

# ACOUSTIC EMISSION TESTING

MONITOR STRUCTURAL INTEGRITY OF YOUR EQUIPMENT



TEKPROM  
CONFORMITY  
ASSESSMENT AND  
INSPECTION  
SERVICES



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# ACOUSTIC EMISSION TESTING

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PART 01

# WHO WE ARE?

## OVER 13 YEARS EXPERIENCE

- We are providing conformity assessment services especially inspection in energy sector since 2009.
- We are performing our services since 2010 as an accredited Type-A Inspection Body according to the ISO/IEC 17020.



**TSE TÜRK STANDARDI**

**TS EN ISO/IEC 17020**  
Haziran 2012  
TS EN ISO/IEC 17020:2005; TS EN ISO/IEC 17020/T1:2006 yerine  
ICS 03.120.20

**Uygunluk değerlendirmesi - Çeşitli tiplerdeki muayene kuruluşlarının işletimi için şartlar (ISO/IEC 17020: 2012)**

Conformity assessment - Requirements for the operation of various types of bodies performing inspection (ISO/IEC 17020:2012)

Évaluation de la conformité - Exigences pour le fonctionnement de différents types d'organismes procédant à l'inspection (ISO/IEC 17020:2012) Konformitätsbewertung - Anforderungen an den Betrieb verschiedener Typen von Stellen, die Inspektionen durchführen (ISO/IEC 17020:2012)

EN/ISO IEC 17020:2012 Standardının Türkçe Tercümesidir.

**TÜRK STANDARDLARI ENSTİTÜSÜ**  
Necatibey Caddesi No. 112 Bakanlıklar/ANKARA

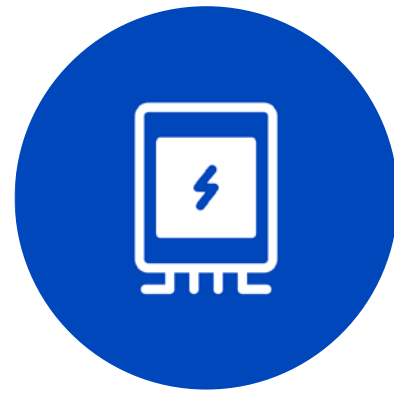


## SERVICES



### **Acoustic Emission Testing**

EN 12817, EN 12819,  
EN 13477-1, EN 13477-2,  
EN 13554, EN 15856,  
EN 15495, EN 14584,  
E569/E569M-20,  
ASTM E1930/E1930M-17  
ASME-BPVC Section V



### **Electrical Equipment Periodic Check**

Regulation Concerning the  
Conditions on Health and  
Safety during the use of  
Professional Equipment

Grounding Regulation in  
Electrical Installations

Electrical Internal  
Installations Regulations



### **Pressure Equipment Periodic Check**

Regulation Concerning  
the Conditions on Health  
and Safety during the  
use of Professional  
Equipment



### **Lifting Equipment Periodic Check**

Regulation Concerning  
the Conditions on Health  
and Safety during the  
use of Professional  
Equipment



WE PROVIDE

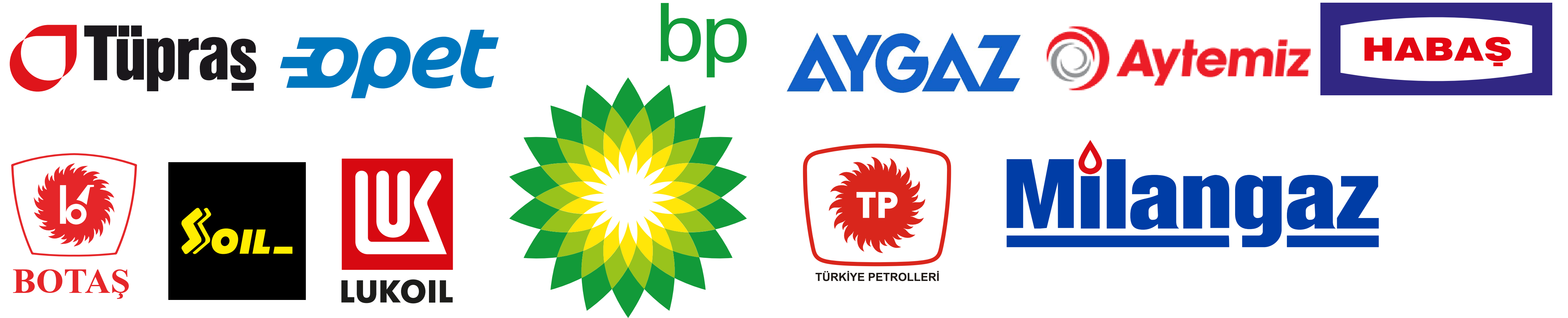
TECHNICALLY AND ETHICALLY

CONFIDENT SERVICES

FOR CONFORMITY ASSESSMENT

## CUSTOMER RANGE

More than 1300 customers in Türkiye and over international environment in 2022.



