



**UNIT 2 - Leak Testing and  
Pressure Testing Methods  
and Associated Hazards.**



PRESSURE & LEAK TESTING  
TRAINING

# Two Main Pressure Testing Methods

## Hydrostatic Testing (Water)

is a method that involves filling a pipe or vessel with water and pressurizing it to a specific level. The system is then monitored for a set period to detect leaks or structural weaknesses. This method is widely used for its safety and effectiveness, especially for testing large systems.

## Pneumatic Testing (Air)

uses air or another gas to pressurize the system. It's often used for systems without water exposure or where detecting small leaks is critical. Pneumatic testing is faster than hydrostatic testing but requires careful handling due to the compressibility of gases.

# Comparison Between The Two Main Pressure Testing Methods

- Hydrostatic Testing:

- Preferred for large systems, offers better safety and is more effective in detecting small leaks.

- Pneumatic Testing:

- Ideal for systems sensitive to water, it provides quicker results but requires more caution due to potential energy stored in compressed gases.

The choice between hydrostatic and pneumatic testing depends on the specific requirements of the tested system. Understanding the characteristics and applications of both methods ensures that the right approach is chosen for each unique situation, contributing to the safety and efficiency of industrial operations.

## Other Pressure/Leak Testing Methods

•**Underwater bubble test:** This method involves submerging the object in water and applying pressure to it. Any bubbles that form indicate the presence and location of a leak. This method is simple, inexpensive, and effective for finding large leaks, but it may not be suitable for detecting small leaks or testing objects that are sensitive to water damage

•**Bubble soap paint:** This method involves applying a soap solution to the surface of the object and applying pressure to it. Any bubbles that form indicate the presence and location of a leak. This method is also simple, inexpensive, and effective for finding large leaks, but it may not be suitable for detecting small leaks or testing objects that have complex shapes or rough surfaces

## Other Pressure/Leak Testing Methods

•**Pressure and vacuum decay:** This method involves filling the object with air or another gas and measuring the change in pressure over time. A decrease in pressure indicates a leak. This method is fast, accurate, and quantitative, but it requires a calibrated pressure gauge and a leak-free test fixture. This method can be used for testing objects that have one or more openings, such as pipes, valves, or containers<sup>2</sup>

•**Tracer gas detectors:** This method involves filling the object with a gas that can be detected by a sensor, such as helium, hydrogen, or halogen. The sensor is used to scan the surface of the object or the surrounding area for any traces of the gas that may have escaped through a leak. This method is very sensitive, reliable, and nondestructive, but it requires expensive equipment and a controlled environment. This method can be used for testing objects that have no openings, such as sealed electronics or medical devices



