

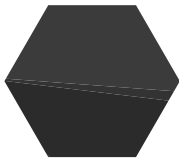


**Corporate  
Partner**

*The American Society for Nondestructive Testing*



**NDT TESTING**   
nondestructive testing since 1997



**NONDESTRUCTIVE TESTING** ■ ■ ■ ■

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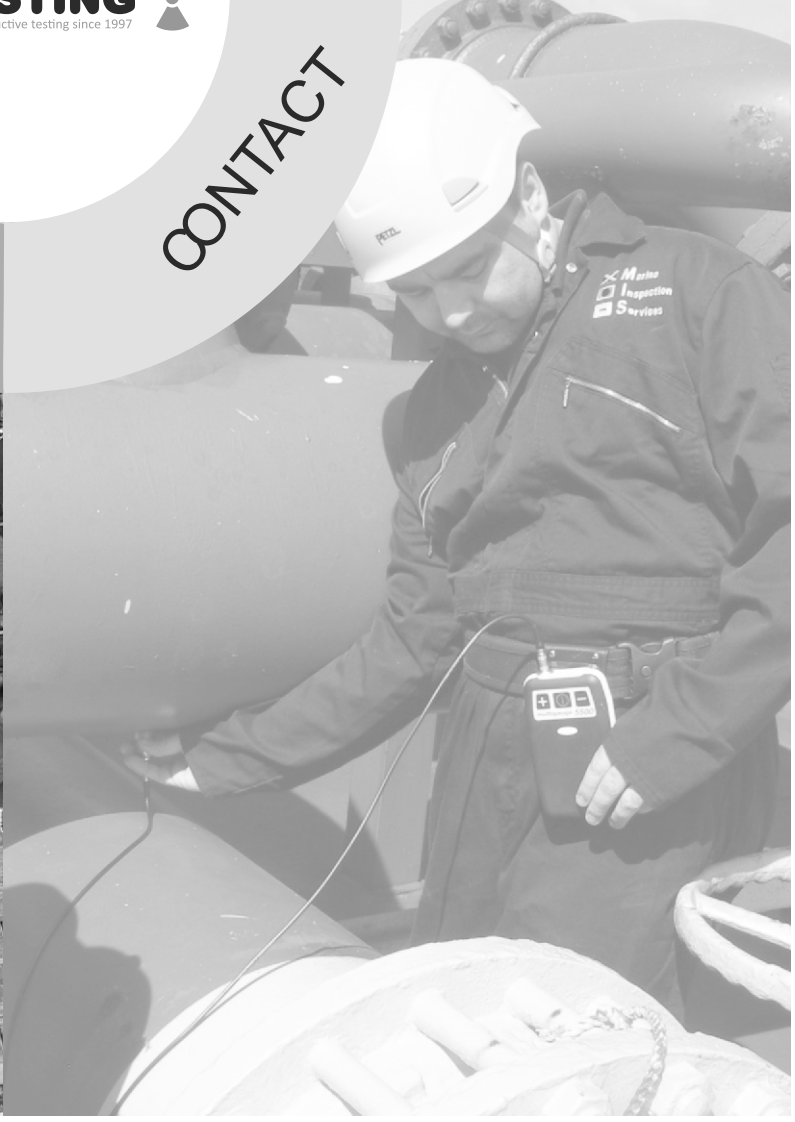
SERVICES

EQUIPMENT

**NDT TESTING**   
nondestructive testing since 1997

CLIENTS

CONTACT



**NDT Testing** is a limited liability company which performs destructive and non-destructive examinations. The domains in which the company operates are:

- Energetic field – power plants, oil and gas transportation etc;
- Chemical and petrochemical plants;
- Metal constructions;
- Industrial and marine steel structures;

## COMPANY PROFILE

Founded in 1997, NDT Testing is one of the companies from Romania that provides non-destructive examinations using all 5 main examination methods. In order to do so, it counts on the latest devices for Digital Radiography, Ultrasonic Testing (TOFD + Phased Array) and mobile laboratories.

The wide range of services and the modern equipment contributed to the fast development of the company, both nationally and internationally.

Due to the attention for details, professionalism and flawless services that have been delivered over time, the company acquired valuable partners. They became very important parts of our business card, enhancing through these collaborations, our credibility and prestige within the market.

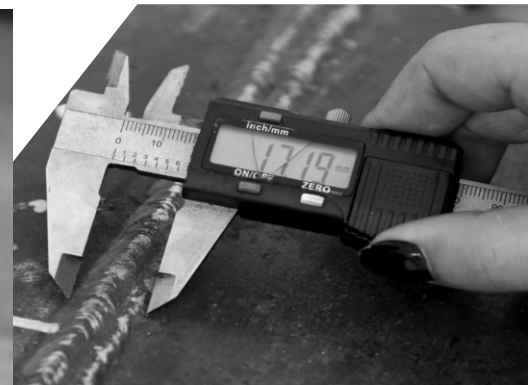
### **Authorizations held by the NDT Testing operators:**

- level II in accordance with EN 9712
- level II and level III, in accordance with SNT-TC-1A

# VISUAL TESTING



Visual testing is one of the most used NDT methods, usually the first part of any inspection, due to its immediate evaluation. Once the visual testing is performed, it can be established which non-destructive method can be further used.



## APPLICATIONS:

- The identification of all visible flaws on the surface.
- The inspection of less accessible areas.

## TYPES OF EXAMINATIONS:

- Direct examination;
- Indirect examination using magnifiers, endoscopes etc.

## ADVANTAGES

- Simplicity;
- Speed;
- Low cost.



# PENETRANT TESTING

This examination consists of applying a dye penetrant on the examined surface. After penetration time, the developer is applied. Due to the absorption properties of the developer is highlight the discontinuities open to the surface.

## APPLICATIONS:

- Identification of all defects opened to the surface, including the ones that can not be seen on visual examination.
- Examination of welded joints of metallic and nonmetallic (ceramic, aluminum, etc.)

## TYPES OF EXAMINATIONS:

- Dye penetrant examination - color contrast.
- Fluorescent penetrant examination.

## ADVANTAGES:

- The method is very sensitive to the presence of small superficial discontinuities which makes it superior to visual examination.
- There are few use limitations. At the same time, several small objects can be tested without compromising quality standards, thus saving time and reducing costs considerably.
- Complex geometries can also be tested.



# MAGNETIC TESTING

## APPLICATIONS:

Identification of surface defects and its vicinity's defects.

Examination of material surfaces likely to crack.

## TYPES OF EXAMINATIONS:

Color contrast magnetic particle testing.

Fluorescent magnetic particle testing.



Magnetic The technique exploits a special feature of ferrous alloys – ferromagnetism; it is the ability to focus the magnetic field on an area in order to highlight the anomalies of the flux lines of magnetic field in the surface defect.



# MAGNETIC TESTING



## ADVANTAGES:

•In contrast to other types of examinations, the magnetic particle can determine the surface defects even in the vicinity. In addition, using this method it is not necessary to clean the surface before, aspect which confers an advantage linked so the execution time, and the conditions in which the examination can be performed.

•The necessary equipment is portable, and the result is immediate.

•High speed examination.

•Simplicity and ease in performing the examination.



# ULTRASONIC TESTING

## PULSE-ECHO Method

The method is based on mechanical waves (ultrasound) generated by a piezo-magnetically excited element at a frequency typically in the range between 2 and 5 MHz. Control involves the transmission, reflection, absorption of ultrasonic propagated wave in the controlled part. Transmitted wave beam is reflected within the play and the flaws, then returns to the flaw that can be both transmitter and receiver. Positioning fault is done by interpretation of the signals.



### APPLICATIONS:

- Identification of internal defects in welds, metal, plastics, ceramics, glass.
- Examination of plates, castings and forgings.



# ULTRASONIC TESTING

## PULSE-ECHO Method

### TYPES OF EXAMINATIONS:

Pulse-echo ultrasound examination using longitudinal waves and transverse waves.

### ADVANTAGES:

- Ultrasonic examination presents a series of advantages compared to other non-destructive methods, it has a high sensitivity and high mobility.

- Using the method is not limited only to magnetic materials (as with magnetic particles) nor to the discontinuities open to the surface (such as dye penetrant) and to the scan, it does not require any kind of radiation protection.

- The possibility of determining the position of the defect in the controlled part.

- Mobility of the equipment.

### EQUIPMENT:

- Krautkramer-USM 36;
- Olympus –MXU.

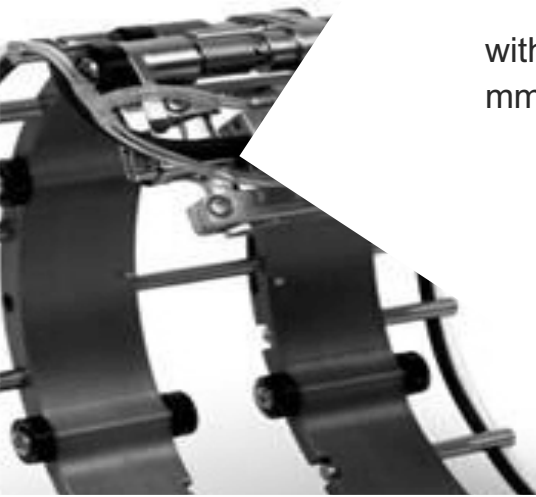


# COBRA Manual Scanner



The COBRA™ kit was specifically designed to provide a complete solution for the replacement of radiography on small diameter girth welds with limited scanning access.

