

**QUALITY STARTS AT THE SOURCE:**  
*High-quality tube inspection just after the welder machine*

# COMPLETE INSPECTION SOLUTIONS FOR ERW AND HFW PIPES



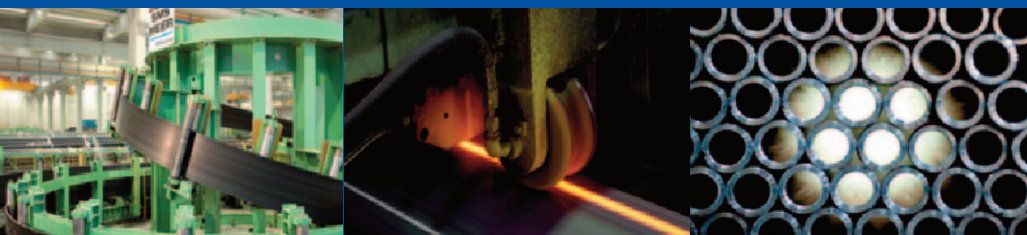
Member company of  
«OKO ASSOCIATION»  
Group



**Monitoring of the ERW weld quality in in-line welding area**

**Real Time Presentation of Wall Thickness Data, in engineering units, on the tube mill**

**Scrap Reduction. Catch ID and OD flash removal problems before they become a costly encounter.**



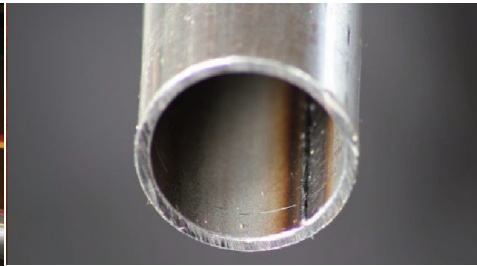
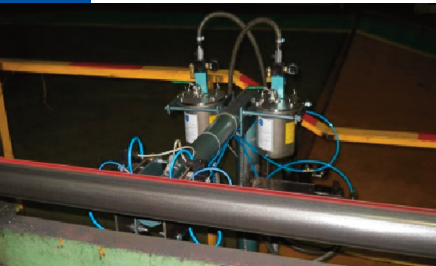
[www.oko-ndt.com](http://www.oko-ndt.com)

## YOUR NEEDS

Inspecting further upstream (near welder) would detect defects earlier, potentially saving tons of a valuable product

ERW tubes need to be inspected to meet API and ASTM standards required for these applications

Earliest monitoring the flash trimming process on longitudinal weld seams of ERW-pipes to control welding technology.



## OUR SOLUTIONS

WE GIVE AN OPPORTUNITY OF TOTAL MONITORING QUALITY IN THE PRODUCTION PROCESS

### MONITORING

For a user of welding lines for the production of ERW-pipes, it is important to see whether the trimming tool, responsible for removal of the inside flash, is working correctly. Using the testing system which we developed, this monitoring is made directly after welding and not after the tubes have been cut. Therefore, our testing system is primarily a system for monitoring and control of the production process.

