

Internal Leak Detection in Valves Using Acoustic Emission

TETA (Tahghigh&Tose'e Iranian)

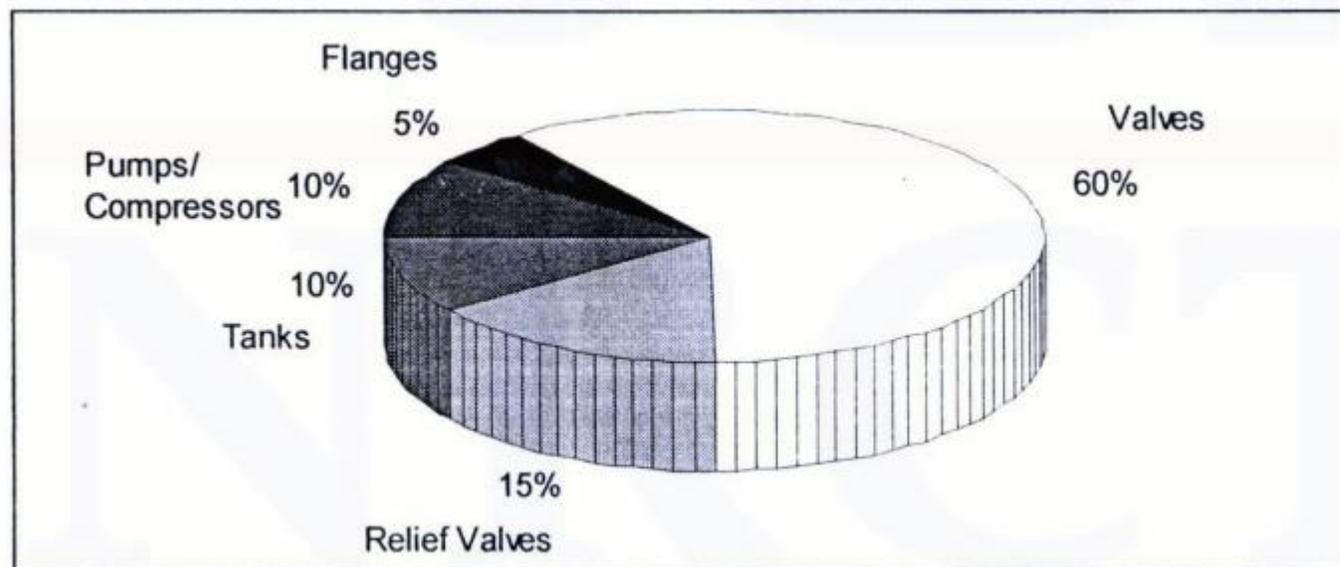
RIGHT SOLUTIONS RIGHT PARTNER

CREATIVITY IS A DRUG, WE CANNOT LIVE WITHOUT



The Problem

- ❖ The leakage problem is dreadfully significant for refineries, petrochemical plants and power generation plants.
- ❖ In fluid transmission network , there are many sources of fugitive emissions from leaking components such as valves, flanges, pumps and other connectors. However, valve leakage is critical source of losses .
- ❖ Valve leakage problem can cause not only explosion and fire but also other serious threats from fluid degradation owing to fluid mixing.





The Problem

- ❖ Evaluating the condition of in-service valves that process fluids is difficult.
- ❖ Diagnostic methods that require valve movement often cannot be utilized while the plant is in operation and future maintenance is being planned.
- ❖ Delaying valve maintenance may eventually result in future, costly, unplanned maintenance while the plant is in operation.
- ❖ Not only can unplanned maintenance be expensive but also typically the associated loss of production is far more expansive than the maintenance operation itself.