The COBRA holds up to two PA probes for inspections on pipes with outside diameters ranging from 0.84 in. to 4.5 in (21 mm to 114 mm).





## CODES

### ASME Cases allowing Ultrasonics in lieu of radiography

#### **Case 2235-9**

Use of Ultrasonic Examination In  
Lieu Of Radiography  
Section I; Section VIII, Division 1  
and 2; and Section XII

#### **B31 Case 181**

Use of Alternative Ultrasonic Examination  
Acceptance Criteria in ASME B31.3

#### **B31 CASE 179**

Use of alternative Ultrasonic Examination  
Acceptance Criteria in ASME B31.3

#### **Case 2599**

Use of Linear Phased Array E-Scan Ultrasonic  
Examination Per Article 4  
Section V

#### **Case 2541**

Use of Manual Phased Array Ultrasonic Examination  
Section V

#### **Case 2558**

Use of Manual Phased Array E-Scan Ultrasonic  
Examination Per Article 4  
Section V

#### **Case 2557**

Use Of Manual Phased Array S-Scan Ultrasonic  
Examination Per Article 4  
Section V



# COBRA Manual Scanner

The COBRA scanner on a 0.84 in. pipe with two A15 PA probes, Y-adaptor splitter, and an OmniScan MX2 16:64 displaying two PA groups.



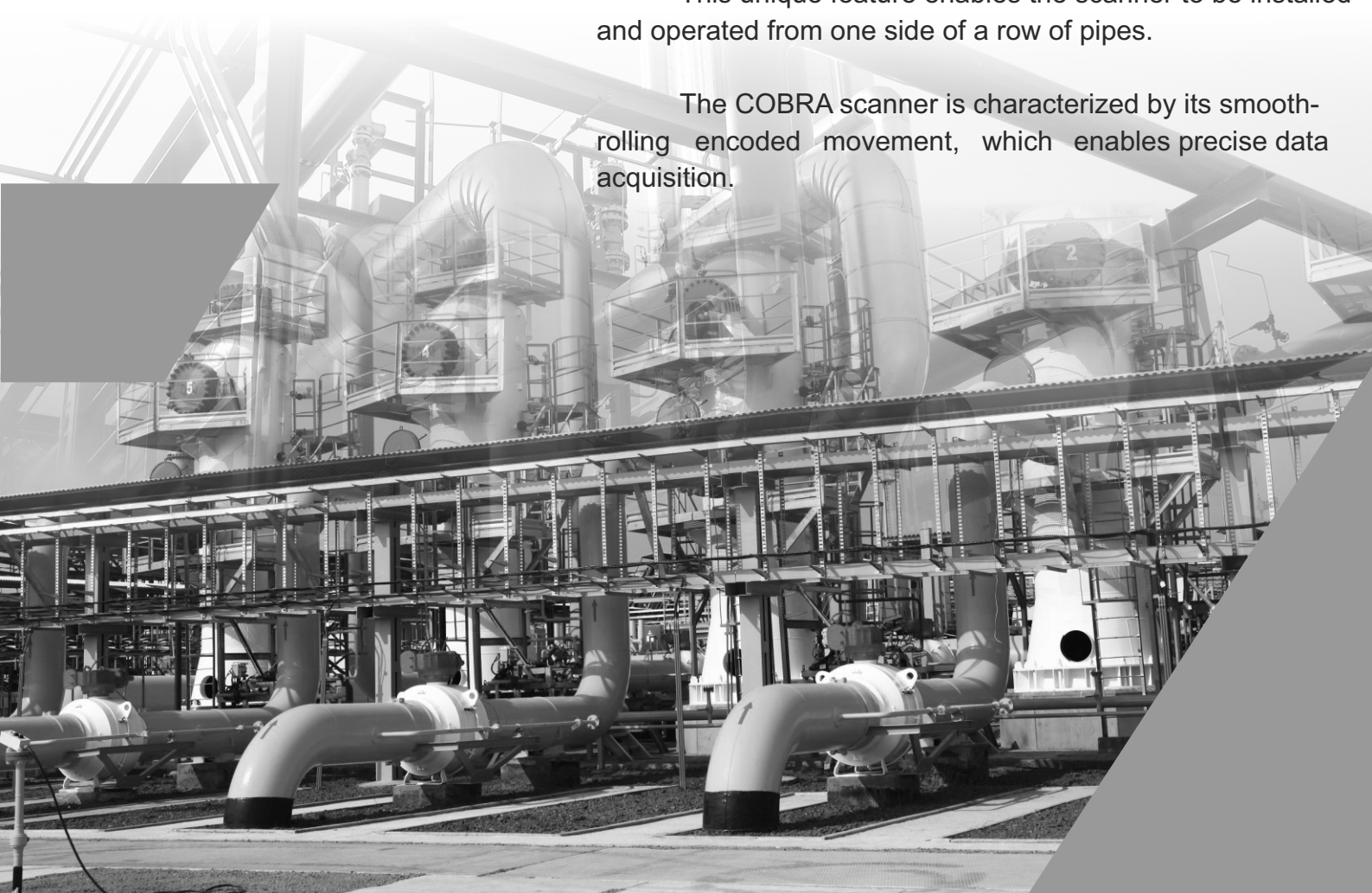
## ADVANTAGES

With its very slim design, this manual scanner inspects pipes in limited access areas where minimal clearance is required.

Adjacent obstructions, such as piping, supports, and structures, can be as close as 12 mm (0.5 in.). This spring-loaded scanner is designed to clasp carbon steel and stainless steel pipes of various diameters using multiple link.

This unique feature enables the scanner to be installed and operated from one side of a row of pipes.

The COBRA scanner is characterized by its smooth-rolling encoded movement, which enables precise data acquisition.



# COBRA Manual Scanner

The scanner holds up to two phased array probes for complete inspection of the weld in one pass.

For pipe-to-component inspections, the scanner can be configured quickly to perform one-sided inspections using a single probe.

This Olympus solution uses low-profile phased array probes with optimized elevation focusing, which enhances detection of small defects in thin-wall pipes. Specially designed low-profile wedges fitting each pipe diameter covered by the scanner are also available for a complete solution.

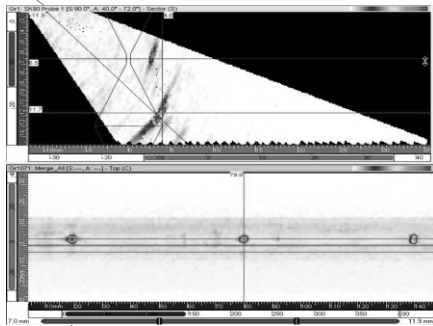
The COBRA scanner ensures stable, constant, and strong pressure, thus providing good UT signals and precise encoding around the full circumference of the pipe.



# COBRA SCANNER

## One Sided Scanner

- The Cobra scanner can be configured for two sided or one sided inspection;
- Permitted by ASME code where two sided coverage is not practical;
- High probability of detection cracks;
- Inspection results consistently outperforms RT even with one side inspection limitation.



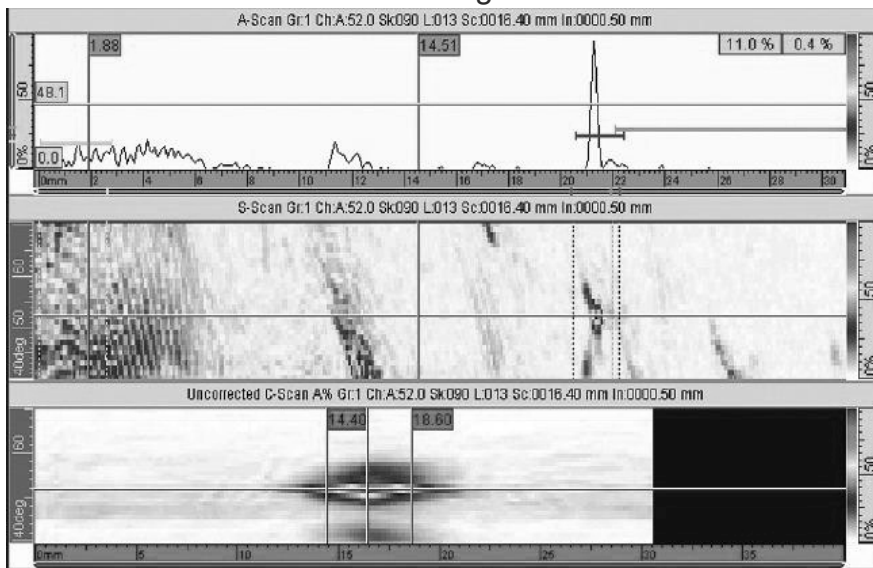
Opposite side (Far side) detection of lack of fusion from one sided inspection.

