Technical Bulletin

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INSPECTION OF SURFACES AT ANY DESIRED LOCATION

It is preferable to conduct trials and tests to inspect surfaces at the laboratory because that is usually where the necessary analysis equipment is located. There are however a number of inspections that cannot be moved to the laboratory. Examples include inspections during the transfer of newly-built installations, inspections during stops or after cleaning, corrosion analyses and inspections to determine the condition of storage tanks. A general condition for these inspections is that the analysis method used must be non-destructive. Following the description of which techniques can be used for the various inspections at any desired location, the techniques themselves are described in more detail.

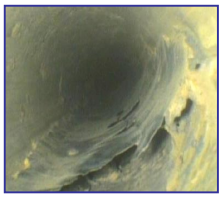
Corrosion inspection

There are a great many different types of corrosion, and just as many analysis methods. The most important questions, however, remain: how serious is the corrosion, can it be repaired or restored and how can corrosion be prevented? To answer these questions, it is important to establish, for example, the depth of the pitting corrosion and the thickness of the remaining plate material under the pitting corrosion. Other essential measurements during corrosion inspections usually include the passivation test and the ferroxyl test.

Internal inspection of a heat exchanger

Cleaning inspection

Prior to cleaning it is import to know where the contaminants are located, and after cleaning whether the contamination has been effectively removed. Frequently applied test methods for cleaning inspections are video-endoscopy and televisual inspection.



Internal inspection of a contaminated tube

Additional inspections upon completion or during stops

New stainless steel building structures can look superb, whilst at the same time being highly sensitive to corrosion. Testing the surface using the ferroxyl test and the passivation test can show in good time whether the supplied material is sensitive to corrosion and can indicate whether a subsequent treatment has been effective or is required. Before completion it is also often important to determine the roughness to verify that the requirements set for surface roughness are being met. It is also possible to determine the quality of the interior welding work using video-endoscopy and televisual inspection. The quality of individual pipes in heat exchangers can be determined using IRIS analysis.

Internal inspection of a welding seam

Passivation test

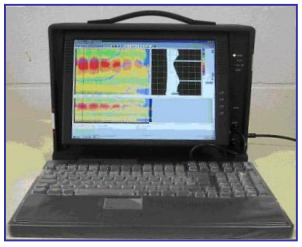
An important measurement for corrosion analysis is the determination of the material's passivation. If the material is passive, the oxide skin protects the underlying material against corrosion. If the material is not passive, the material is sensitive (and often already subject) to corrosion, also under mild conditions. In cases in which the material is not passive, the passivation can virtually always be restored by means of a pickling treatment. The passivation can be established for various metals such as the austenitic types of stainless steel (such as AISI 304 and 316), but also for duplex steel, aluminium, titanium and zinc. The passivation test can be carried out using the passivation meter (oxilyser), using the clinox test or the palladium test.

Ferroxyl test

The ferroxyl test is used to establish 'foreign iron' contamination on stainless steel. This contamination can be caused during mechanical processes through contact with tools and devices, especially if other metals (carbon steel) are processed with them. Contamination of the surface with foreign iron (also invisible quantities) can cause corrosion of stainless steel. A pickling treatment results in a surface that is free of foreign iron contamination or other contaminants. It is therefore important to have the stainless steel pickled after each mechanical treatment.

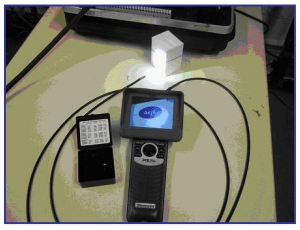
IRIS analysis

IRIS (Internal Rotary Inspection System) analysis is used mainly to accurately measure the wall thickness of pipes in heat exchangers, air coolers, steam boilers and condensers. This measurement technique uses ultrasonic pulses, which makes it possible to inspect a wide range of materials. The IRIS analysis can be used to detect and quantify pitting and damaged areas as well as a general reduction of the wall thickness, so that the condition of the entire pipe cluster can be charted. The analysis results facilitate highly specific and preventative maintenance.



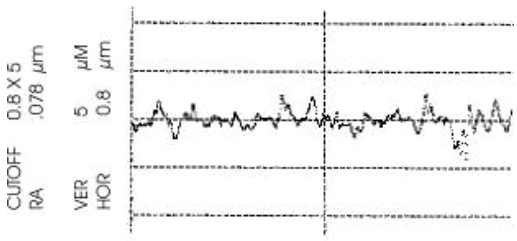
Video-endoscopy and televisual inspection

Endoscopy is a highly suitable method for studying the interior of pipeline systems or coolers. It is used to establish the presence of contamination, but also other irregularities such as cracks or local corrosion. Thin tubes and pipes can be inspected using video-endoscopy (probe diameter 6-8 mm) and wider and longer pipes using televisual inspection (probe diameter 25-45 mm). With this technique, the position and the type of contamination and the irregularity are clearly shown on the monitor.



Roughness measurements

There are several applications for which requirements are set for the roughness of the surface. In the food and pharmaceutical industry, for example, a low roughness level is important owing to reduced adhesion of contaminants to the surface. A low roughness level is also important in bends and funnels in order to prevent blockages. The roughness is often determined in accordance with the ASTM standard and expressed as an Ra value in µm.



Roughness scan after ceramic bead blasting

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