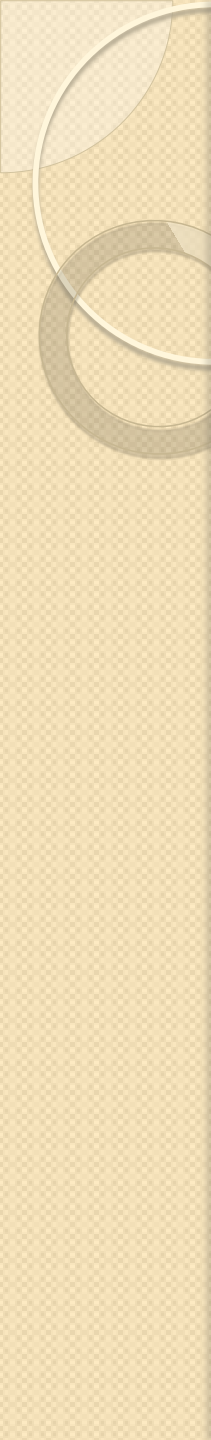


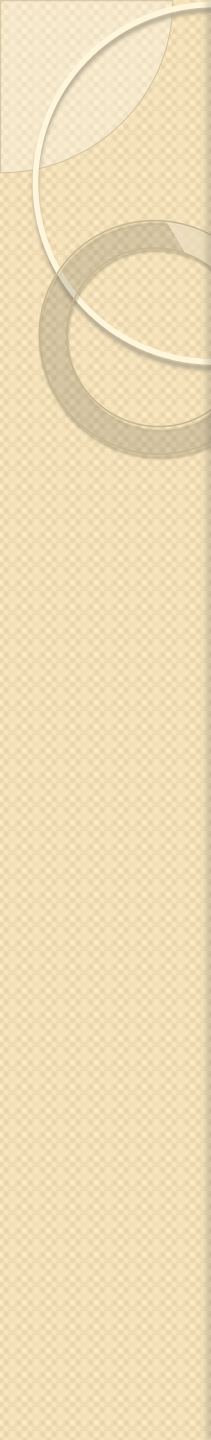






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- So what are the main concerns with regards to the safety of pressure vessels?
  - Why should they be inspected?
  - What should the owners/users of pressure vessels be concerned with?

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- Fatigue
  - Fracture
  - Blow-out of plugs and fittings
  - Explosions

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- Areas where weaknesses can be more commonly found:
    - Air/water interfaces inside the vessel
    - At joints/seams
    - At fittings, plugs and attachments





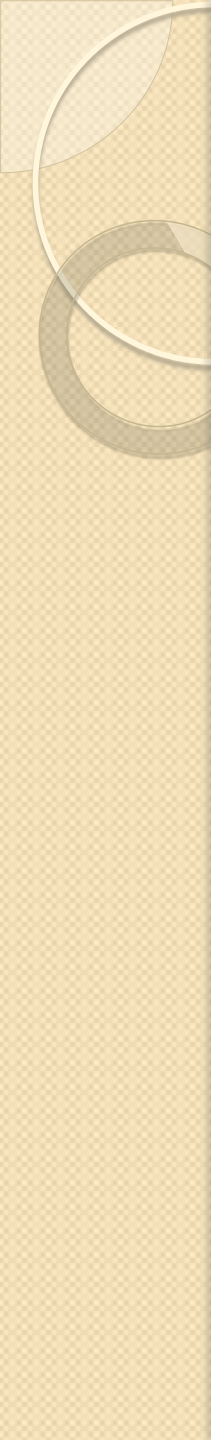


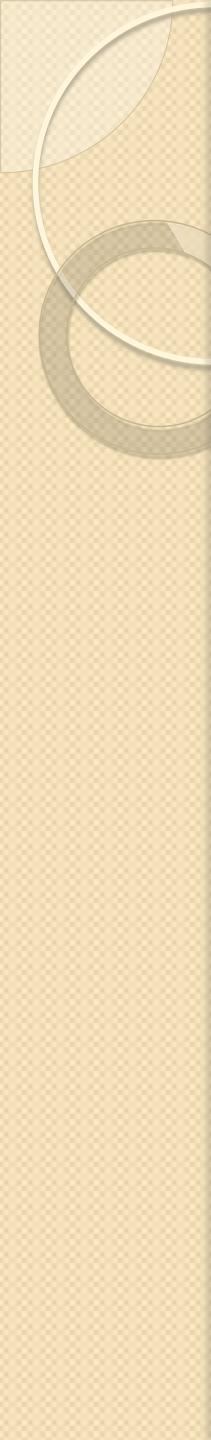








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- **Testing:**
    - How is this done?
    - What are the different types of test?
    - What are competent persons looking for?