# COBRA Manual Scanner

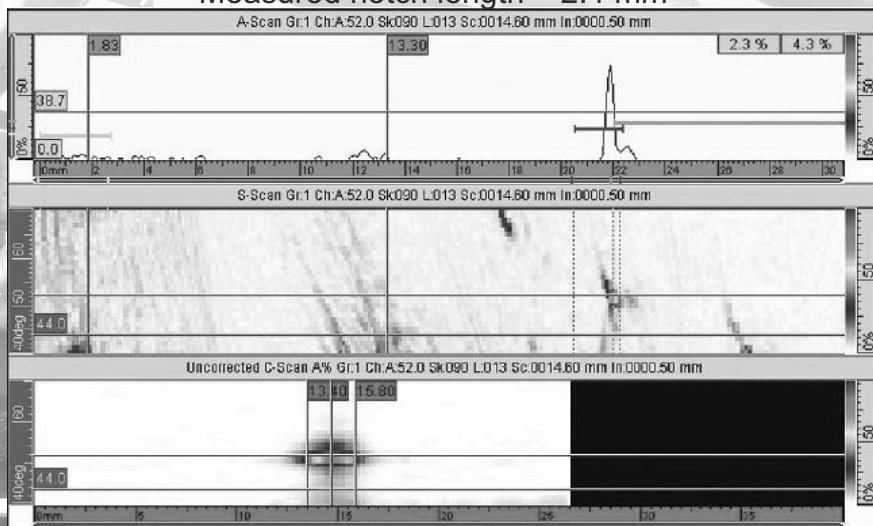
## EXAMPLE

- 2.75 inch (70mm) diameter pipe inspection with 1mm through wall hole
- Data below visualizes detection of the outside end of 1mm through wall hole after 1 skip using -6dB drop sizing technique

**Flat Array**  
Measured notch length = 4.2mm



**Curved Array**  
Measured notch length = 2.4 mm

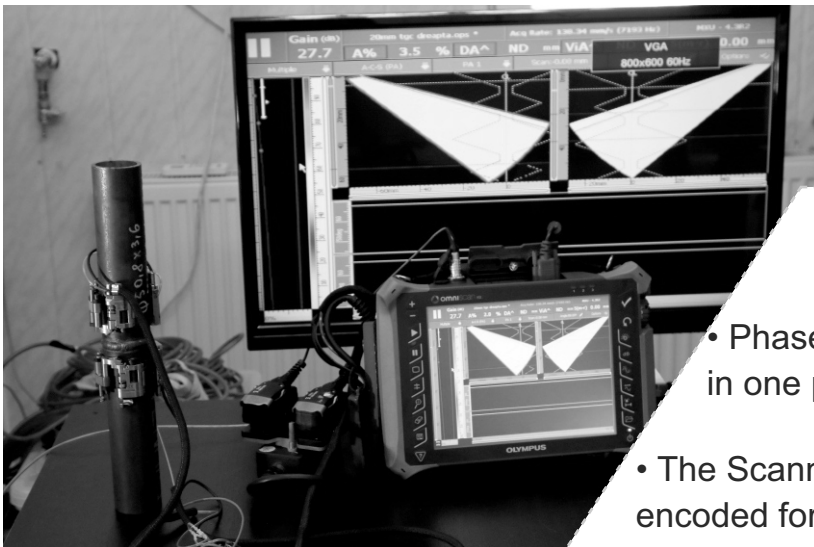


Lenght sizing accuracy of the flaw is largely improved with the curved array

## CONCLUSION

It is a complete assembly to perform ultrasonic inspection of welds on small diameter pipes with the following characteristics:

- Phased-array inspection from both sides in one pass for the inspection to be fast;
- The Scanner is manually driven but encoded for repeatability;
- The scanner and the probes are designed to be low-profile to fit between tubes;
- The OmniScan MX instrument provides ultrasonic settings and imaging;
- Phased-array probes are geometrically focused to improve accuracy;
- Applicable to a large range of pipe diameter.



# ULTRASONIC EXAMINATION

## Thickness measurement

### EXAMPLE

Thickness measurements are an application of ultrasounds. The method has applicability on any steel product or any other homogeneous material whose structure allows longitudinal wave propagation with relatively constant speed and from which a ultrasound beam reflection can be obtained from the opposite probe.



#### APPLICATIONS:

- This verification is used for thickness measurements of pipes, storage tanks, pressure vessels, metal structures etc.



# ULTRASONIC EXAMINATION

## Thickness measurement

### TYPES OF EXAMINATIONS:

- Direct reading examination method;
- Examination by the method of multiple echoes;

### ADVANTAGES:

- Mobility given by the fact that it is necessary to perform measurements accessing only one side of the object examined (pipes, tanks and other objects).
- Precision;
- Speed;
- Measurement performed through the paint layer using D7908 probe with simultaneous display of material thickness and paint layer.
- Measuring the thickness of the material at components with temperatures up to 500 °C in operation using D799 probe.



### EQUIPMENT:

- Olympus MG 45



# COMPUTERIZED RADIOGRAPHY

Computed Radiography is the future regarding the penetrating radiation checks, completely covering the conventional radiography and providing answers in real time (getting images and interpreting them).

It assumes capture, processing, display, storage and transmission of digital radiographs.



# COMPUTERIZED RADIOGRAPHY

## APPLICATIONS:

- Inspection in the automotive industry pieces (aluminum and other non-metallic material different shapes and thicknesses in a single exposure);
- Examination of pieces with complex geometries and configurations (valves, components plants in function);
- Examination of ceramic pieces (insulators, etc.);
- Examination of electrical cables in wind turbines;
- Examination of component part for water pump.

## ADVANTAGES:

- The method can be used on installations in function without stopping the production process and insulated pipeline without removing the insulation layer;
- Computed radiography is much faster than the conventional one because the exposure time is reduced by 60%;
- Replace chemical developing process of the film by scanning the phosphor plate;
- Examination results are available in 1-5 min after exposure.

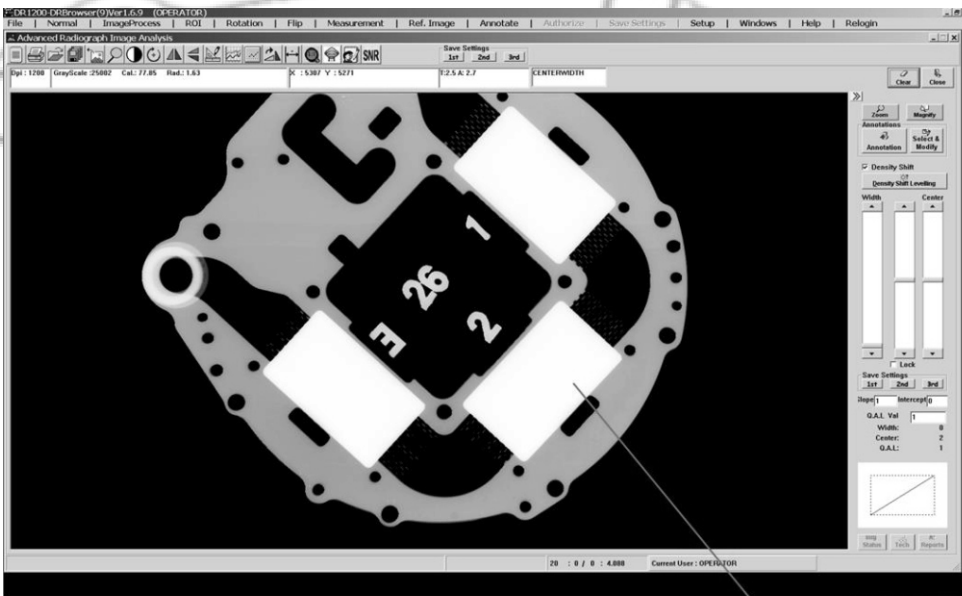
# COMPUTERIZED RADIOGRAPHY

Examination of electrical cables in wind turbines

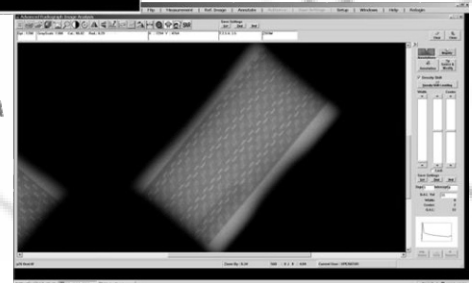


# COMPUTERIZED RADIOGRAPHY

Inspection in the automotive industry pieces (aluminum and other non-metallic material of different shapes and thicknesses in a single exposure).