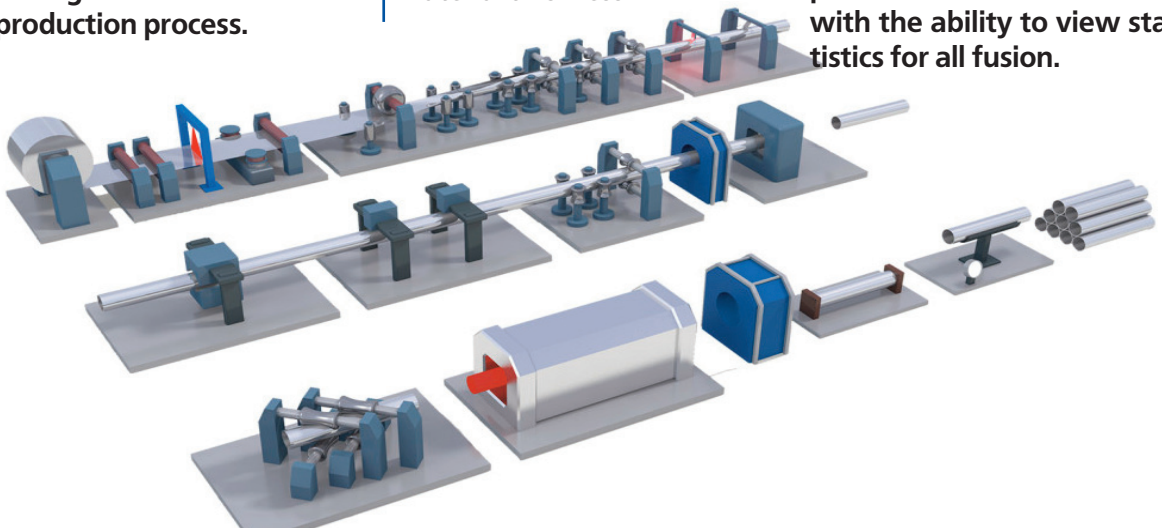
### SOLUTIONS VARIETY

Our Company provides both solutions that make testing in welding line most effective:

- tubes are tested for longitudinal defects (transverse defect detection only on request) in the weld seam as well as for laminations in the HAZ;
- system scans the weld zone, and monitors the quality of the inside and outside flash removal process. Operator receives a detailed picture of weld area material thickness.

### TECHNOLOGY

Catching ID and OD flash removal problems, the System can control automatically correction of welding process and make scrap reduction as well as guide UT scanner in the case of weld wandering. Finding cracks and thickness problem, the System can control a cutting machine to provide cutting out of defective zones. High performance algorithms provide a detailed presentation of the results with the ability to view statistics for all fusion.





## FLASH REMOVAL MONITOR SYSTEM (FRM SYSTEM)

It is primarily a scrap reduction tool. It displays the weld profile in engineering units and in real time on a video display. Broken, worn or chipped flash cutting tools or mismatched weld edges are easily detected and alarmed. The FRM system is also used to monitor weld profile to make sure that the overall weld thickness is within tolerance. Installing an FRM unit on the tube mill close to the welding station can give early warning of problems and play a significant role in reducing scrap.

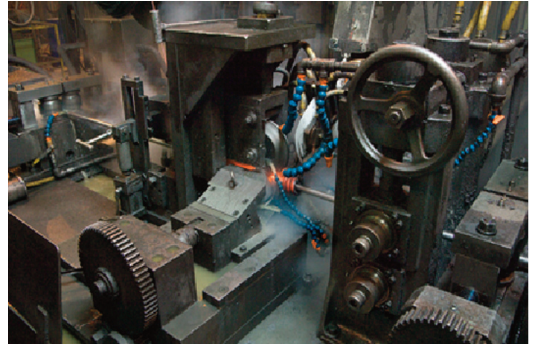
The removal of ID flash from seam-welded tube is a difficult and delicate operation. It is basically a "blind" operation since the cutting is done inside a fully formed and welded tube.

Consequently, the tube mill may produce a considerable amount of scrap material before a flash problem is discovered and corrected.

The Prompylad FRM gives the tube mill operator a series of cross sectional views of the weld zone virtually as soon as it is trimmed. The video display is easy to interpret, and it tells the operator in real terms what the material cross section is through the weld zone.

Using this information, the mill operator can make corrections and adjustments to the ID flash tool on the fly, or if necessary, halt production for tool changes before excessive scrap material has been produced.

The FRM utilizes an ultrasonic transducer connected to an oscillating arm, which traverses the pipe weld area at a variable rate, usually once every 0,1 seconds as the pipe passes beneath it.