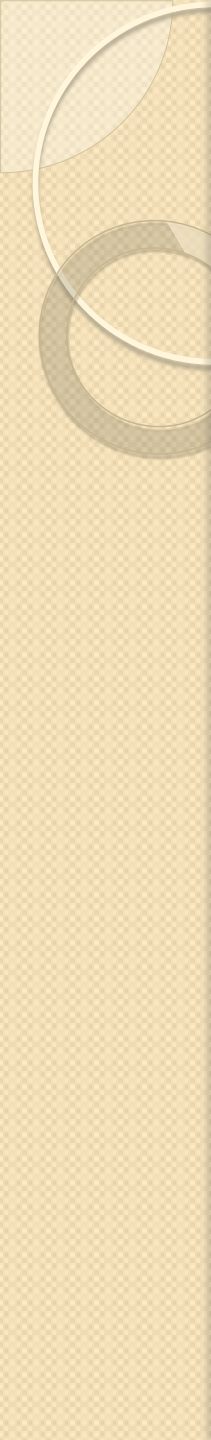
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- **Visual inspection**
    - Internal condition of vessel
    - Loss of metal (rusting)
    - Exterior condition of vessel
    - Fittings as required (functioning pressure gauges, safety relief valves, proper operational pressure switches, intact welding seams, etc.)



- **Other tests**

- **General**

- Are the pressure switches working as they should
- Will the pressure relief, or safety valve, lift AND continue to relieve pressure even if the compressor continues to operate
- Is there excessive oil carry-over when the compressor is operating
- Is the tank properly protected against the elements (rain, etc.)

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- **Hydrostatic**
    - Will the receiver and its fittings remain intact at 1.5 times the maximum safe operating pressure?
    - Are there any unusual bulges in the receiver?
    - Are the welding seams intact ?

- **Hammer/Impact test**
  - Are there soft spots not seen by the naked eye which compromise the integrity of the receiver?
  - Does the material of the receiver sound uniform across the entire shell and head of the tank?
  - Will the fittings become loose with impact while the vessel is under pressure?



- **Other tests**

- Ultrasonic scan
- Drilling
- Lifting
- Penetrating inks and X-ray
- Destructive testing

# Boilers

- Can be steam or hot water. Most commonly used boiler in this region is steam boiler
- Uses water to generate steam
- Extremely high energy source
- Involves some form of heat source, generally fuel, to generate steam or hot water
- Can be very small to very large
- Usually has tubes to separate water from heat source