Verificare lipire  
placuta cu rasina

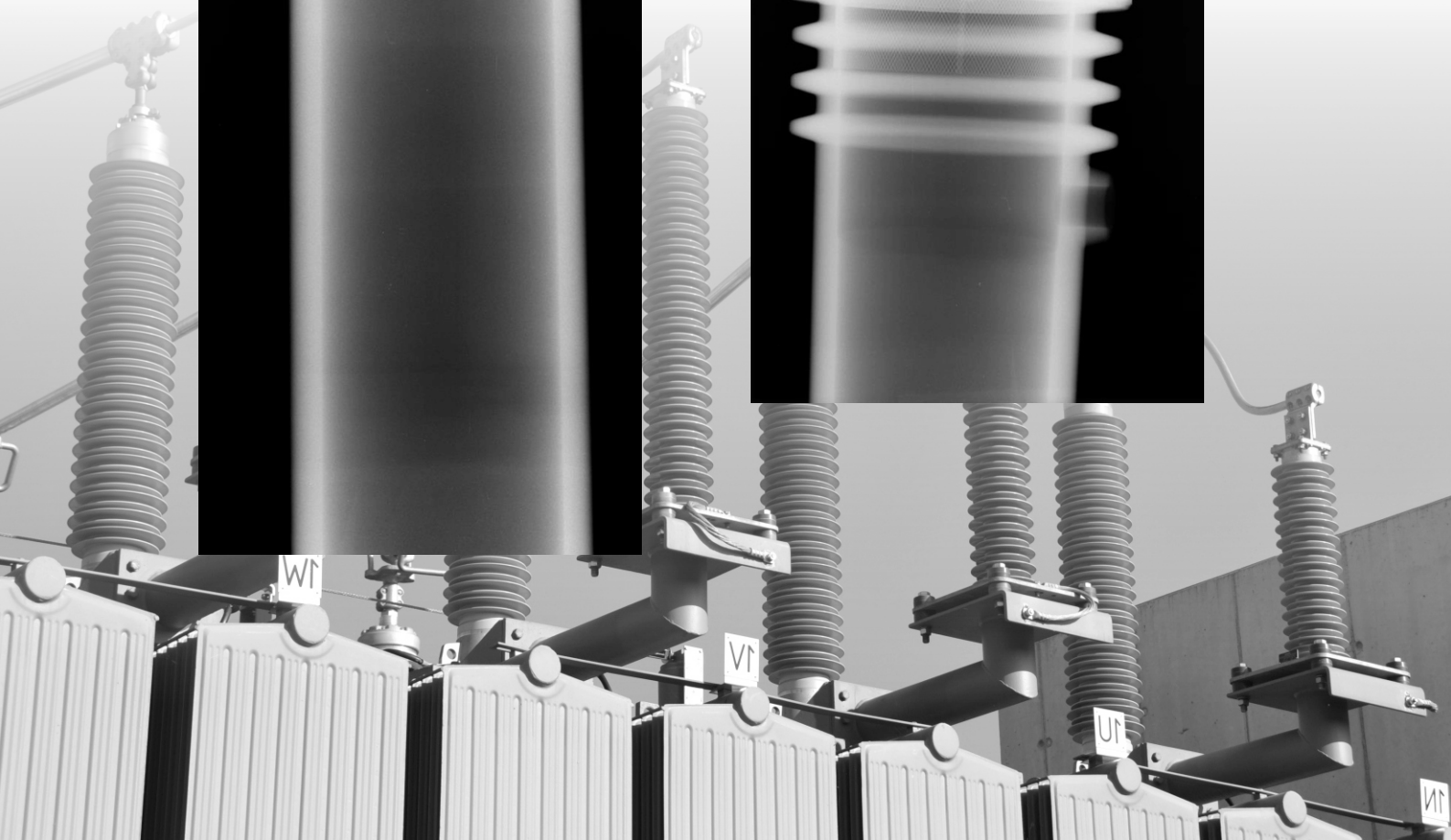
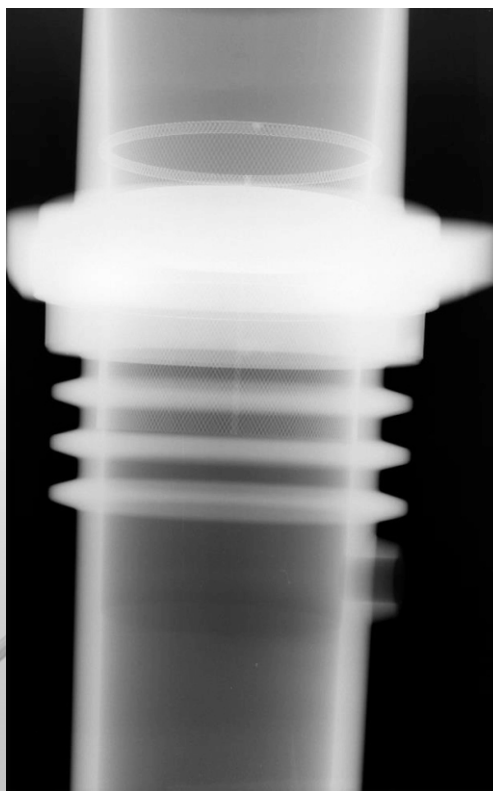
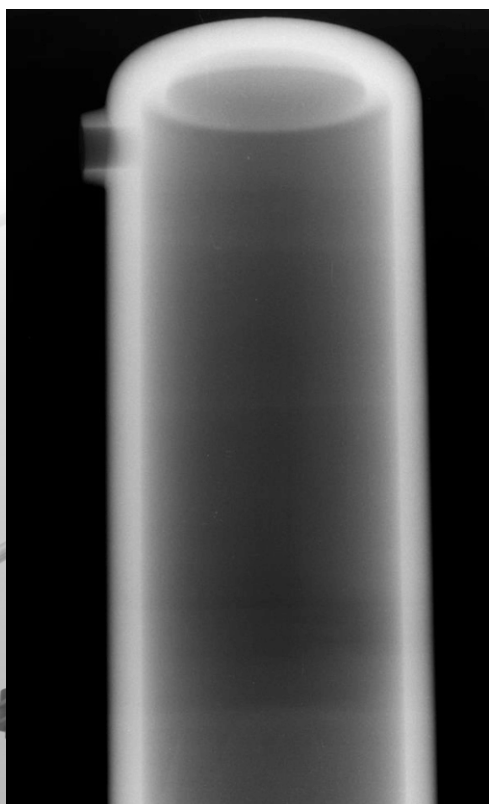


## Cherchirg pasting resin plate

# COMPUTERIZED RADIOGRAPHY

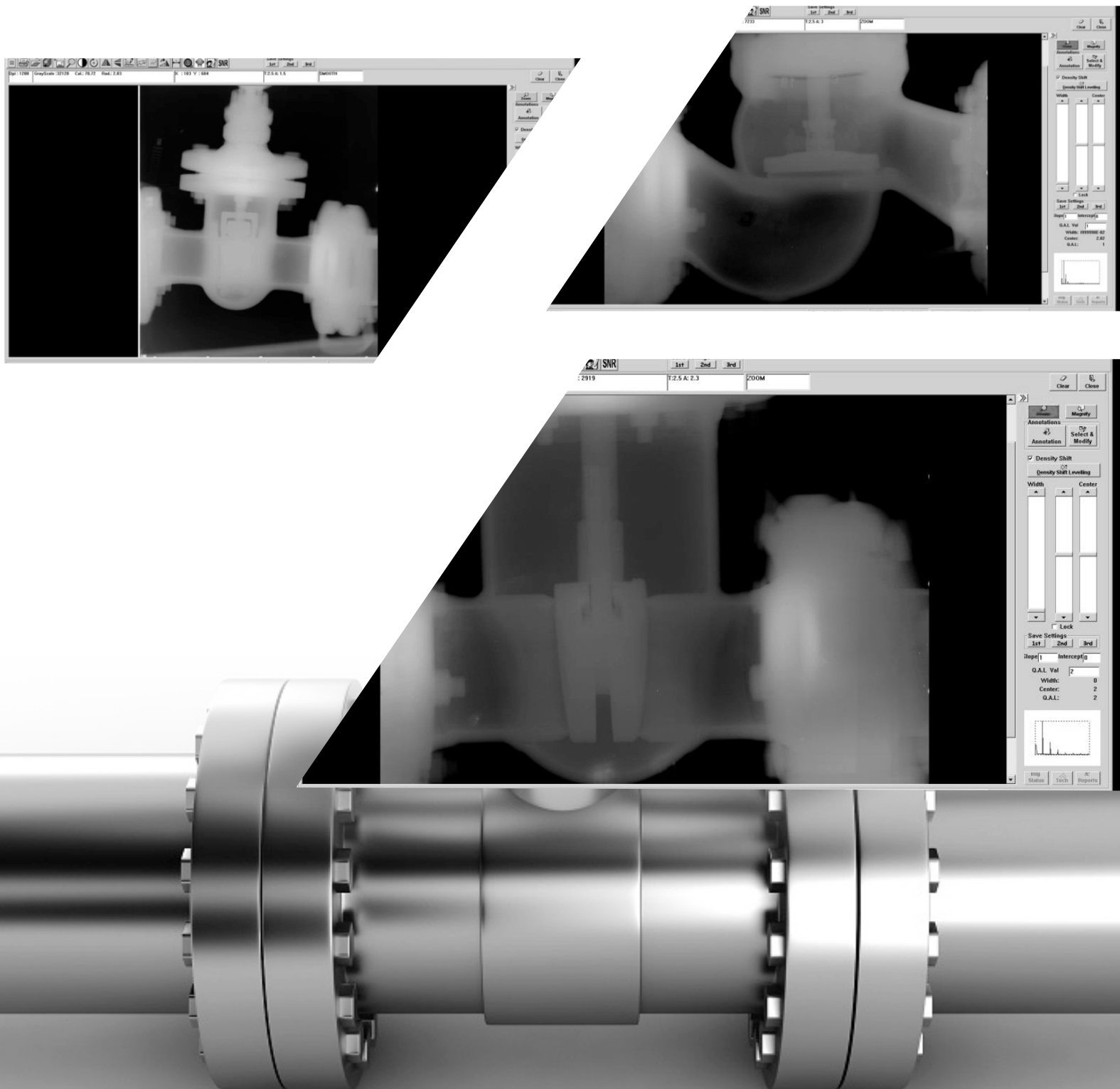


**Examination of ceramic pieces  
(insulators etc.)**



# COMPUTERIZED RADIOGRAPHY

Examination of pieces with complex geometries and configurations (valves, components plants in function)



# COMPUTERIZED RADIOGRAPHY

Radiography of online insulated pipes for determining the wall thickness and possible deposits or defects.