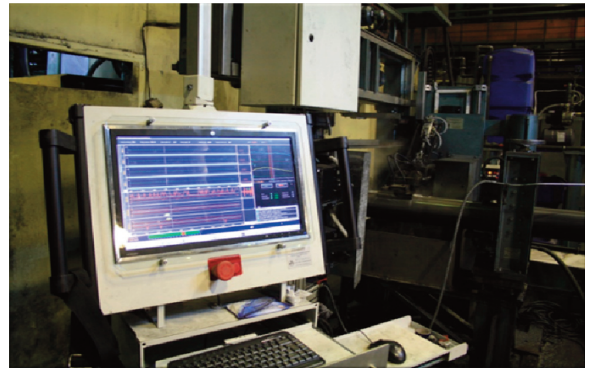


Data from ultrasonic thickness readings are collected and supplied to a computer. The resulting profile or cross-sectional view of the weld area is displayed on the graphics display.

Results are presented in engineering units (inches or mm).

Min/Max alarm settings are adjustable.

Average wall thickness readings can be used to calculate the weight of processed tubing.



## FRM SOFTWARE

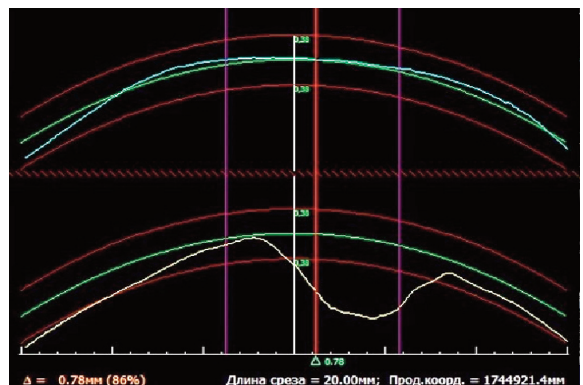
The FRM Thickness Gauge software is a modern, user friendly and very reliable tool for on-line or off-line thickness measurement. The computer interface controls the gauge and displays thickness readings.

Although the Thickness Gauge can be used for dedicated thickness monitoring applications, it forms an integral part of the FRM System and also provides data communication with the Data Logger



### FEATURES OF THE THICKNESS GAUGE SYSTEM INCLUDE:

- Very high resolution and wide measurement range.
- Remote pulser with a wide-band preamplifier.
- Easy set-up and calibration.
- Nonvolatile set-up memory.
- RF signal display.
- Operator friendliness.





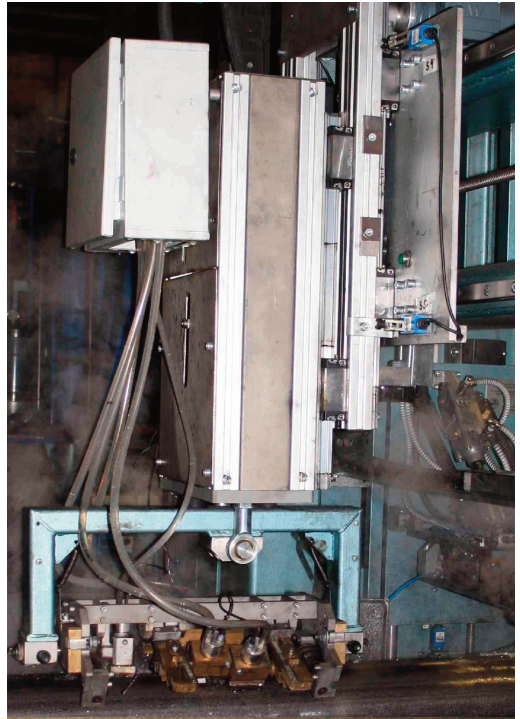
# FLAW DETECTOR SYSTEM (FD System)

## TESTING ERW-PIPES WELD SEAMS, PARENT MATERIAL OF HEAT AFFECTED ZONES (HAZ)

The tubes are tested for longitudinal defects (transverse defect detection only on request) in the weld seam as well as for laminations in the HAZ. Either angle-beam probes with fixed angles or immersion probes with adjustable incidence angles can be used in this test system. Laminations are detected with immersion probes.

The number of probes is dependent on the wall thickness of your tubes and on the test task. A test system consists of at least two probes for longitudinal testing. It is possible to extend the system if it is necessary to distinguish between inside and outside defects.