The Problem

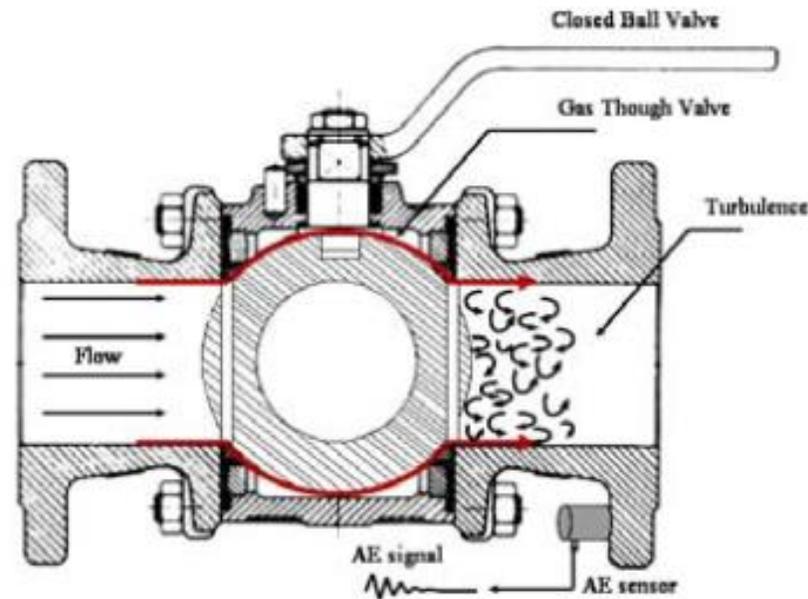
- ❖ Hydrostatic and pneumatic test are usually applied to valves and can monitor the performance of valves when the process plants are off-line or shutdown completely.
- ❖ Bypass technique for hydrostatic and pneumatic test is utilized to considerate this problem but still require a partial shutdown.





The Principle

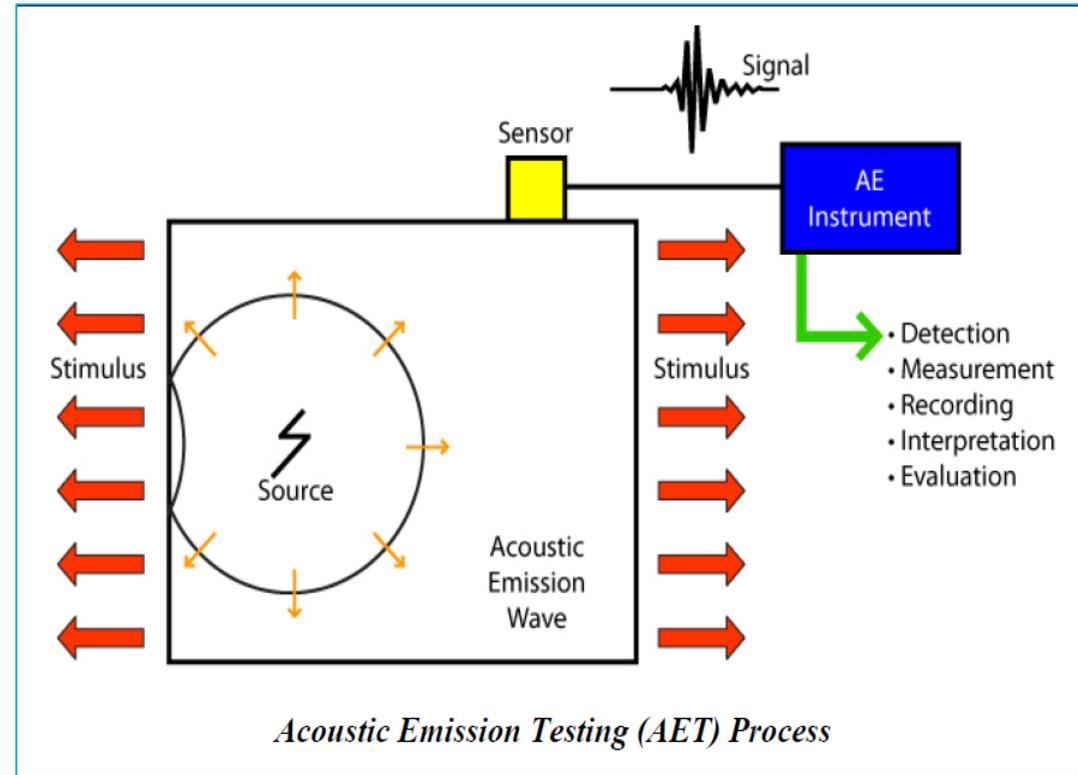
- ❖ During leakage, fluid loss is accompanied by acoustic energy loss.
- ❖ The method of using the release of acoustic energy to detect leaks is called Acoustic Emission (AE).
- ❖ When used with an experience base, the amount of measured AE can also be related to the actual leakage .





Acoustic Emission

- ❖ Acoustic Emission is a phenomenon of sound and ultrasound wave radiation in materials undergo deformation and fracture processes.