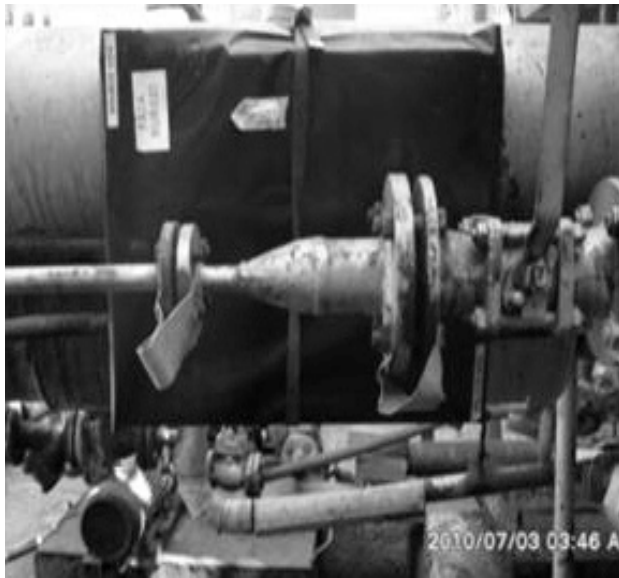
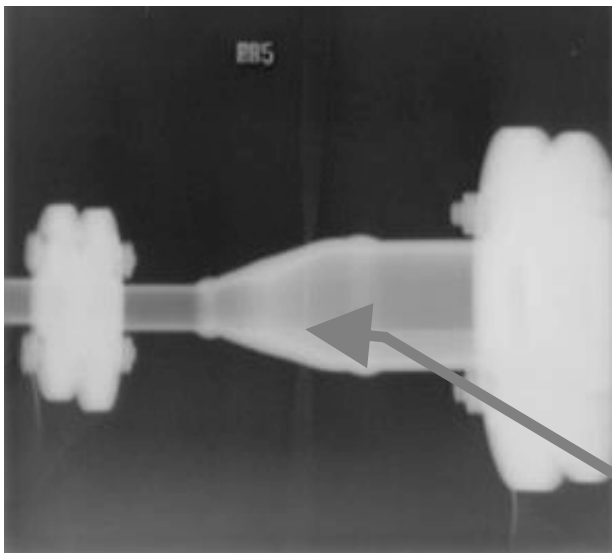


Image of online pipe

Radiography was performed using Ir 192, container Sentinel



Radiography' image

**liquid**



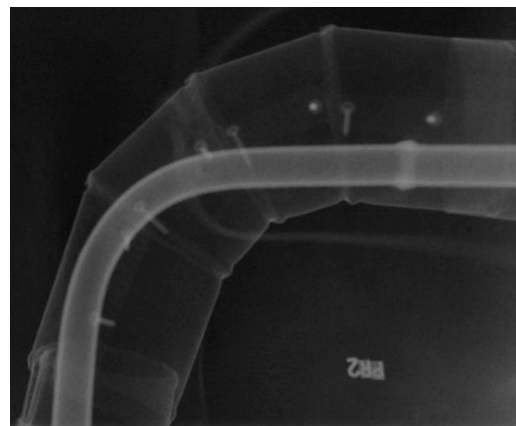
# COMPUTERIZED RADIOGRAPHY

## EQUIPMENT

Radiography of online insulated pipes at temperatures from 460°C to 640°C for determining the wall thickness and possible deposits or defects.

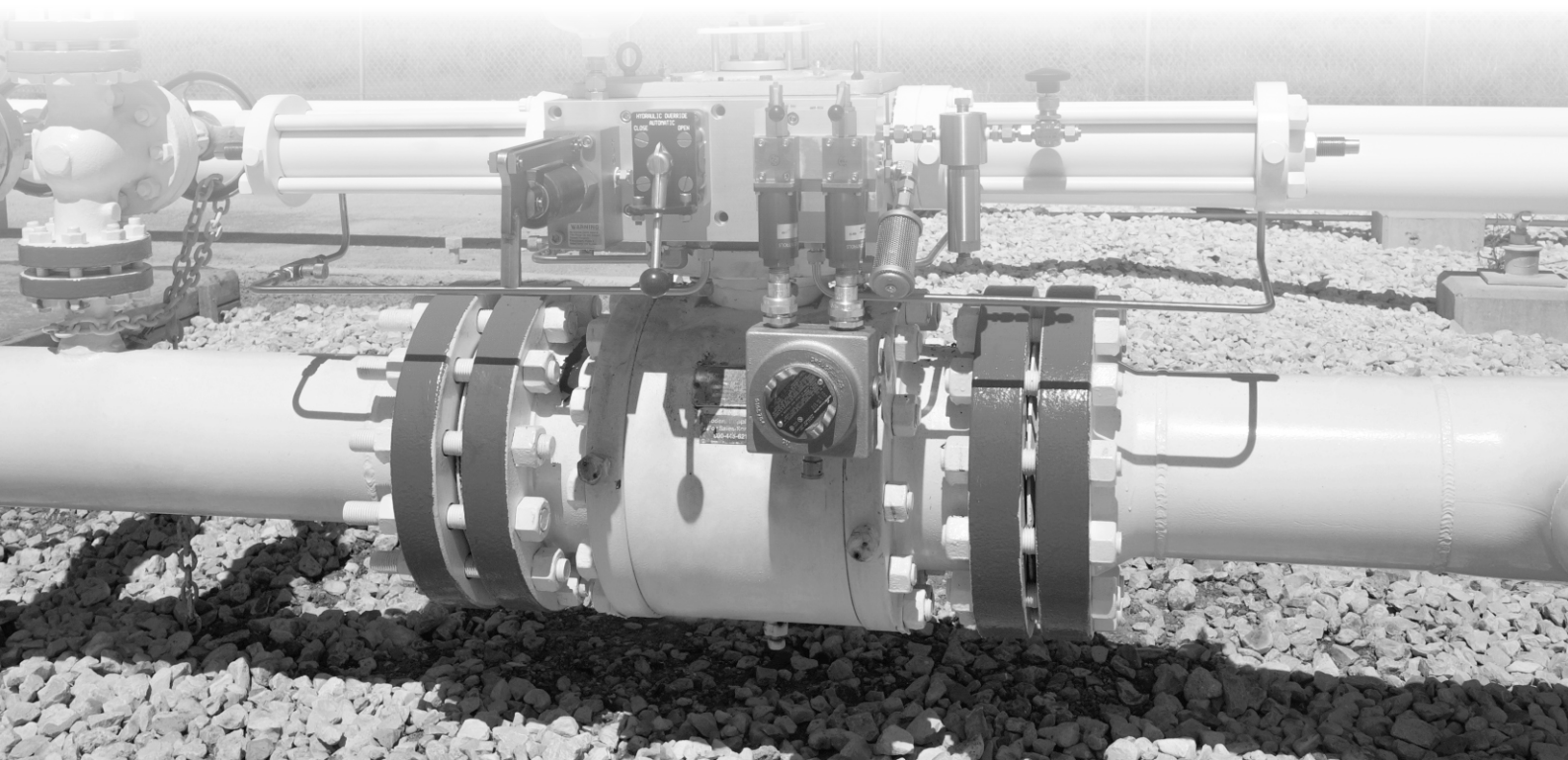


Image of insulated pipe  
at 460°C



Radiography' image

**Radiography was performed using Ir 192,  
container Sentinel**



# SEMI (AUTOMATIC) EXAMINATION - PA-TOFD

Semi (automatic) examination with PA and TOFD is made using manual cart and automatic using Weld rover.

## CONFIGURATION CAN BE:

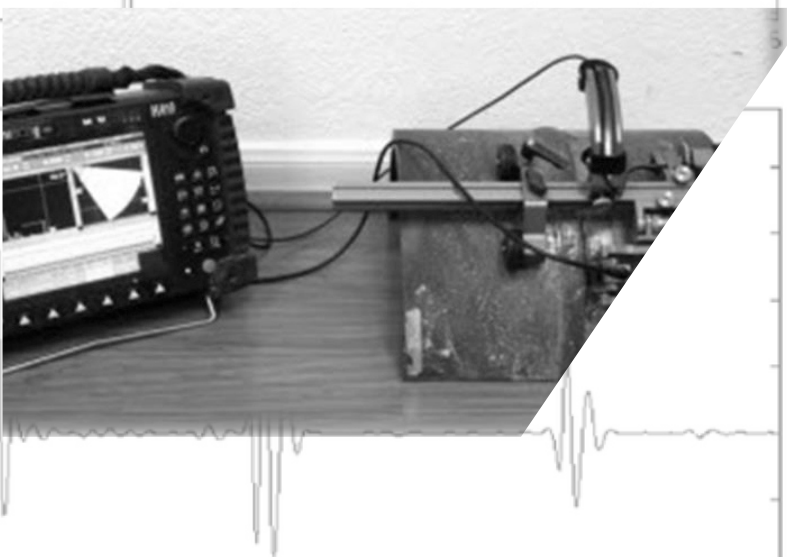
- 1 PA Probe and one pair TOFD;
- 1 PA Probe and two pairs TOFD;
- 2 PA Probe and one pair TOFD;
- 2 PA Probe and two pairs TOFD;

## APPLICATIONS:

Control of welds with great thicknesses.