The tubes are further tested for laminations on both sides of the weld seam in the HAZ. The test is carried out in a pulse reflection method. With weld testing, coupling and function checks are made via the through-transmission echo and with HAZ testing via the backwall echo.



**TECHNOLOGY:** \_\_\_\_\_ conventional  
\_\_\_\_\_ ultrasonic inspection

**TRANSDUCERS:** \_\_\_\_\_ 4 to 6

**INSPECTION SPEED:** up to 2 m/s (400 ft/min)

**INSPECTION ANGLES:** \_\_\_\_\_ 45° and 70°

**WELD WANDER:** \_\_\_\_\_ ± 5 mm (± 0.2 in.)

**DEFECTS:** \_\_\_\_\_ ID, OD, mid-wall



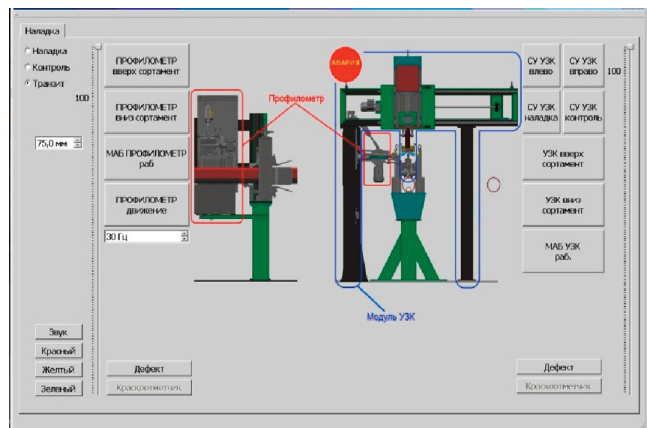
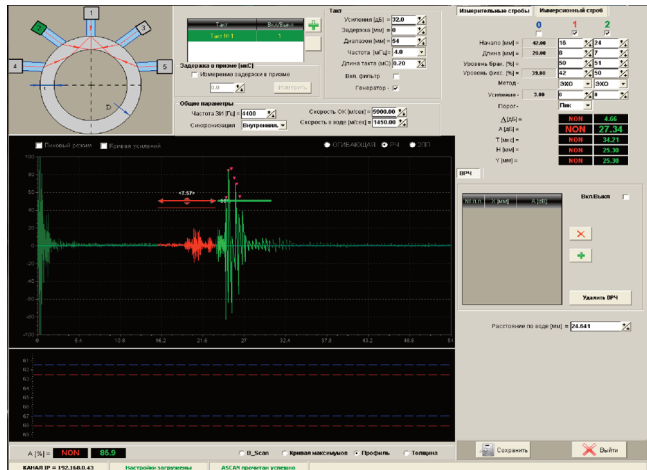
Conventional ultrasonic inspection in FD System is performed using 45-degree and/or 70 degree UT probes. 45-degree probes are sensitive to surface-breaking ID/OD cracks. The 70-degree probes are sensitive to mid-material flaws.

The testing machine for weld seams and parent material on ERW-pipes consists of mechanics mounted on a portal.

Lifting and lowering of the complete mechanics are performed by the central pneumatic unit. The mechanics consist of a test frame with guiding rollers which are positioned before and behind the probe unit for guidance on the tube surface.

The complete unit can be withdrawn out of the mechanics for calibration on a reference piece outside of the production line.

Extremely hard environment conditions are applied by IP64 OKO-22M-UT electronic units. Fast Software provides high-speed tube testing with up to 10 channels simultaneously.



