

Special Issue

Fatigue Analysis of Casting Defects

Message from the Guest Editor

The fatigue resistance of structural components is strongly sensitive to casting details such as casting technology and underlying cooling rate, geometry of the component, inoculation, etc. All these aspects induce typical defects and microstructural gradients which makes the fatigue resistance of casting components lower than those obtained in components produced by wrought alloys. In casting, solidification defects such as porosity and microstructural alterations such as exploded graphite nodules in ductile iron are difficult to avoid. These anomalies are responsible for the lowering of the fatigue strength of components.

The initiation event is critical for fatigue strength. Fatigue initiation points are found with casting defects, typically gas pores, microshrinkage, oxide skins, defective microstructures, etc. Defects of a sufficient size act as pre-existing microcracks that, under service load, can develop into a component failure. In contrast, small defects may behave as non-propagating and thus are irrelevant to fatigue failure.

Important scientific advancements would come from studying the quantitative role of defects on fatigue initiation in castings.

Guest Editor

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Deadline for manuscript submissions

closed (20 July 2024)



Applied Sciences

an Open Access Journal
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