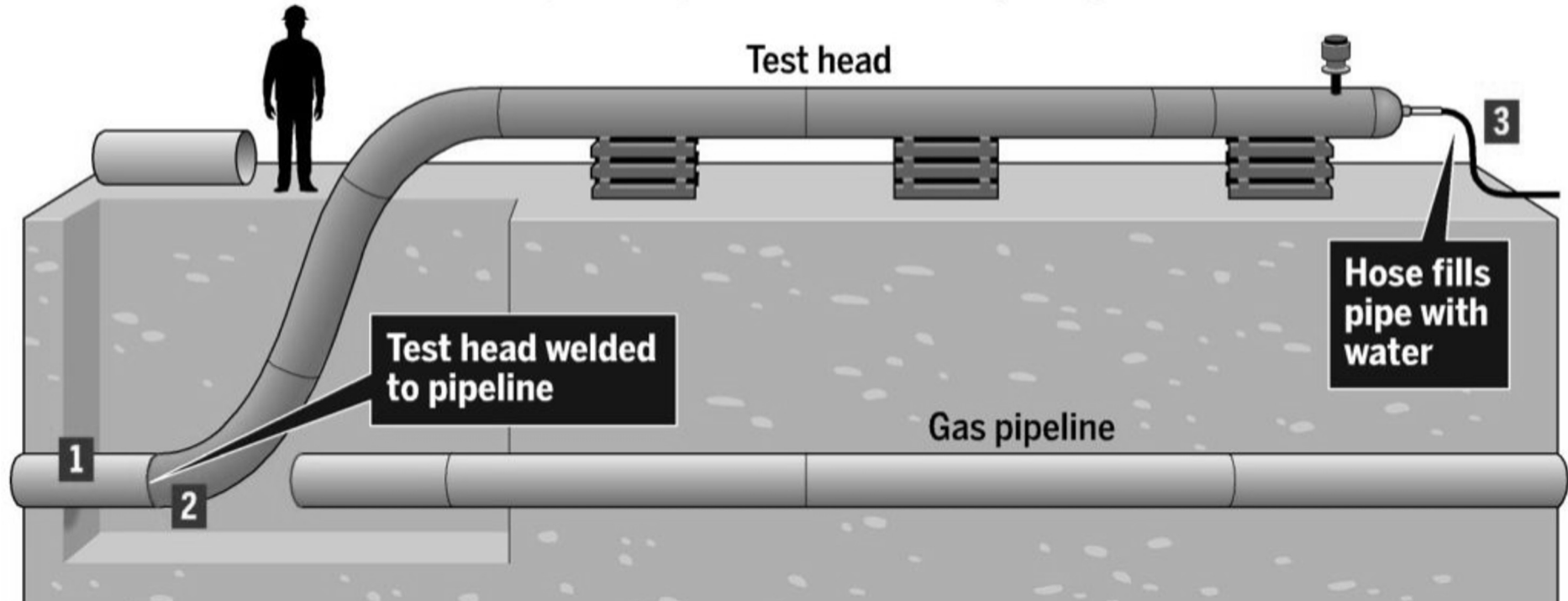
Hydrostatic  
pressure testing



Pneumatic  
pressure testing

# How pressure testing works

To conduct a hydrostatic pressure test on its gas pipelines, PG&E first obtains all needed work permits, coordinates with local agencies and provides gas to customers temporarily from an alternative source.



# Proof Testing & Strength Testing

- Proof testing and strength testing are two types of tests that are performed on pressure vessels and pipework to ensure their safety and reliability.



# Proof Testing

- Proof testing is a non-destructive test that exposes the vessel or pipe to a pressure higher than the normal operating pressure, but lower than the burst pressure, to check for any leaks or deformations. The test is successful if the vessel or pipe can withstand the proof pressure without any damage or permanent change in shape. Proof testing is usually done using water or oil as the test fluid, and may involve adding a dye to make leaks more visible. Proof testing is also known as hydrostatic testing or hydraulic testing when oil is used as the test fluid

# Strength Testing

- Strength testing is a destructive test that exposes the vessel or pipe to a pressure higher than the burst pressure, to determine the maximum pressure that the vessel or pipe can withstand before failing. The test is used to measure the strength and quality of the material and the joints, and to identify any defects or weaknesses. Strength testing is usually done using gas or air as the test fluid, and may involve measuring the permanent deformation or distortion of the vessel or pipe. Strength testing is also known as pneumatic testing or burst testing when gas or air is used as the test fluid.

# Differences & Risk Of Using Water/Inert Gas As Test Medium

- Water is incompressible, while gas is compressible. This means that gas can store more potential energy than water for the same volume and pressure conditions. If a rupture occurs during a pressure test, gas can release more force and cause more damage than water.
- Water has higher viscosity and surface tension than gas. This means that water can resist flowing through small openings more than gas. Therefore, a low-pressure air test can detect leaks more easily than a high-pressure water test.
- Water can cause corrosion or freezing problems if it is not drained properly after the test. Gas can avoid these issues if it is dry and non-reactive.

# Differences & Risk Of Using Water/Inert Gas As Test Medium

- The main risks of using water as a test medium are:
  - Water can cause damage to the system or the environment if it leaks or spills during the test. Water can also contaminate the system if it is not clean or treated properly.
  - Water can freeze inside the system if the temperature is low, which can cause cracks or bursts. Water can also expand or contract due to temperature changes, which can affect the accuracy of the test.
  - Water can be difficult to fill or drain from the system, especially if it has complex geometry or multiple branches. Water can also trap air pockets inside the system, which can reduce the effectiveness of the test.

# Differences & Risk Of Using Water/Inert Gas As Test Medium

- The main risks of using pressure inert gas as a test medium are:
  - Gas can cause explosions or fires if it ignites during the test. Gas can also be hazardous to human health if it is toxic or asphyxiating.
  - Gas can be difficult to control or regulate during the test, especially if it has high pressure or flow rate. Gas can also create noise or vibration problems in the system.
  - Gas can be expensive or scarce to obtain, especially if it is a special or inert gas. Gas can also require special equipment or safety measures to handle or store.