Spalling Defect Elimination

The Problem

Foundry R experienced spalling defects that varied in degree for several years. During this time, their spalling defect was tied to the age of the primary slurry; as the primary slurry increased in age, the amount of spalling defects increased. To eliminate the severity of the defect, Foundry R instituted a policy to change the primary slurry every six months. This operating practice worked for several years, until unexpectedly the spalling defect was no longer eliminated by simply changing the primary slurry.

After working unsuccessfully to resolve the spalling defect with their existing slurry supplier, Foundry R turned to the experts at R&R to assist them in resolving this process-related issue. The R&R team worked closely with Foundry R to evaluate and analyze the problem in an effort to customize a precise solution tailored specifically to fit Foundry R's needs.

The Solution

In the past, traditional efforts to solve the spalling defect typically involved changes to the shell building process that could not be evaluated until castings were completed. Without evidence to indicate that the defect will be eliminated, process changes were risky. The foundry could lose time, material and potentially process control without seeing any impact on spalling defect reduction. R&R realized that implementing a measurement technique earlier in the shell building process could reduce these risks.

With that knowledge in hand, R&R focused on the development and application of a testing method to measure the spalling load; or the weakest force at which a shell fails or delaminates. The R&R team developed the spalling load test to provide a quantifiable measurement of the spalling load. This measurement allowed the team to isolate ceramic shell construction variables that affect intercoat adhesion of ceramic shell layers.

R&R's spalling load test allowed the team to compare shell systems in the laboratory to optimize slurry adjustments prior to implementing them in production at Foundry R. Data from the adhesion test showed that increasing the load required to delaminate had a positive impact in resolving the spalling defect.

Utilizing R&R's newly developed adhesion test, Foundry R found that they could optimize the slurry shell building process to reduce the potential for spalling defects on their castings. Implementing this solution into production at Foundry R eliminated the spalling defect without issue and Foundry R has also realized the benefits of decreased scrap and rework in their foundry.

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