## ADVANTAGES:

- Automatic recording of the entire control, which can be provided to the client on CD;
- The control of thicker welds;
- Accurate identification of defect positions in Welding;
- The control up to 10 m tall with weld rover, without the need of installing a scaffold.



# SEMI (AUTOMATIC) EXAMINATION - PA-TOFD



## EQUIPMENTS:

- Olympus MXU;
- Olympus MX2.



# ULTRASONIC EXAMINATION Phased Array

The examination PA uses a single probe which contains multiple elements (16-128) to send ultrasonic angle beams through the test object.

Each individual element can be pulsed to send where timed phase.

This produces several beam angles, which combined form a network.

This network of beams identify changes in the material, such as cracks or inclusions that can be viewed on screen and identified.



# ULTRASONIC EXAMINATION

## Phased Array

### APPLICATIONS:

- Weld examination;
- Control of plates, forgings;
- The examination of metallic pieces.

### ADVANTAGES:

- The examination can be performed using the encoder that records real-time control, and location of discontinuities.
- The results can be viewed immediately and saved / stored in the equipment.
- Possibility of automatic control using weld rover.
- The ability to show multiple images at the same time, resulting in the rapid identification of discontinuities.
- Configuring the examination with the help of Estbean Tols and Setup Bilder.
- Mobile equipment, examination can be made at home.

### EQUIPMENTS:

- Olympus MXU;
- Olympus MX2.



# ULTRASONIC EXAMINATION Phased Array

Time of flight diffraction is one of the most advanced techniques of ultrasound examination. The method is based on the phenomenon of diffraction of the ultrasonic waves that create virtual images of the discontinuities found in the examined parts. This method has a higher degree of accuracy than any other method of ultrasound and it is considered to be one of the fastest NDT methods because a weld can be examined in a single scan.



# ULTRASONIC EXAMINATION

## Time of Flight Diffraction

### ADVANTAGES:

- Images obtained with the help TOFD guarantees complete coverage of the area examined/ inspected.
- TOFD technology can detect 100% defects in controlled parts.
- TOFD has a high sensitivity regarding the detection of defects planar, vertical or horizontal which can not be distinguished by X-ray or with conventional UT.
- TOFD system is able to store and evaluate the details of the defects, on the height, length, and makes this with a high degree of accuracy using the TomoView program.
- The ability to show multiple images at the same time, resulting in rapid identification of discontinuities with the help of TomoView and Omni PC programs.
- Configuring examination with the help of Estbean Tools and Setup Bilder.

### APPLICATIONS:

- Control of welds with large thicknesses.
- Recording and storage on the control device and transmitting the recorded CD.

### EQUIPMENTS:

- Olympus MXU;
- Olympus MX2



# EXAMINATION PA Corrosion Mapping

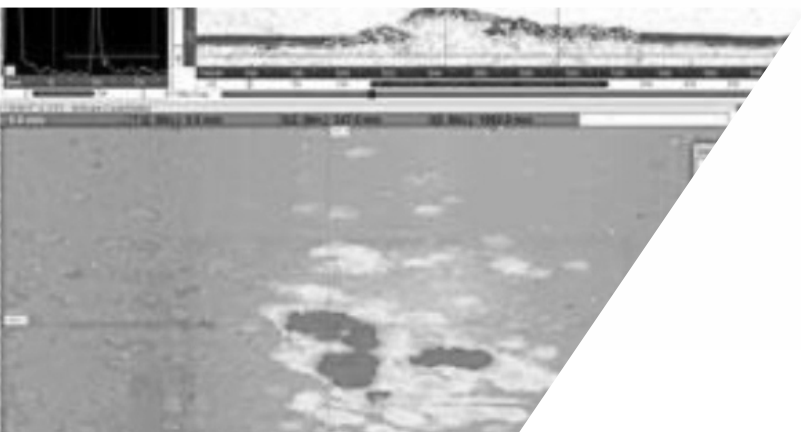
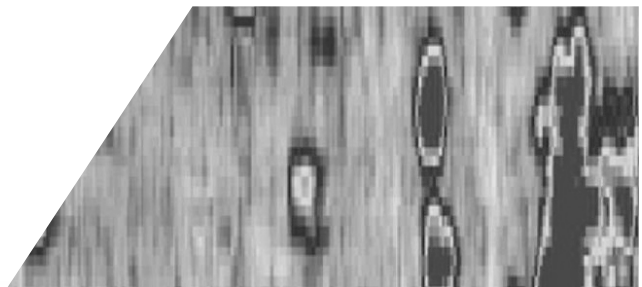
PA technology - Corrosion Mapping was developed for checking and measuring corrosion in different subassemblies of the industry. This method consists of scanning large areas, resulting in a mapping of the entire surface in different colors indicating the thickness / corrosion of metal.

## ADVANTAGES

- Recording the control with the encoder .
- Interpretation of the results by computer.
- Corrosion mapping.

## APPLICATIONS

- Corrosion mapping from tanks, pipes, and other components where there is this requirement.



## EQUIPMENTS:

- Olympus MXU;
- Olympus Mx2;

# RADIOGRAPHIC TESTING

The method of penetrating radiation or radiographic examination consists of the penetrating radiation interaction with photosensitive films. It may be carried out with X-rays or gamma rays.

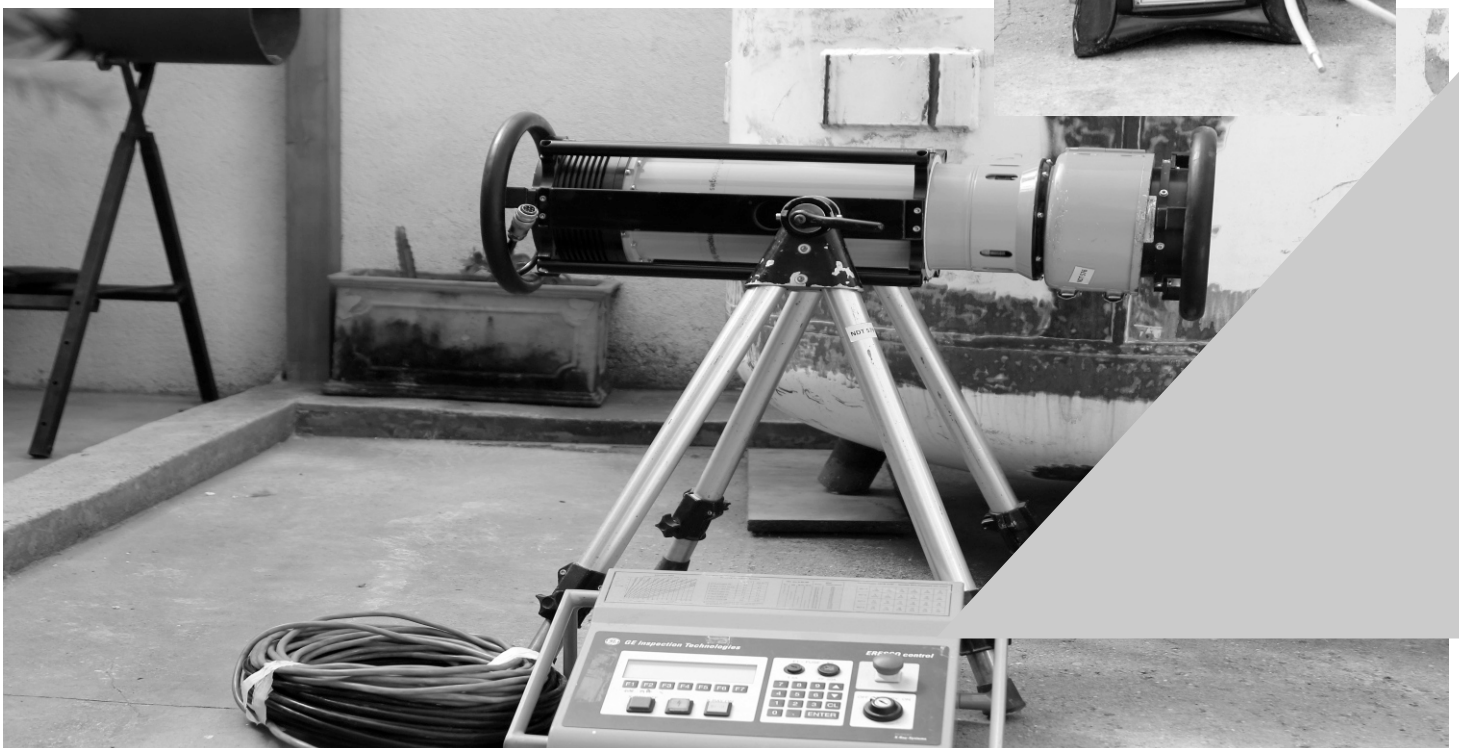
Examination gamma radiation (gammagraphy) - consists of irradiating the controlled workpiece. The image on radiographic film is obtained after the irradiation of the internal macroscopic part structure.

## APPLICATIONS

- Examination of welds, castings and forgings.
- X-rays examination - consists in controlled bombing of the workpiece by X-rays, radiographic film to give the internal image of the macroscopic structure of the workpiece..

