HD scan is the measuring system of the future

for classifying the internal quality of cast products

The quality of cast products is the crucial economic factor not only for manufacturers and retailers, but for further processing companies and consumers too. SMS group develops quality-defining technology for the mechatronic components and for the metallurgical process in continuous casting plants. Customers of the SMS group are thus able to manufacture products of demonstrably high quality on their plants and with them set standards on the market.

When evaluating the quality, however, certain questions need to be examined: What criteria are used to evaluate quality? Are there objective analyses and evaluations?

"There are with our product HD scan," says **Dr. Tamara Gusarova**, development engineer, and **Martin Klein**, sales engineer, who both work for SMS group. **Tamara Gusarova**: *"We use a tried and tested method: Ultrasound is already used for technological and medical applications. The software we developed to evaluate the data produces objective, valuable reports on the internal quality of cast products."*
"HD scan is easy to operate, the method is reliable, and the results are reproducible. In addition to all these benefits, HD scan is above all risk-free, it can be used without acids, and it does not require a specially equipped room in the works," explains **Martin Klein**.

Information

HD scan consists of an ultrasound unit, a bath for the samples with a scanner and ultrasonic sensors, as well as a computer for control and automated evaluation purposes.
The size of the bath depends on the customer's requirements. One example could be: A bath of 1.5 square meters for approx. nine samples (approx. 400 x 400 mm²).

An array of benefits compared with etching techniques

With the macro-etching method, the quality of a cast product is tested on a random surface, which is taken to represent the whole product. However this often results in an incorrect evaluation of the quality: the results are either too good or too poor.
By contrast, HD scan provides three-dimensional volume information and enables conclusions to be drawn on the quality based on several surfaces. With the macro-etching method this can only be achieved by investing far greater time and effort. By comparison with macro-etching, HD scan provides representative results.

Macro-etching is segregation-specific; with HCI etching only C segregations are visible. HD scan, on the other hand, is suitable for all types of segregation.

For the purpose of the ultrasound quality test, the surface of the sample does not need to be specially treated, as is the case with macro-etching. A roughly milled surface is entirely sufficient, and not even rust interferes with the measurement.

Objective results thanks to automated evaluation

The automated evaluation performed by the HD scan software provides information on the product quality for the purpose of optimizing the casting parameters and machine settings and for testing new cast qualities.
As a result, HD scan can be used to classify centerline segregations, detect cracks (including the type and length of the crack and its position on the sample), and to assess the sample geometry, incl. eccentricity, trapezoidal form, and bulging. The macrostructure is also shown.

Comparability of products and clear classification

With its evaluation software HD scan offers far better comparability of products. As a result, manufacturers of premium products will be able to strengthen and expand their market position.

Most manufacturers use the HKM catalog to classify their products and thus compare them with products from other manufacturers.
After preparation a lab technician compares the image with comparative images from the HKM catalog. However he or she classifies the product based on purely visual aspects – "by eye", so-to-speak. Therefore a comparison of the product quality is neither practical nor useful.

A clear system of classification is important for downstream process stages. Thanks to its independent, automated and objective evaluation, HD scan offers clear quality assurance.

Easy to use

No complex operating instructions are required to use HD scan. The operator loads the samples into the immersion tank. Once the loading process has been confirmed, the test procedure is performed fully automatically, right up to classification of the centerline segregation.

The section of the sample to be analyzed can be chosen at random. With other test methods the term "section" always implies a two-dimensional surface. With HD scan, however, section implies three-dimensional volume information on the sample. HD scan gathers measurement data over a depth of 6 centimeters. This information is displayed using 100 individual layer images. To achieve the same result using the macro-etching technique, the sample would need to be finely ground and etched 100 times.

HD scan is designed for the automatic classification of centerline segregation. The system can make dimensionally accurate distinctions between internal defects at a resolution of 0.5 millimeters. The choice of ultrasonic head and frequency has been optimized for the automatic classification of centerline segregation. It can also detect other internal defects, such as fine cracks for example.

Digitization is the key

The existing etching photographs are digitized and archived. Therefore the archive is not started 'from scratch', and comparability is maintained over longer periods of time.
What's more, the photographs can be automatically evaluated using the HD scan software. For better comparability, the same evaluation algorithms used for ultrasound data are applied here.

For the HD scan data, long-term archiving with a low volume of data is planned. The digital evaluations can also be linked with existing process data, meaning processes can be optimized quickly and reliably.

Summary

With HD scan – the measuring system of the future for classifying the internal quality of cast products – SMS group has developed a product with no hidden risks, either economic or health-related. The procurement and operating costs are low, as are the manpower resources required. It offers a return on investment (ROI) of 18 months. The information volume is high, the evaluation software is easy to use, and the results are factual and objective.
HD scan is a reliable and state-of-the-art technology that provides visibly successful quality results.

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