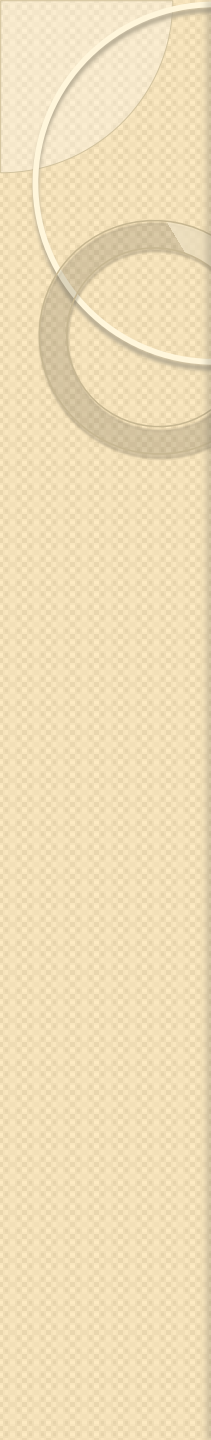


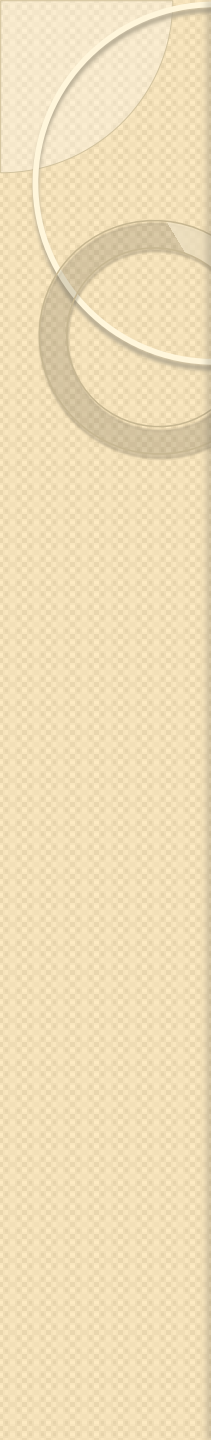


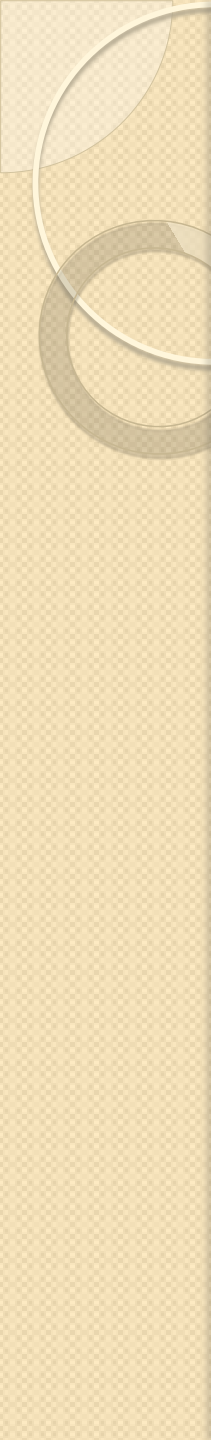






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- **Boilers generally are designed to:**
    - Have controlled and regulated fuel/air supply to generate heat source
    - Have a few exposed tubes to “dry” the steam provided
    - Have “blow-down” controls to remove impurities which will build-up with continuous evaporation of water being supplied to create steam

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- So what are the main concerns with regards to the safety of boilers?
  - Why should they be inspected?
  - What should the owners/users of boilers be concerned with?

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- The single largest concern is explosion.
  - This can occur due mainly to:
    - Excessive fuel in the chamber
    - Low water conditions



— BOILER EXPLOSION AT BEAVER MILLS, RHODE ISLAND, MAY 12, 1893. —

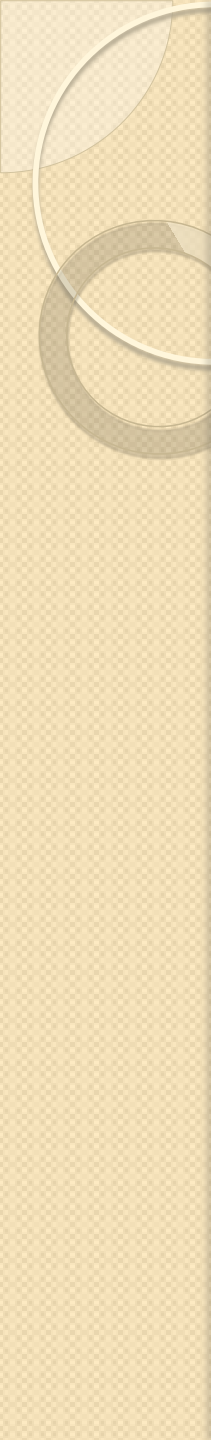
Photo includes Milan Cory, night fireman and Milan Johnson, foreman of *Cheshire Chair Co.*, which occupied one of the buildings. Two men were killed in the explosion.

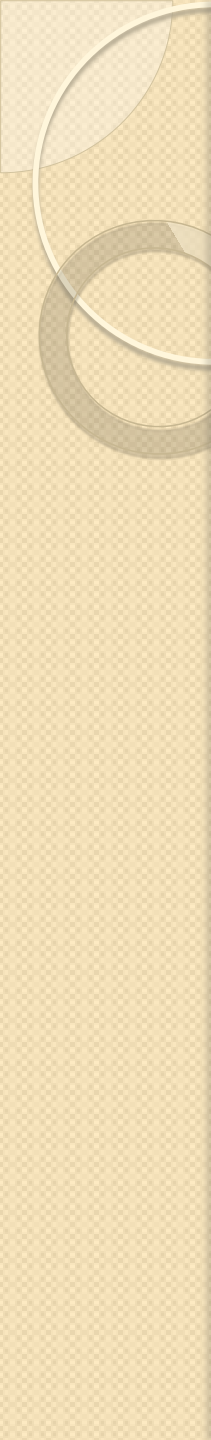




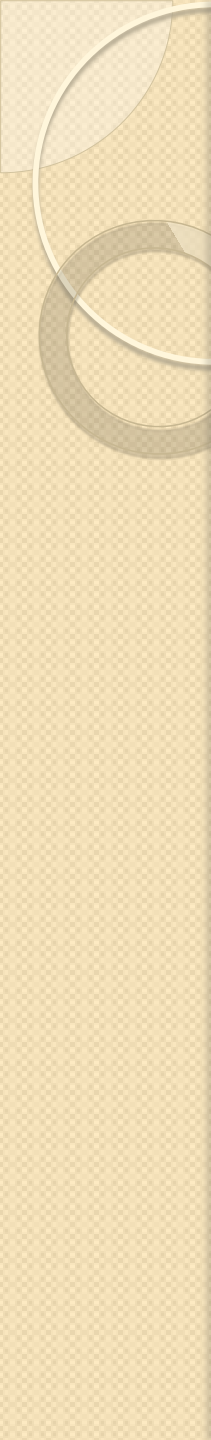
**School cafeteria after a hot water tank explosion**

