

5.1.16. ULTRASONIC STEEL CLEANLINESS INSPECTION ACCORDING TO SEP 1927 BASED ON THE ECHOGRAPH 1093

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Currently, the macroscopic purity grade of steel samples is often examined with the so-called blue brittleness test. A steel disk is broken in a controlled manner after being heated up to the so-called blue brittleness temperature. At the fracture surface you may find an oxide layer with typical and intense colouring. Non-metallic inclusions are clearly seen due to the good contrast conditions. The obvious disadvantage of this simple test is that solely discontinuities can break-off and become visible which are near to the fracture line and this happens in turn only when adequate mechanical strength is present.

A new attempt makes use of an ultrasonic testing procedure for a steel batch. With this approach, the full volume of a small sample (out of the large steel batch) is inspected.

For many years, immersion tank tests are performed by different steel makers. But after extensive round robin tests it has become apparent that test results could not be compared to each other. One reason was the use of different test equipment (e.g. electronics, probes etc.). Also the different testing procedures (e.g. scanning pattern) lead to results which varied to a large extent.

In order to overcome this constraint, a working group under the guidance of the VDEh (Verein Deutscher Eisenhüttenleute) was established around 10 years ago. In this group steel makers, end users of steel and test equipment manufacturers were active. A new test specification SEP 1927 was created to ensure the comparability of the test results by harmonizing the testing procedure and some components of the test systems respectively. For assuring a constant coupling, testing is solely carried out in immersion technique. By scanning the steel samples in an x-y- or helical pattern, the entire volume information is collected and statistically evaluated. The SEP 1927 suggests various sensitivity classes. They are defined by different flaw sizes and different flaw indications per volume. One important part of the test system is the automated statistical software evaluation of the indications.

For this test task, a test system has been developed where either square or round bar steel samples can be checked in arbitrary sequence for their respective cleanliness. The test tank is automatically loaded and unloaded via a portal system. Within the immersion tank, the samples are automatically positioned in the corresponding workpiece support and the appropriate test parameters are fed into the ultrasonic electronics ECHOGRAPH 1093.



Fig. 1