The screenshot shows the 'Automated UT Installation P1b 10' software interface. At the top, there are tabs for 'Automation', 'Testing', 'Adjustment', 'Settings', and 'Results'. Below the tabs, there are fields for 'Operator', 'Status', and 'Time'. A video feed shows a pipe being tested. The interface is divided into several sections: 'Pipe parameters' (Pipe diameter, Wall thickness, Joint width, Numbers of joints), 'Identification' (Number of lot, Number of pipe), and 'Information' (Normative document, Steel grade, Task). There are buttons for 'START TESTING', 'STOP TESTING', 'pipe return', and 'pipe off load'. A 'User list' window is open, showing a table of users with columns for Name, Status, and Registration date. The table contains the following data:

Name	Status	Registration date
Melodyik M	closed user	20.09.2007
Muzov I	operator	20.02.2007
Nemeygov A	developer	20.02.2008 21:30:43
Ustankin A	expert	20.02.2008 21:30:43
Dvorka	expert	20.09.2007

At the bottom, there are fields for 'Enter password' and 'Specify item', and buttons for 'OK' and 'Cancel'.



# MAIN TECHNOLOGICAL FEATURES



## WELD LINE DEFECTS DETECTED BY FD SYSTEM

Entrapments, pre-arc, lack of fusion, lack of fusion on edges, mid wall lack of fusion, paste weld, cast weld, porosity, stitching. Testing according to API 5L, API 5 CT, EN 10246-17.

## WELD LINE DEFECTS DETECTED BY FRM SYSTEM

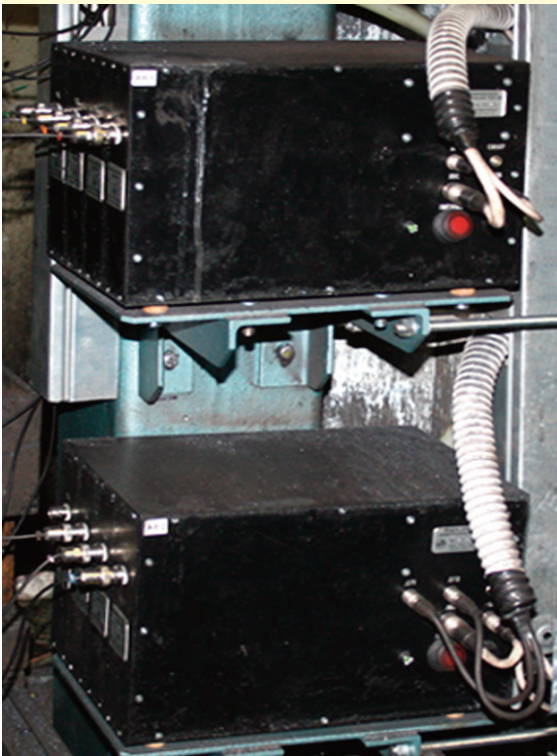
Defects caused by broken, worn or chipped flash cutting tools, mismatched weld edges, inconsistency with weld thickness tolerances.

## TESTING DETAILS FOR FD SYSTEM

- **TECHNOLOGY:** \_\_\_\_\_ conventional UT
- **TRANSDUCERS:** 4 up to 6 (for weld line),  
\_\_\_\_\_ 2 up to 4 (for HAZ)
- **INSPECTION ANGLES:** \_\_\_\_\_ 45°, 70°
- **TESTING SPEED:** \_\_\_\_\_ up to 2 m per second
- **WELD WANDER:** \_\_\_\_\_ ± 6 mm (0,25 in.)

## TESTING DETAILS FOR FRM SYSTEM

- **TECHNOLOGY:** \_\_\_\_\_ conventional UT
- **TRANSDUCERS:** \_\_\_\_\_ 1 up to 2
- **INSPECTION ANGLES:** \_\_\_\_\_ 0°
- **TESTING SPEED:** \_\_\_\_\_ up to 2 m per second
- **TESTING ZONE:** \_\_\_\_\_ ± 15 mm (0,6 in.)
- **WELD PROFILE ACCURACY:** \_\_\_\_\_ 0,05 mm (0,002 in.)
- **THICKNESS RESOLUTION:** \_\_\_\_\_ 0,1 mm (0,004 in.)



## HIGH LEVEL MAN-MACHINE INTERFACE

Extremely hard environment conditions are applied by IP64 OKO-22M-UT electronic units. Fast Software provides high-speed tube testing with up to 12 channels simultaneously.

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