

One of the most difficult issues in pipe maintenance is detecting corrosion damage in good time and with reasonable expense for inspection and assessing the extent of the damage. The aim of these efforts is to ensure cost-effective production and above all safe operation of the system.

Companies that operate pipes are obliged to keep them in proper condition, monitor them permanently, conduct any necessary maintenance and repair work promptly and take appropriate safety measures – otherwise there is a risk not only of serious damage but of considerable fines.

In this respect what causes particular complications are sections of pipework that are not readily accessible, which may be insulated, coated, connected to masonry, buried in the ground or even embedded in cement.

The innovative CORRfinder inspection system provides a remedy for these problem cases. It has been developed by the Saarbrücken Fraunhofer Institut für zerstörungsfreie Prüfverfahren (IZFP) in conjunction with ZWP Anlagenrevision GmbH from Beckingen/Saar, and is based on electromagnetic ultrasound inspection technology.

ZWP Anlagenrevision is a subsidiary of the TÜV Saarland. As an accredited testing laboratory we have been active in the field of non-destructive materials testing for over 30 years.

In the case of non-destructive detection of concealed corrosion in lamp-posts and pipeline systems we work predominantly using electromagnetic ultrasound technology in addition to well-known methods for non-destructive materials testing.

# **CORR** Finder

*The new inspection method for corrosion  
in inaccessible pipes*

*This brochure was given to you by:*

## The problem at hand: corrosion

The “absolute worst-case scenario” as a result of corroded pipes usually occurs entirely without warning and can lead to considerable damage both to people and property. As a rule expensive repair work is required which in turn entails costly shut downs in production and down-times.

The problem is already put in place when a new pipeline is installed, even if it is planned carefully and installed professionally and if materials conform to current directives.

The problem is called corrosion, and nearly all materials used in industrial pipeline construction are subject to this fatal process. What aggravates matters is that it is usually difficult or impossible to reach the affected areas in order to perform inspections and maintenance work due to the structural conditions.

Our experience in maintenance of pipe networks has shown that internal and external corrosion is facilitated on the one hand by aggressive media like coke oven gas for instance, but also by faulty insulation at supports and at points where the pipe enters the ground, as well as by inadequate cathodic corrosion prevention.

But how do you inspect inaccessible pipes? Conventional inspection methods can be eliminated because the expense required to expose the relevant sections of pipework is just too great.

## The solution: an innovative inspection method

The safety of corroded pipes can be checked most effectively by comparing

the nominal and the actual wall thickness.

To do so modern systems are used which operate using electromagnetically induced ultrasound waves. This method has already proven itself under the name of LIMAtest for inspecting corrosion and structural stability of lamp-posts, traffic light posts and anchor masts.

With the CORRfinder inspection system an inspection head comprising one or more ultrasound transmitters and receivers is attached to the pipe wall (see figure 3).

The transmitters induce an ultrasound wave as a result of superposition of magnetic fields and Foucault currents (development of the Lorentz force), which is propagated as an impulse in one direction and penetrates the entire thickness of the wall.

If there is any degradation due to corrosion along the inspection path – regardless of whether it is on the inside or outside of the wall – a part of the ultrasound energy is reflected and is recorded by the receivers on the inspection head.

## Comprehensive analysis

This reflection is analysed by a computer and depicted in the form of a scan. The intensity of the reflection is colour coded; the tester thus obtains an initial informative impression of the pipe's condition within a few minutes.

The completed scan is saved and attached to the inspection report with a digital image of the pipe. Documentation is created in the format requested by the customer, e.g. MS-Office (see figure 3).

## The crucial advantage

As guided ultrasound waves are propagated uniformly within the pipe wall, reliable pipe inspections can be conducted irrespective of the surface geometry – hence also at points with restricted access.

It is therefore possible to locate corroded sections at a distance of up to 25 metres and to assess their impact on the viability or durability – without the need to expose the pipe completely (see figures 1 und 2).

Thanks to the use of electromagnetic inspection heads the inspection can be conducted in a “dry” state, i.e. without special preparatory work for the pipe surface and without need for a coupling medium.

Paint layers up to 2 millimetres thick have a slight effect, as do PE coatings with gas pipes. Bitumen coatings reduce the range of the ultrasound waves.

Since this method gives results that are entirely reproducible, the rate of corrosion can be additionally determined within a short time by using a comparison measurement.

The CORRfinder technology provides:

- conveniently sized inspection unit
- short inspection times
- a reduction in costs
- accurate inspection results
- a reliable basis for planning

ZWP Anlagenrevision GmbH offers this technology as a service with certified inspection staff throughout Germany.

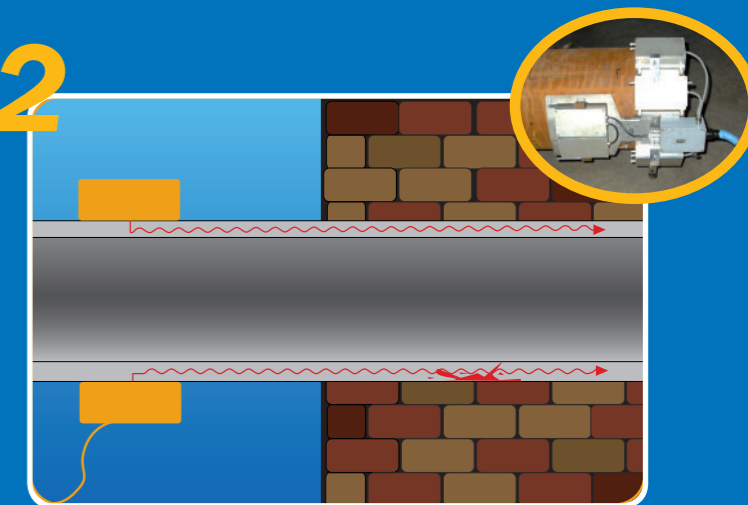
# This is how it works.

# 1



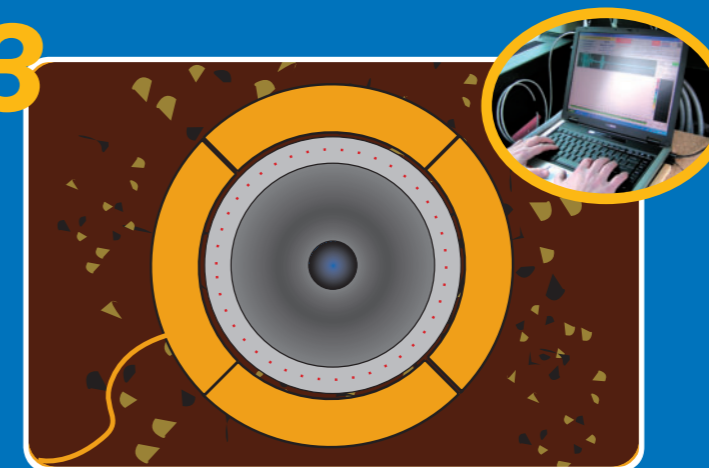
Inspection where access is restricted

# 2



Arrangement of inspection unit: inaccessible pipework inside building

# 3



Arrangement of inspection heads: analysis and storage of results