The Benefits

Use of AE equipment to determine valve leakage helps plants to:

- ❖ Prevent unplanned shutdowns and maintain consistent product output.
- ❖ Minimize the need for valve tear downs during plant shutdowns.
- ❖ Learn about valve maintenance problems before they become critical and more effectively manage engineering and maintenance personnel.
- ❖ Improve plant health and safety.
- ❖ Avoid unnecessary maintenance on valves that have minimal trim damage.



Minimize steam
(= energy) losses



Reduce costly
maintenance
time



Reduce health
& safety risks
to employees

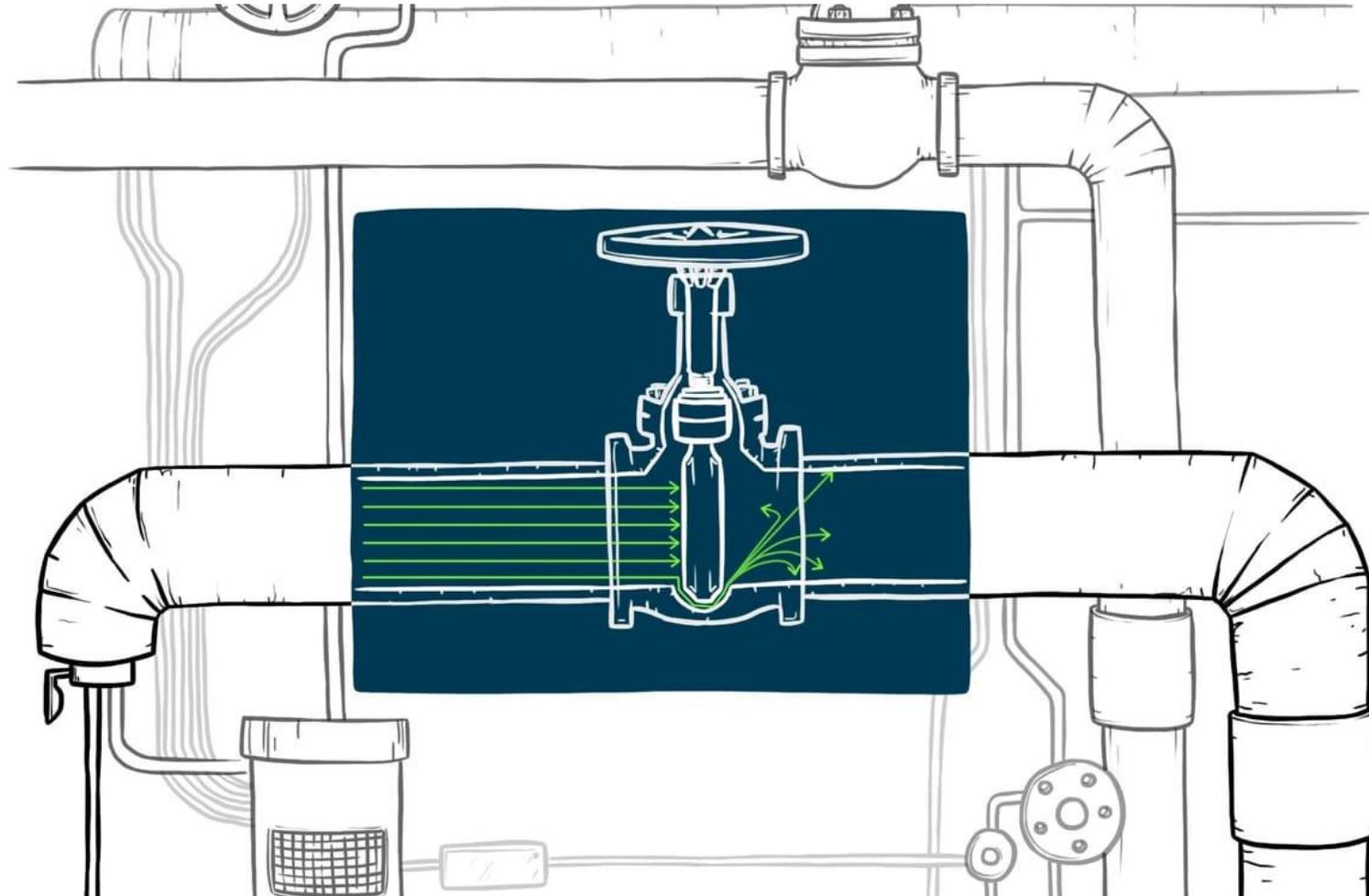


Stop
replacing
healthy valves



AE Leak Detection

- ❖ AE leakage detection quoted about 1 ml/s for liquid and 10 ml/s for gas.