## EQUIPMENTS:

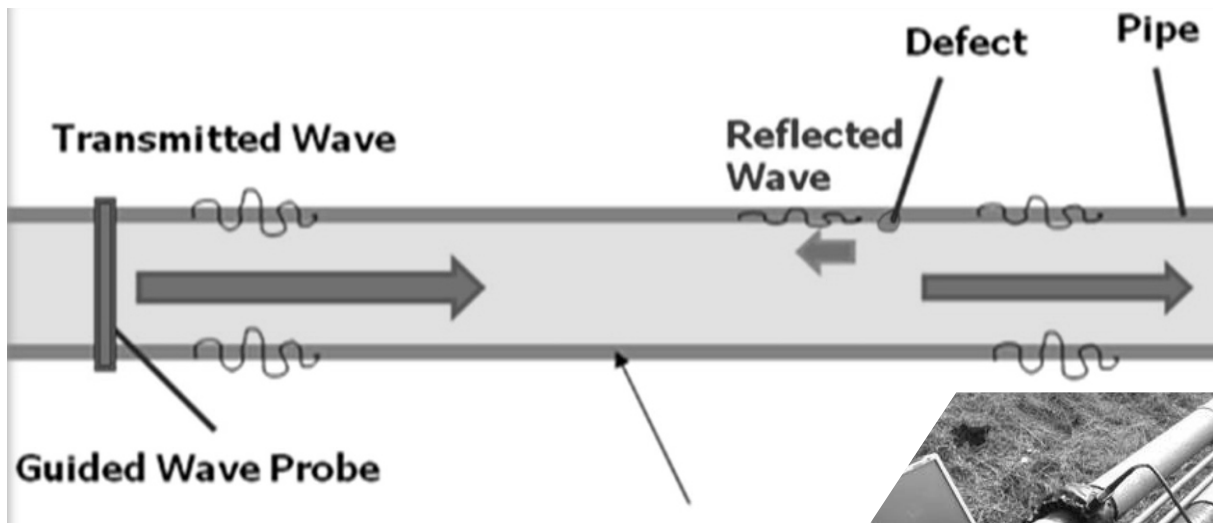
- Eresco 65MF3 (300kv, 3mA);
- Eresco 32 (200 Kv, 10 mA, panoramic);
- Sentinel Elitte 800 (max. 50Ci, Ir 192);
- Sentinel Elitte 800 (max. 150Ci, Se 75).



# GUIDED WAVES

Guided Waves are ultrasonic waves that are transmitted into the examined structure and propagated along it. Propagation is constrained and guided by the geometric lines of the structure.

As shown in the picture below, in pipes, guided waves propagate along the axis and are reflected by abrupt changes in cross-sectional areas, such as corrosion or cracks.



# GUIDED WAVES

## The system used for GW examination – MsS System

The system includes a device that, in electromagnetic mode, generates and receives ultrasonic waves which are propagated in the tested structure in order to perform guided wave analysis over long distances.

The entire system consists of a laptop, the MSs 3030R instrument and MsS probes, as shown in picture:

The MsS software installed on the laptop controls the parameters of the MSs 3030R instrument, collects the data through an USB port, analyzes the data and generates an inspection report.

The MsS 3030R instrument generates electric impulses of short duration, modulated amplitude, that are transmitted to the MsS probes, and then detects the voltage induced by the guided waves passing through the probe.



# GUIDED WAVES

## The system used for GW examination – MsS System

### MAXIMUM DISTANCE OF THE INSPECTION

The most difficult question to be answered prior to the Guided Wave inspection is, “What can the maximum distance of the inspection be ?” How far, in the axial direction, can the system perform the examination? The answer depends mainly on the capacity of the system (which is the strength of torsional or longitudinal generated waves and how much can it reduce the generation of asymmetrical waves :e.g. the flexural waves), flaw size, presence and type of insulation, the depth at which the pipe is buried, nature of the soil around the pipe and the degree of compaction.

### GUIDED WAVE MONITORING

Long-term monitoring advantages compared to inspection are:

- The new data are obtained fast, from the probes already installed;
- Small variations of the structure condition can be observed by comparing the data obtained initially with the periodically collected data;
- The insulation or soil have to be removed only when installing the probe for the first time;
- Allows the examination of “in service” pipelines at high temperatures or of overhead pipes;
- Provides extra time for maintenance and reduces plant downtime.



# POSITIVE MATERIAL IDENTIFICATION (PMI)

Positive material identification, using Innovi X System equipment, is a nondestructive examination method which consists of analyzing steel alloys and low alloys to establish their chemical composition by determining the percentage quantities of the constituents.

PMI-MASTER SMART is the first truly portable optical emission spectrometer for metal analysis. Thanks to its light weight and small size, the PMI-MASTER Smart can be conveniently carried, performing complete chemical analysis, especially in hard to reach areas. The rechargeable battery pack provides enough power for approx. 10 h in standby, 450 measurements in spark mode, depending on the measurement conditions.



## ADVANTAGES:

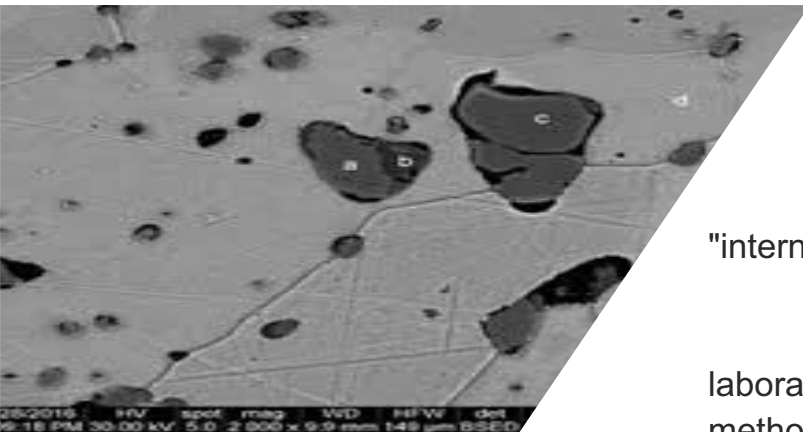
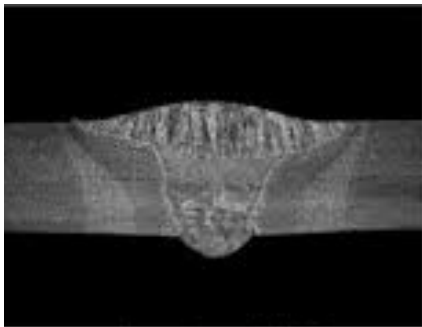
- Examination can be performed at the location designated by the client.
- Dimensions and portability of the equipment allows tests on pipes in operation both at ground level and at height.
- The equipment's software allows direct reading of chemical composition.
- It is an extremely fast method of examination, the result is obtained in 15 sec/ analysis.



# MACROSCOPIC AND MICROSCOPIC ANALYSIS

Macrostructure shows the structure of metallic materials that can be viewed and studied with the naked eye or using magnifiers with magnification up to 30 times.

## Macroscopic analys



## Microscopic analys

Microstructure shows the structure of "internal" metallic materials.

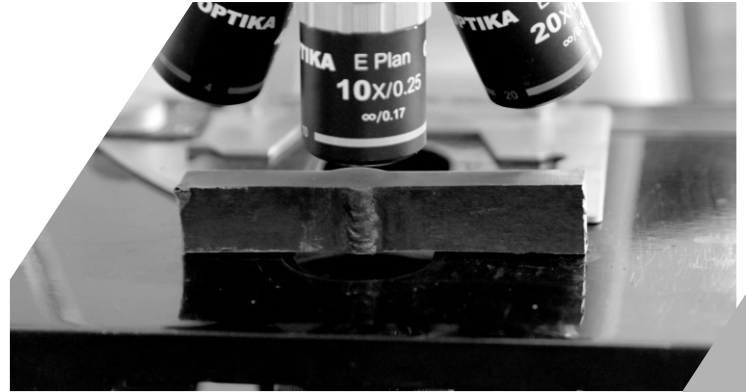
Microstructural analysis is both classic in the laboratory and in the field by metallographic replica method, magnification up to 1500.