PART 02

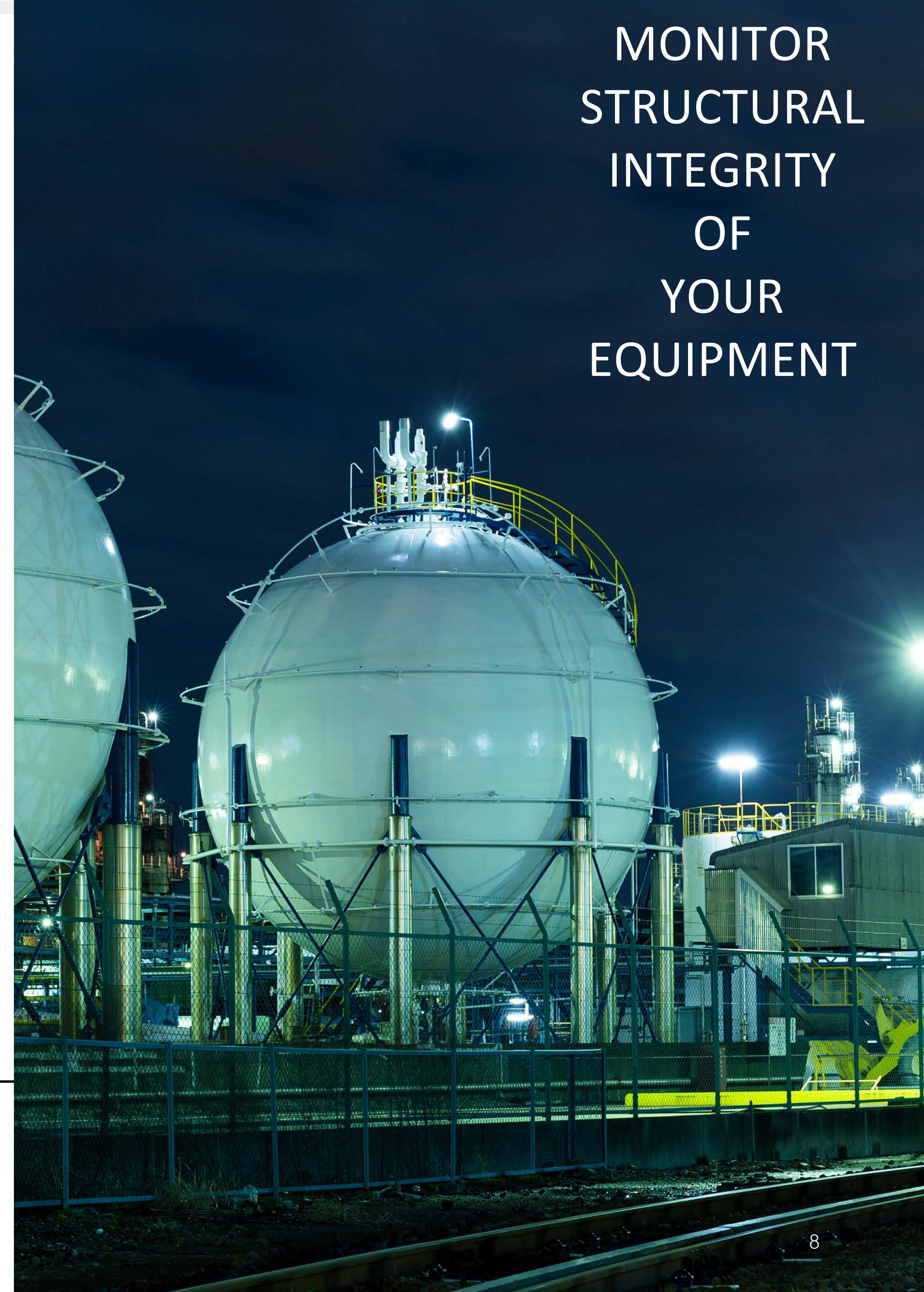
# WHAT IS AE TESTING?

## WHAT IS AE TESTING?

Acoustic Emission Testing (AET) is a non-destructive testing (NDT) method that is based on the generation of waves produced by a sudden redistribution of stress in a material. When a piece of equipment is subjected to an external stimulus, such as a change in pressure, load, or temperature, this triggers the release of energy in the form of stress waves, which propagate to the surface and are recorded by sensors.

Acoustic emissions can come from natural sources, such as earthquakes or rock bursts, or from the equipment itself such as melting, twinning, and phase transformations in metals. Detection and analysis of AET signals can provide information on the origin and importance of discontinuities in a material.

MONITOR  
STRUCTURAL  
INTEGRITY  
OF  
YOUR  
EQUIPMENT



## WHAT IS AE TESTING?

In addition, unlike other methods, AET does not require access to all parts of the equipment. This situation offers the advantage of being an alternative method, especially in applications such as underground storage tanks that are difficult to access.

On the other hand, there is no need to stop the process or discharge the equipment during the acoustic emission test. The acoustic emission test allows inspection while the enterprise is running.

UNLOCK  
THE HIGHEST  
POTENTIAL OF  
YOUR  
BUSINESS

# WHICH EQUIPMENT CAN BE TESTED?



PRINCIPALLY, WE ARE ABLE TO TEST ALL WORK EQUIPMENT THAT WE CAN PUT UNDER STRESS OR OBSERVE A PHYSICAL REACTION. FOR INSTANCE;

*PIPELINES*

*PRESSURE VESSELS*

*ATMOSPHERIC STORAGE TANKS*

*HIGH PRESSURE CYLINDRICAL TUBES*

PART 03

# WHICH DEVICES DO WE USE?

## MISTRAS & VALLEN

Tekprom can perform acoustic emission testing by using up to 134 sensors simultaneously.



No	Device Description / Model	Brand	Number of Channels
1	Micro-II AE Digital System	Mistras	8
2	Micro-II AE Digital System	Mistras	32
3	Vallen AMSY-6	Vallen	16
4	Vallen AMSY-6	Vallen	64
5	Vallen AMSY-6	Vallen	38
6	Vallen AMSY-6	Vallen	16

PART 04

# STANDARDS AND PROCEDURE

## STANDARDS AND PROCEDURE

Baseline  
Standards

### EN 12817

#### **LPG equipment and accessories - Inspection and requalification of LPG tanks up to and including 13 m<sup>3</sup> overground**

This document specifies requirements for: a) routine inspection, periodic inspection and requalification of fixed LPG pressure vessels of sizes from 150 l up to and including 13 m<sup>3</sup>, and associated fittings; b) marking pressure vessels and/or keeping records, as appropriate, as a result of routine inspection, periodic inspection and requalification.