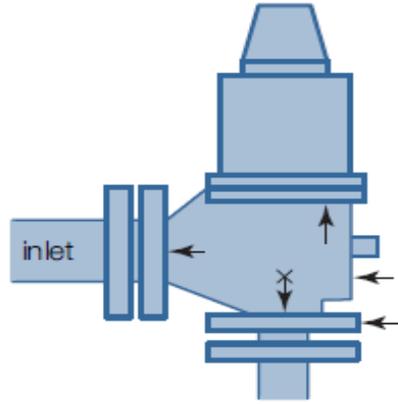




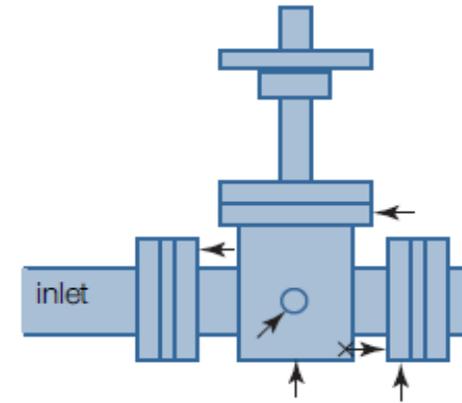
AE Leak Detection

(a) relief or pressure safety valve, (b) plug valve, (c) gate valve, (d) ball valve

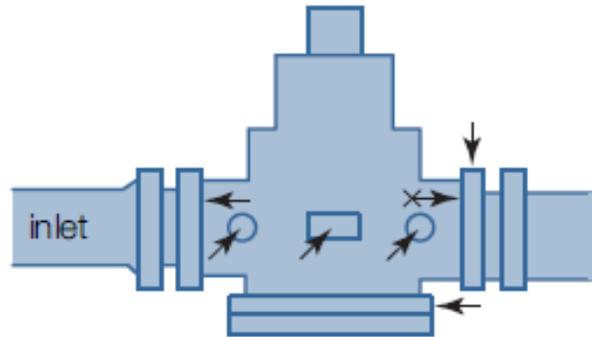
(a)



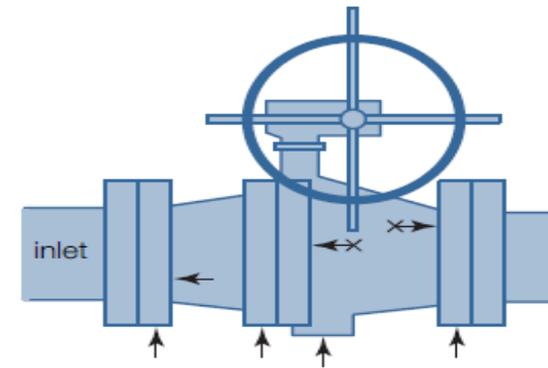
(c)



(b)



(d)



→ = measurement point
x→ = best measurement point



Portable Valve Leak Detector (Senseven)

Valve Sense

The mobile inspection system
for leak detection



Valve Sense components





Portable Valve Leak Detector (Senseven)

Valve Sense is based on the industry-wide established and standardized acoustic emission technology (see DIN EN1330-9), combined with new, digital features



- 1 Acoustic emission sensors collect AE signals between the frequencies of 20 and 500 KHz.
- 2 The Seven one device digitizes the AE signal and performs a background noise check. It is directly connected to a Smartphone via a USB interface.
- 3 The Senseven App on the Smartphone guides the user through the inspection process, visualizes the signals and calculates the result within seconds.

The first digital leak detection tool:
fast, independent, cost effective



- > RFID tags to scan valve data quickly and easily
- > Step by step software guided process
- > Automated background noise detection
- > Immediate result on site
- > Compare your inspection with historical inspections and tag reference values

- > Visualization of RMS values
- > Live view for experts
- > Add more details e.g. pictures of the measured valve, meta data
- > Immediate auto generated reports based on ISO 18081
- > Direct connection to other software systems