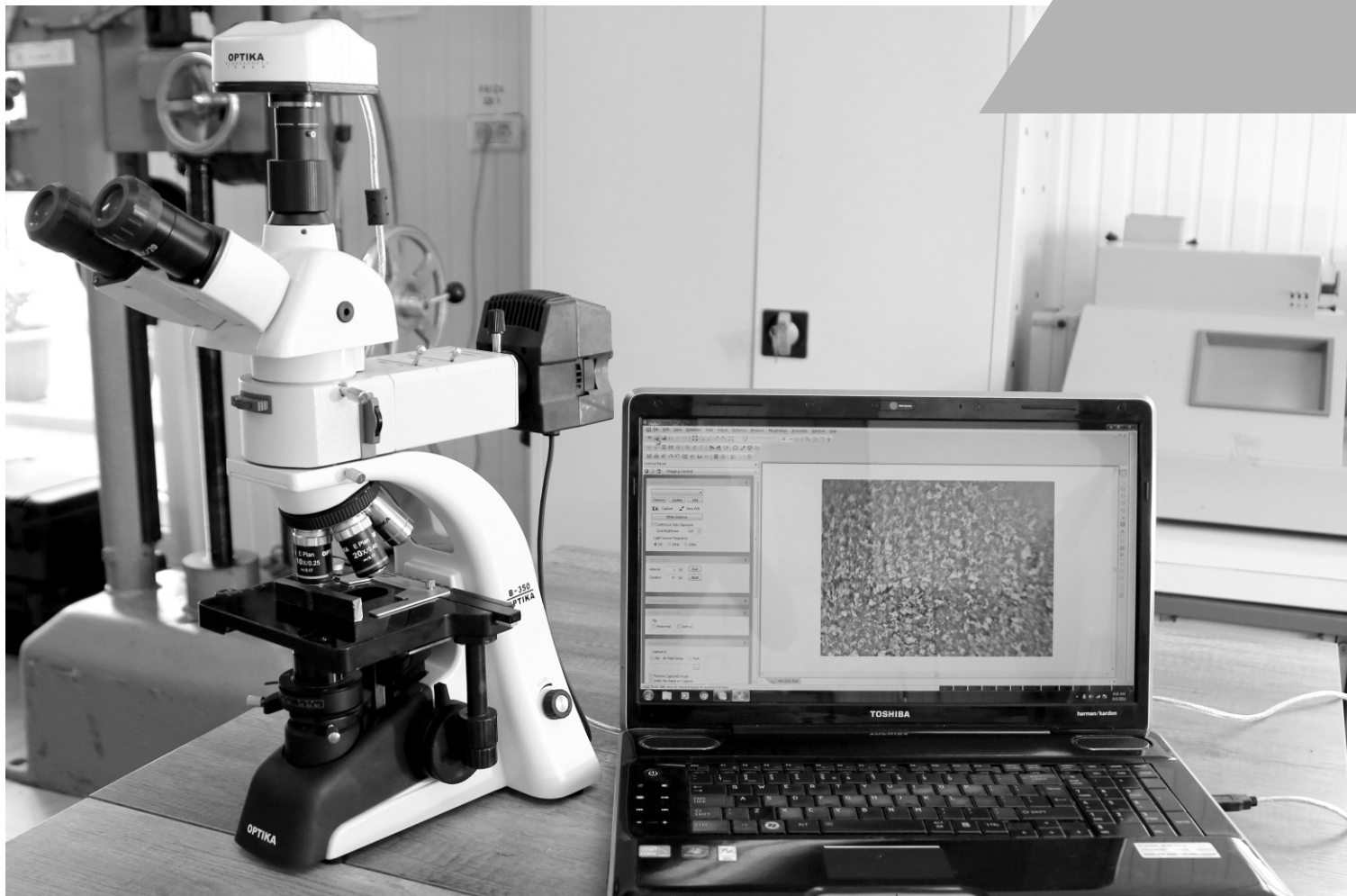
# MACROSCOPIC AND MICROSCOPIC ANALYSIS

## APPLICATIONS

- It studies the formation and arrangement of structural elements (particles).
- It examines the changing structure of material after an operating period.
- It controls the quality of welded joints.
- It detects and studies the structure of defects (inclusion gas/ porosity, cracks, chemical homogeneities).



- Metallographic sample preparation in the laboratory and in the field, is made with various grit sandpaper and diamond paste.
- Receiving and capturing images is performed using a digital camera microscope directly on the specimen or celluloid.



# MECANIC TESTING - Steel

Destructive control laboratory tests and analyzes to perform high quality standards for:

- Identifying deficiencies of metallic materials;
- Approval of welding processes;
- Approval of welders.

Destructive control laboratory has its own machine shop for collection and processing of specimens, standards and regulations required by the clients and the law.



## APPLICATIONS:

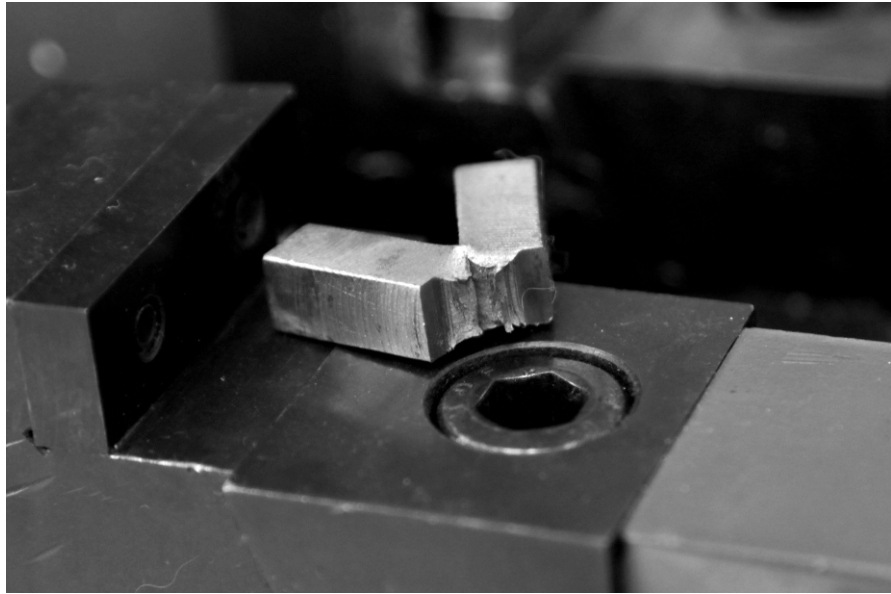
- Mechanical testing resistance.

At ambient temperature and at temperature up to 800 °C ,tensile test specimens run on flat, round or section, depending on the requirements. After breaking the specimen can be determined the sizes characteristics: tensile strength -  $R_m$  conventional yield stress -  $R_{p0.2}$  elongation at break -  $A\%$  stiction-Z.

**Testing technology - bending, breaking plateaus and breakage.**



# IMPACT TEST



Trying to impact the shock run both at ambient temperature and at low temperature.

Using liquid nitrogen and absolute ethanol for adjusting the temperatures from +20 to -196°C (temp. of liquid nitrogen). The temperature was verified with digital thermometers provided with immersion probes.



# HARDESS TESTING

It is made in the laboratory and in the field with portable device. The mesurment can be made in several scales:

- Vickers (HV)
- Rockwell (HRC, HRB ).

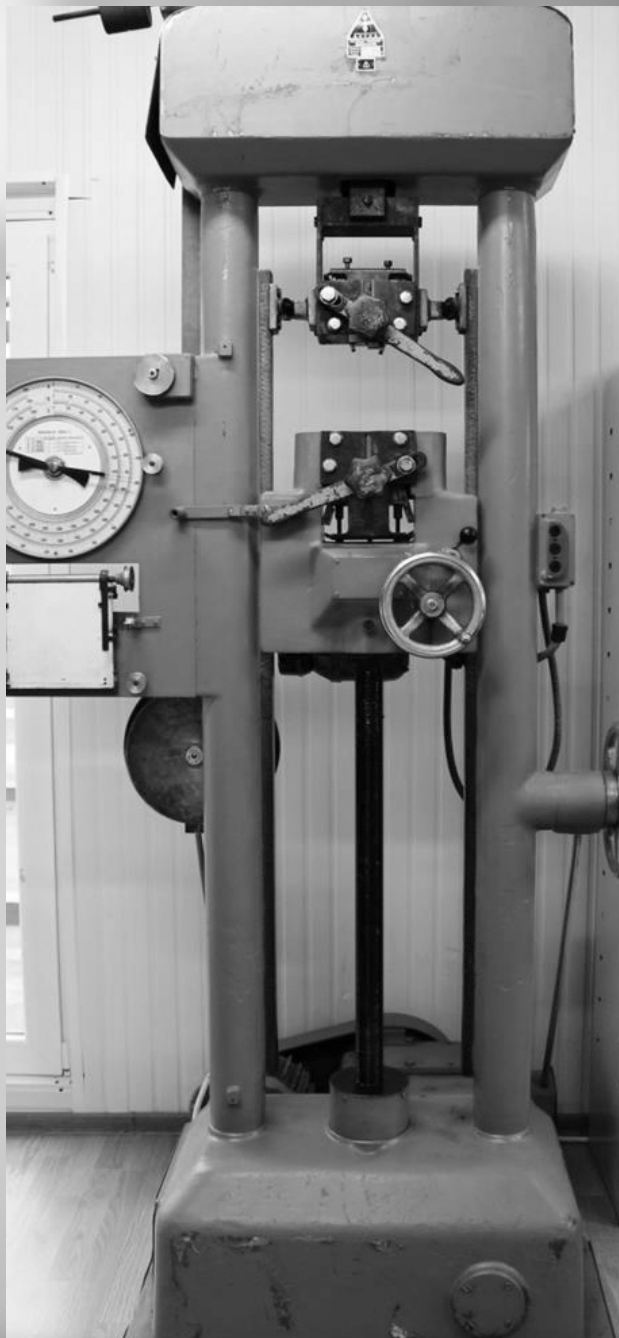


# MECHANICAL TESTING PEHD

Destructive control laboratory tests and analyzes to perform high density polyethylene (PEHD) for:

- Approval of welding processes;
- Approval of welders.

Materials Testing Laboratory has its own machine shop for collection and processing of specimens, standards and norms required by the clients and the law.



## APPLICATION:

- Tensile test;
- Cohesion testing;
- Macrostructure;

# PARTENRS

We are honored to have the confidence of partners like:



Here are only some of the partners that have benefited from the expertise that we provide.

**NDT TESTING**  
nondestructive testing since 1997



**NONDESTRUCTIVE TESTING** ■ ■ ■ ■

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