### EN 12819

#### **LPG equipment and accessories - Inspection and requalification of LPG tanks greater than 13 m<sup>3</sup>**

This document specifies requirements for: a) routine inspection, periodic inspection and requalification of fixed LPG pressure vessels of sizes greater than 13 m<sup>3</sup>, and associated fittings; b) marking pressure vessels and/or keeping records, as appropriate, as a result of routine inspection, periodic inspection and requalification.

## STANDARDS AND PROCEDURE

Baseline  
Standards

### EN 14584

**Non-destructive testing - Acoustic emission testing - Examination of metallic pressure equipment during proof testing - Planar location of AE sources**

This European Standard describes the method for conducting acoustic emission testing (AT) of metallic pressure equipment during acceptance pressure testing using a planar location method.



### EN 15856

**Non-destructive testing - Acoustic emission - General principles of AE testing for the detection of corrosion within metallic surrounding filled with liquid**

This European Standard describes acoustic emission testing (AT) on metallic surroundings filled with liquids for the detection of corrosion processes that are active at the time of the test.

## STANDARDS AND PROCEDURE

Baseline  
Standards

### ASME BPVC.V-2021

**Article 11 - Acoustic Emission Examination Of Fiber-reinforced Plastic Vessels**

**Article 12 - Acoustic Emission Examination Of Metallic Vessels During Pressure Testing**

**Article 13 - Continuous Acoustic Emission Monitoring Of Pressure Boundary Components**



### ASTM E1930/E1930M-17

**Standard Practice for Examination of Liquid-Filled Atmospheric and Low-Pressure Metal Storage Tanks Using Acoustic Emission**

### ASTM E569/E569M-20

**Standard Practice for Acoustic Emission Monitoring of Structures During Controlled Stimulation**

# PLACEMENT OF PROBES

In order to obtain data, piezoelectric sensors with high sensitivity are attached to the surface of the material to be tested. Mechanical waves are converted into electrical signals by sensors and sent to the software.



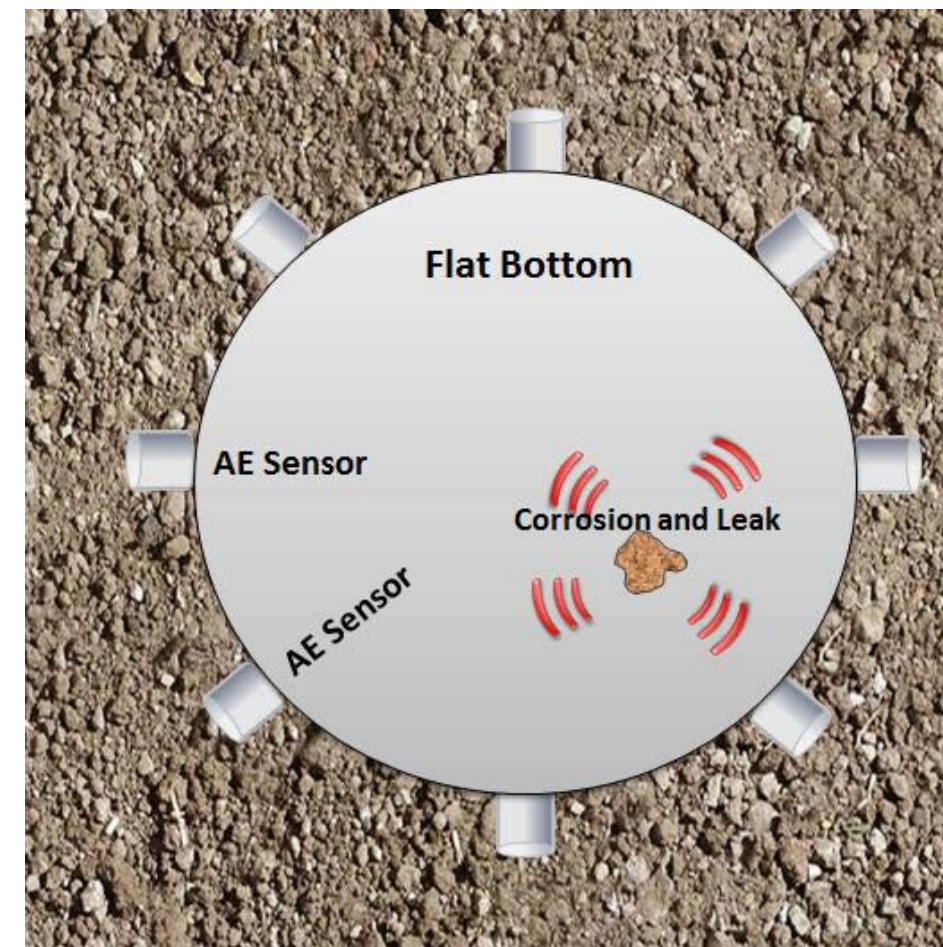
$$d = \frac{1}{2}(D - \Delta T \cdot V)$$

