

A-VT Molding

Background

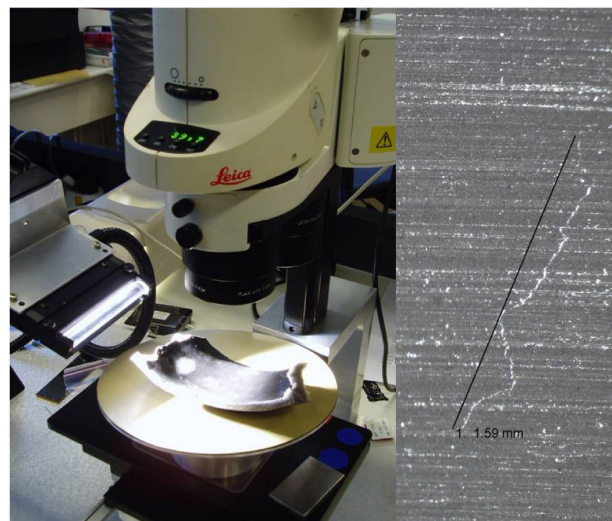
Westinghouse has developed a system for the application of molding of objects underwater coupled with optical characterization of the molds as an innovative new inspection technique.

A mold is customized for a specific purpose and applied to the component with a tool. One such tool is the MouldMan. It is specifically designed for bottom nozzles in boiling water reactor (BWR) plants. The technique is valid for applications in all commercial reactor types for dry, moist and submerged conditions.

Description

MouldMan can be deployed at the nozzle with lightweight rods operated from the auxiliary bridge. The tooling is then locked to the nozzle, and the molding paste is injected into the mold.

Depending on the temperature and choice of molding paste, the hardening of the paste takes 5 to 30 minutes. The mold is then brought to the surface for analysis. The mold can be easily cleaned of loose particles or agent before examination.



Stereo microscope for evaluating mold samples. To the right, a height-sizing sample with a defect height of 1.6 mm.

Technical Specifications

| | |
|---|------------------------|
| Application platform | Manual or mechanized |
| Application environment | Dry or submerged |
| Operational water depth | 1 – 30 m |
| Operational water temperature | 10 – 40 C |
| Qualified detection width | * $\geq 3 \mu\text{m}$ |
| Qualified detection length* | $\geq 1.5 \text{ mm}$ |
| <i>* Qualifying agency: SQC, Swedish Qualification Centre</i> | |

The hardened mold is analyzed under a stereo-microscope for best depth perception. The technique is currently qualified for the detection of defects (open to the surface) with widths from $3.0 \mu\text{m}$ and with lengths of 1.5 mm. If even greater resolution is needed, the analysis can be performed using Scanning Electron Microscopy (SEM).

The technique can just as easily be applied under dry conditions with either manual or remote application via a mechanized platform.

Benefits

Besides the creation of a physical replica that can be stored over time and compared to later such replicas, the molding also offers a method for inspecting small, difficult-to-access areas between or inside objects of most shapes. In addition to flaw detection, it is very beneficial for the characterization of geometries, such as welds and areas subjected to electrical discharge machining (EDM) or laser peening.

Experience

The technique has been used successfully for the characterization of bottom nozzles in BWRs.



MouldMan tooling applied on emergency nozzle during A-VT inspection for defect height sizing.