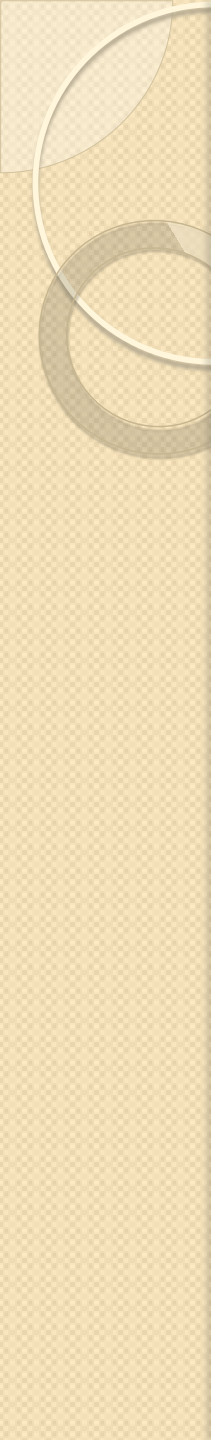
- What tests are important to be performed?
  - Loss of flame controls
  - Low and extra low water controls
  - Visual inspection of the internals (shell, tube) to see any scale or corrosion on metal
  - Hydraulic test to 1.5 times maximum working pressure
  - Safety relief valve operation at or below maximum operating pressure and no accumulation of pressure when the valve operates

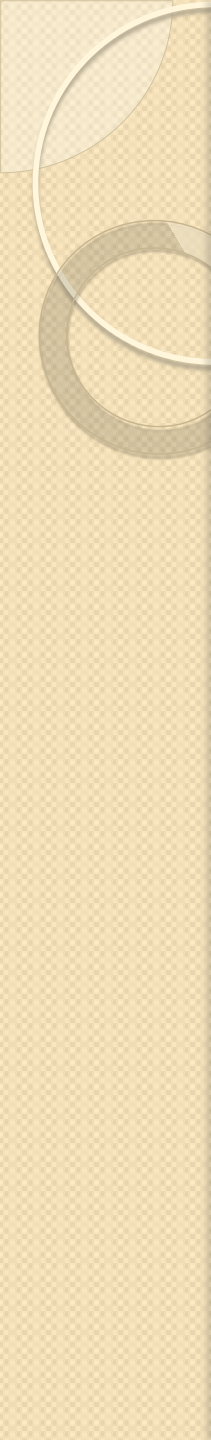
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- Proper operation of “blow down” controls of boiler water system and sight gauge glass
  - Proper operation of control system
  - Condition of exterior surfaces to ensure no corrosion due to the effects of the elements and/or corrosive substances
  - Any other tests that may be required to satisfy that the boiler is safe to operate

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- Competent persons only visit your facility, if everything is acceptable, once annually
  - So what are your responsibilities? How do you reduce the risk of injury or death to employees, or serious damage to property?

- Simple maintenance can reduce these risks
  - Drain air receivers at least once daily
  - Eliminate oil carryover from the compressor to the pipes and receiver
  - Protect the air receiver from rain and corrosive materials
  - Clean the external surfaces of the air receiver and apply paint and rust treatment as necessary
  - Check the pressure gauge and switch periodically to ensure that they are functioning correctly

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- Blow down the boiler regularly to reduce the concentration of impurities on the water side of the boiler
  - Blow down the sight gauges regularly
  - Ensure that the water is properly treated and is provided to the boiler in accordance with the manufacturer's specifications
  - And most importantly ...

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- **TRAIN YOUR STAFF ON THE CORRECT OPERATION AND MAINTENANCE OF THESE TYPES OF EQUIPMENT**

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- The consequences of poor maintenance and operation can be ...





WORKER DEATHS AT BEAVER WELLS, KENTON, N. H., MAY 22, 1901.

# CATASTROPHIC!!!

Promoting Justice In Employment - Building  
A Culture of Safety

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- Thank you for your attention

- **Questions?**