$d$  = distance from first hit sensor

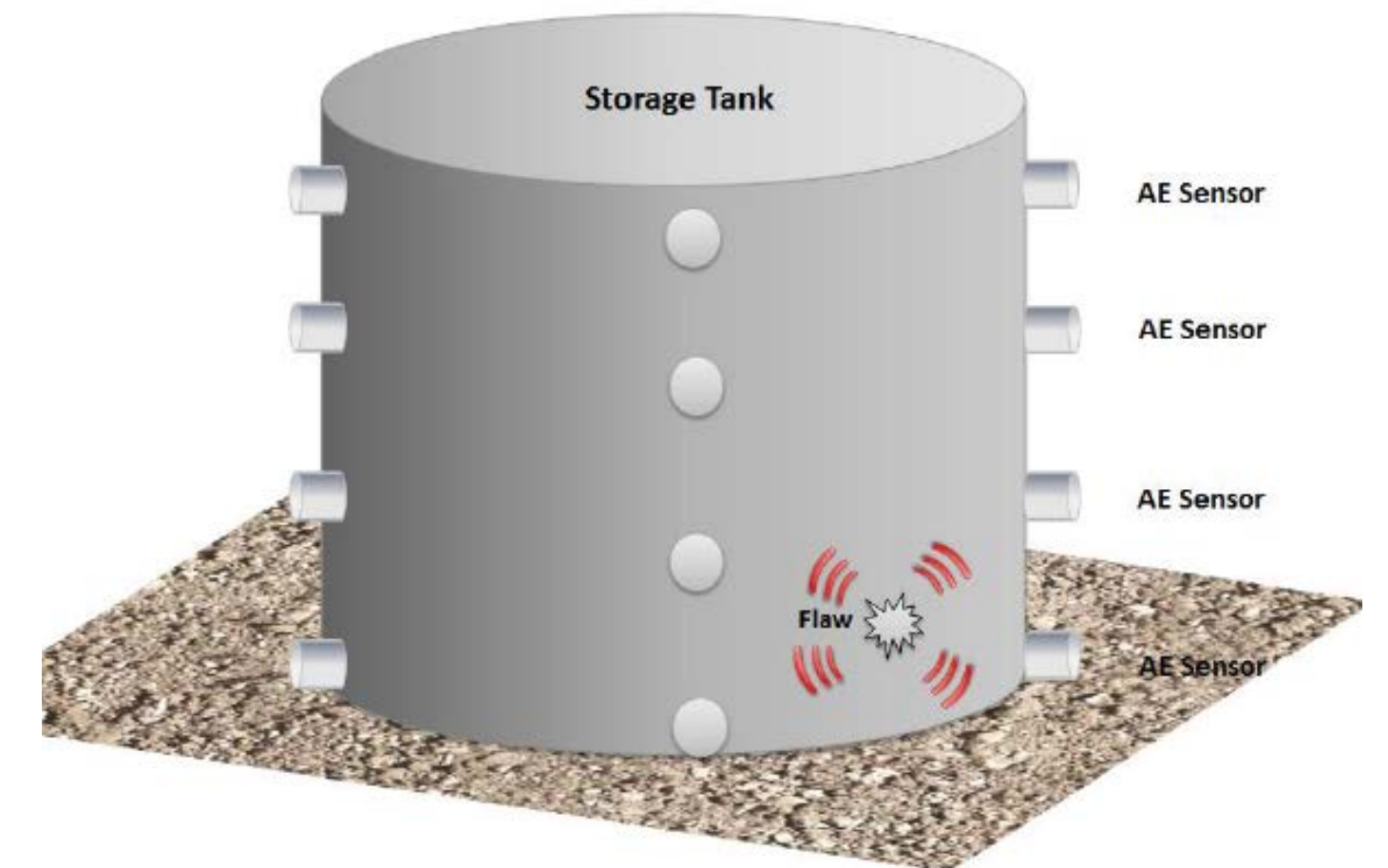
$D$  = distance between sensors

$V$  = wave velocity

**Top View**



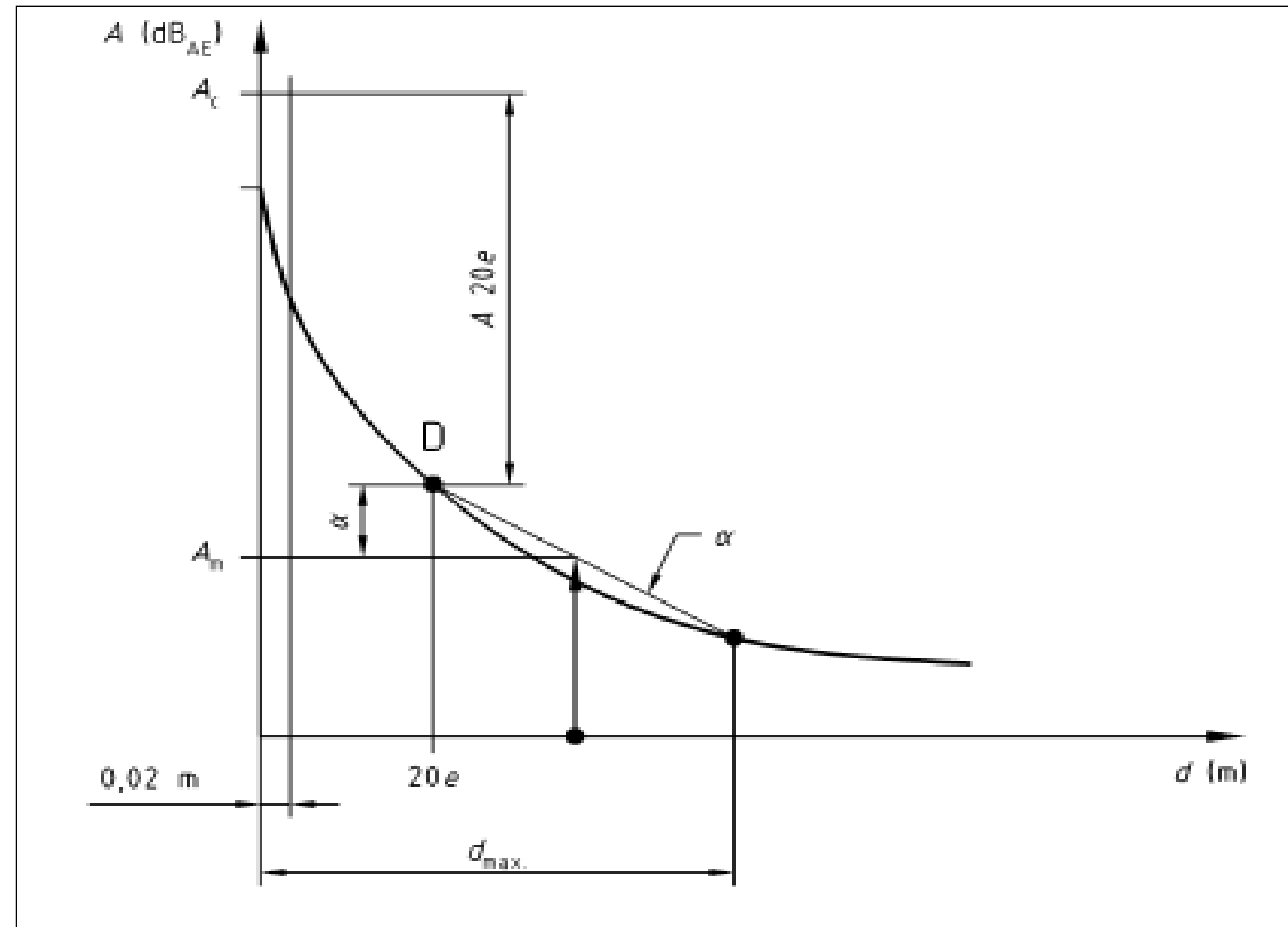
**Side View**



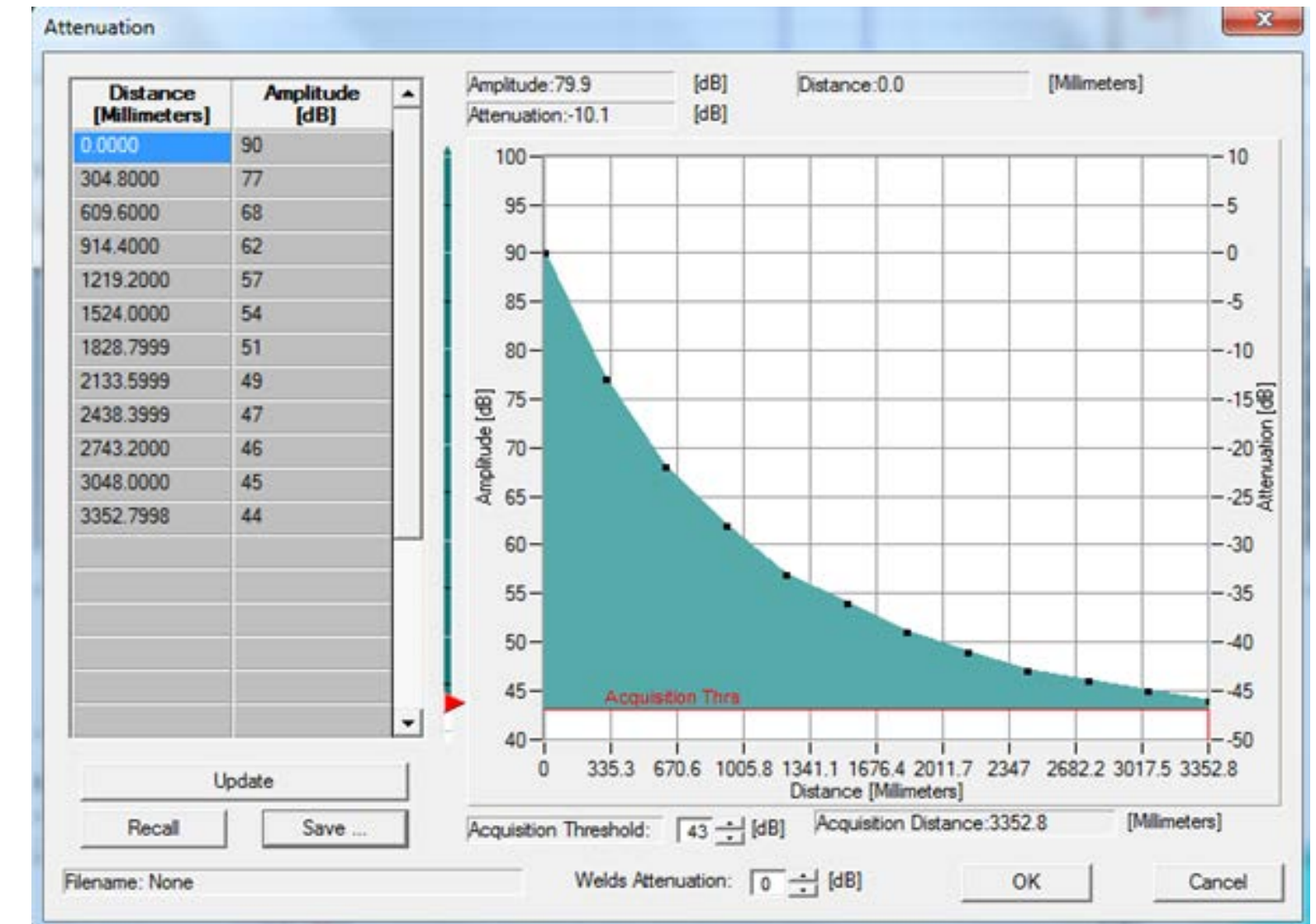
# PLACEMENT OF PROBES

The number of probes is determined by the size, shape and structure of the material to be tested. In the placement of the probes, the maximum range is determined not to exceed the values in the attenuation chart.

Attenuation Chart



Attenuation Chart Software



# VERIFYING THE SYSTEM

Before starting the data collection process in the AE test, the operation of the sensors and the system is verified by using the “Pen Break Method”.

0.5 pencils are generally used for this process. By breaking the pen tips to the sensors at certain distances, the sensor distances and the system are verified.

Acoustic Emission (AE) test and data interpretation procedure was developed by the ASTI (Aboveground Storage Tank Integrity Assessment) institution.

Data (data) is collected with the help of sensors placed peripherally on the tank surface, approximately 1 meter above the bottom of the tank. The frequency range of the sensors can vary in the range of 20-100 kHz.

Thanks to the sensors, the activity of corrosion and possible

leakage (overall corrosion and potential leak activity) is detected.

The AE System distinguishes corrosion and leak data and locates faults.

The data obtained after the analyses are evaluated as follows:

- Evaluate general corrosion.

Overall Corrosion Grading	Floor Condition
A	Very minor/No Damage
B	Minor Damage
C	Intermediate damage
D	Active damage
E	Highly active damage

- Possible leak evaluation. (Score between 1 (very low / no activity) and 5 (very high activity))

## Figural Notation

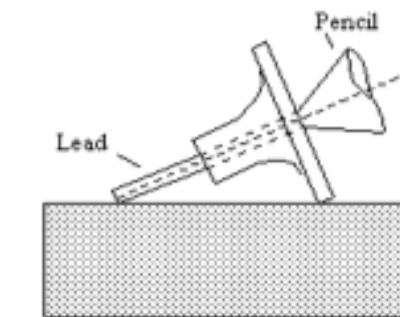
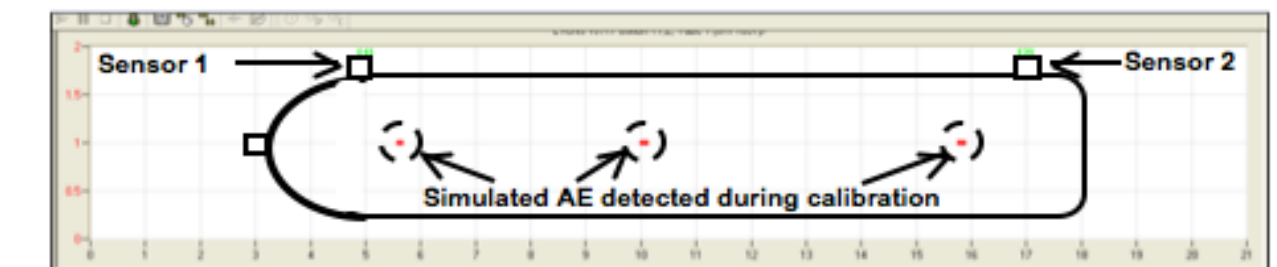


Figure 9. Description of the standard pencil break test used to simulate AE in materials.



PART 05

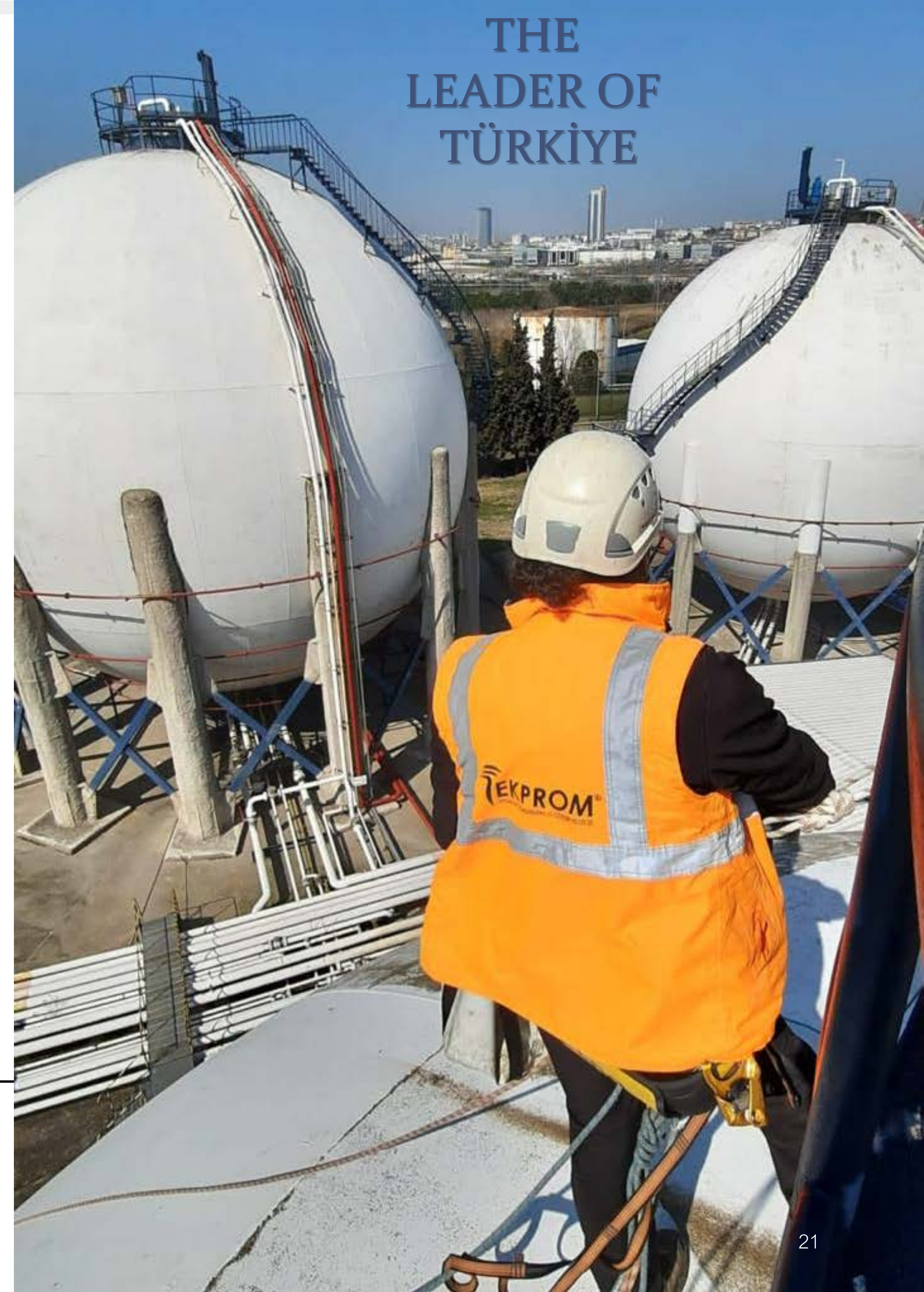
# OUR ACTIVITIES WITH DATA

## IN TÜRKİYE

Since 2009, as the first domestic accredited acoustic emission body of Türkiye, we have been conducting our services professionally and confidently, especially in the field of fuel oil, we check and test over %85 of the sector by using the state-of-the-art devices and with our high qualified engineers.

Since 2014, periodic inspections of almost all the fuel brands operating in Türkiye have been continuously carried out by us.

THE  
LEADER OF  
TÜRKİYE



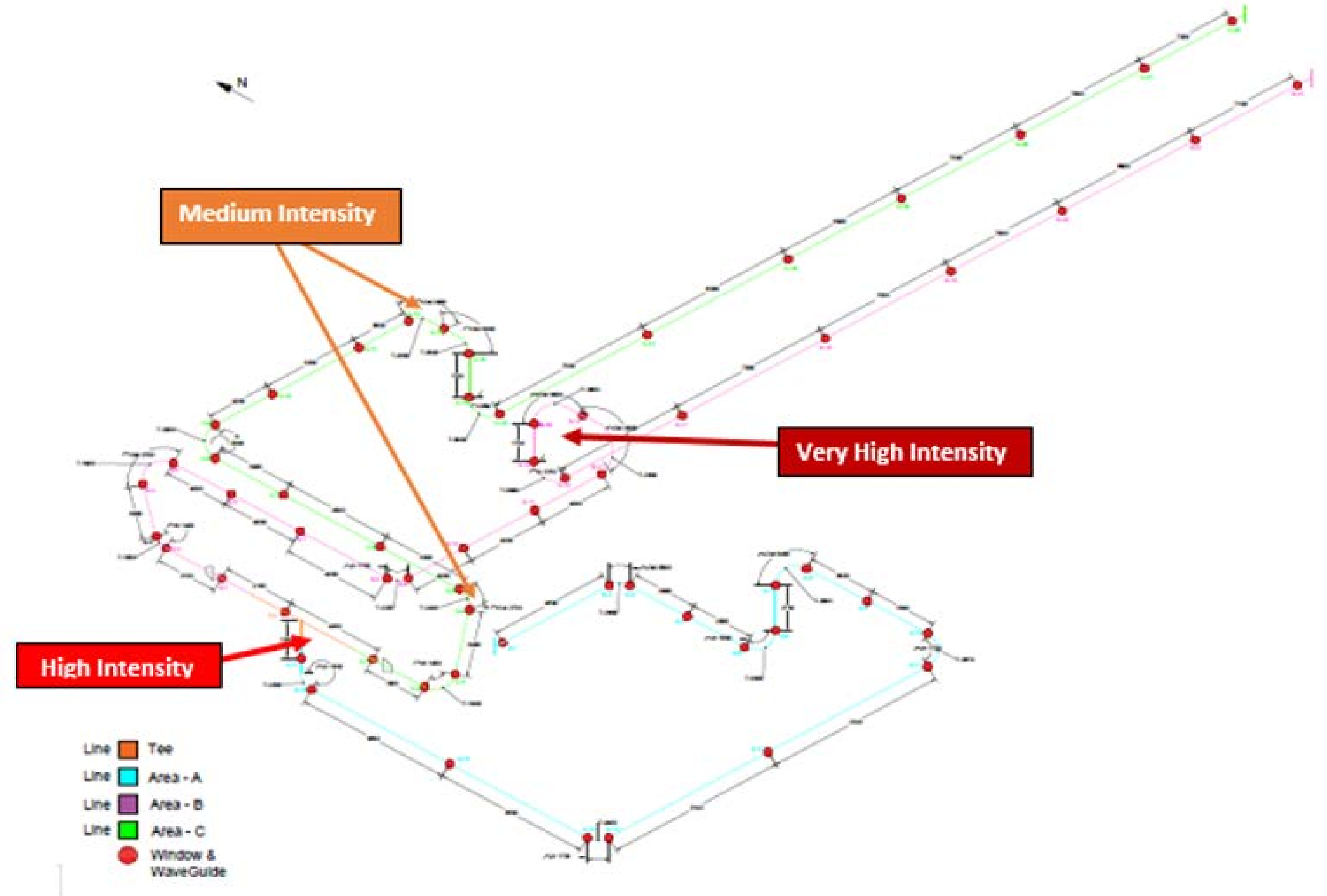
## PIPELINES

As a solution partnership, full-time acoustic emission inspecting of pipelines that have been running for one year has been carried out without stopping the system for even a second.



# PIPELINES

Thanks to the data obtained instantly during the test, risk points were detected in real time and shared with the enterprise.



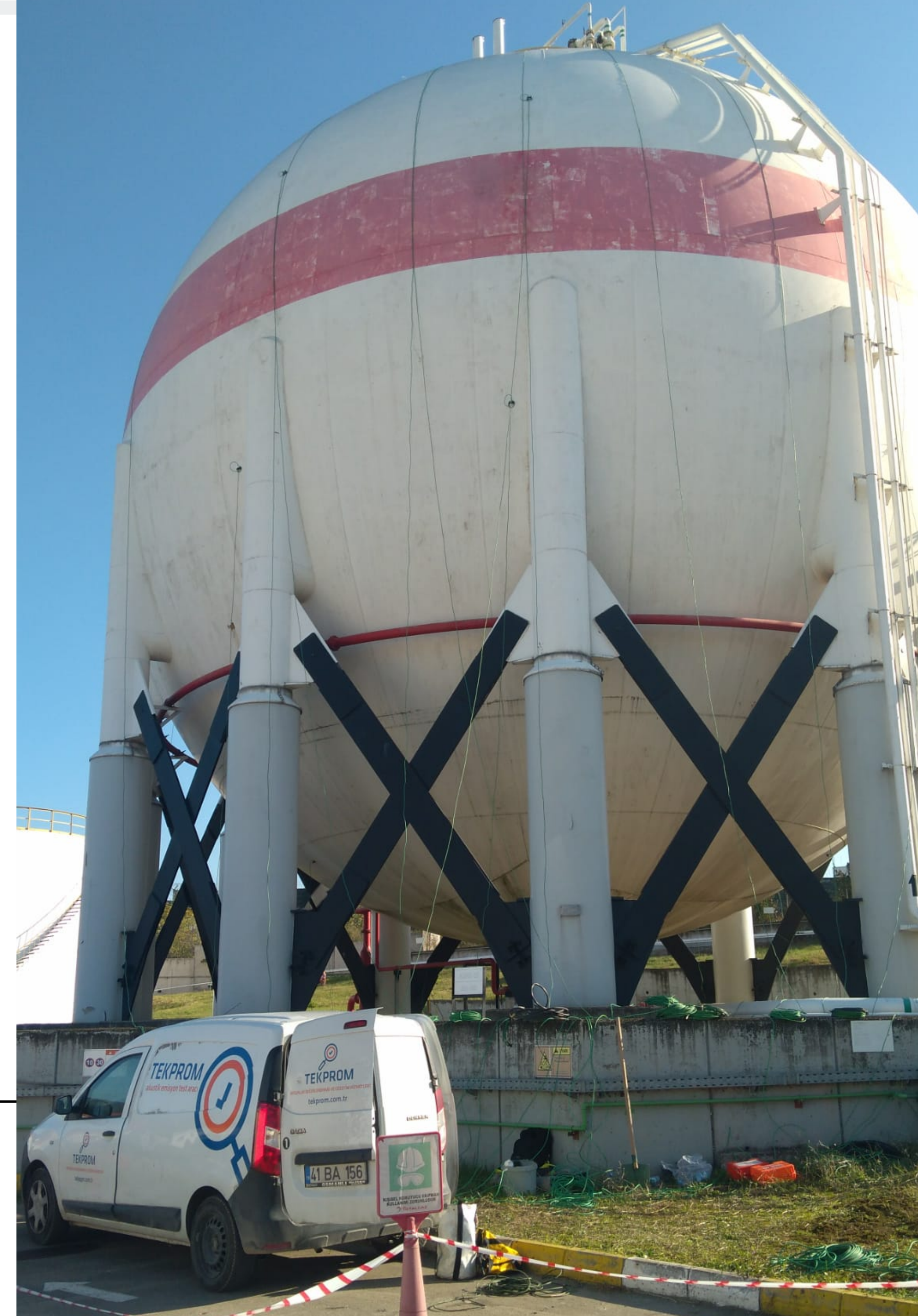
## PRESSURE TANKS

Tekprom, which carries out nearly 5000 tanks inspections of cylindrical, spherical and atmospheric tanks used for various purposes from 1 m<sup>3</sup> to 5.000 m<sup>3</sup>, is still continuing periodic and special purpose checks.



## PRESSURE TANKS

Aid by nitrogen tubes, the pressure vessel is expanded. Sensors (*in the Picture on the right, on the tank*) begin to receive data from the material stretched by increasing the pressure and are transmitted by the cables connected between the sensors and the AE device to the screen as meaningful graphics.



## ATMOSPHERIC STORAGE TANKS

Unlike other test methods, tests of atmospheric storage tanks are carried out according to EN 15856 standard and ASTM E1930/E1930M-17. According to these standards, an inspection of the base, body or all equipment is carried out.

Depending on the test data an inspection report is issued for 1, 3 or 5 years.



# ATMOSPHERIC STORAGE TANKS

Before starting the test;

In order for atmospheric tanks to be tested by acoustic emission, the tank must be closed to the product inlet and outlet at least 24 hours before the test.



## ATMOSPHERIC STORAGE TANKS

- The sensors are placed on the bottom at equal distances around the tank, approximately 1 meter above the tank base, taking into account the manhole, nozzles and sources.
- The tank is monitored for at least 1 hour, excluding lost periods.
- The received data is analyzed and the activities are reported by showing the intensity and location on the tank.



## ATMOSPHERIC STORAGE TANKS

Tekprom has completed the tests of many atmospheric storage tanks ranging from 20.000 m<sup>3</sup> to 135.000 m<sup>3</sup>.

*(the picture on the right belongs to one of the 135.000 m<sup>3</sup> atmospheric LPG storage tank tests we have done at TÜPRAŞ - Turkish Petroleum Refinery)*



## ABROAD

Especially full-time acoustic monitoring of the pipeline containing petroleum-derived products for 1 year and also acoustic emission tests of spherical tanks at various locations have been successfully completed by Tekprom.



PART 06

# SUMMARY AND CONTACT

## SUMMARY

Acoustic Emission Testing;

- allows you to safely monitor the structural integrity of your equipment.
- unlike other methods, does not require to access to all parts of the equipment.
- instead of sending a virtual signal, wave, beam, etc. to the equipment under test, it stresses the material and listens for already existing defects.

# AE Testing



## CONTACT

Please contact us for more information and quotes:

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