



Powder Metal Component Manufacturer Automates Hardness Testing

Background

The powder metallurgy (PM) process offers manufacturers the ability to produce high volumes of complex parts in a cost effective manner. Many PM components go through heat-treat processes producing parts with increased strength or wear resistance. Traditional static indentation testing, such as Rockwell and Vickers hardness tests, is time consuming, subject to human interpretation, and damages the part to some degree. One major PM fuel pump gear manufacturer has integrated an automated eddy current testing solution from Criterion NDT in their production line to test 100% of their components for proper heat treat conditions.

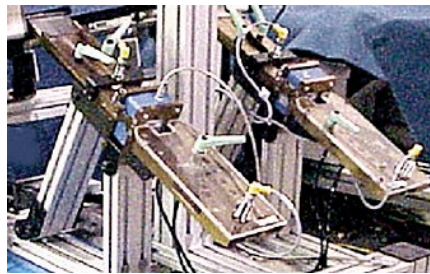


Situation

A major PM fuel pump component manufacturer required an in-line solution to provide test results as accurate as those from Rockwell hardness testers when inspecting 100% of their PM rings and stars. The test had to be easy to configure with a minimum of set-up changes. The overall goal was to reduce both warranty and scrap costs.

Solution

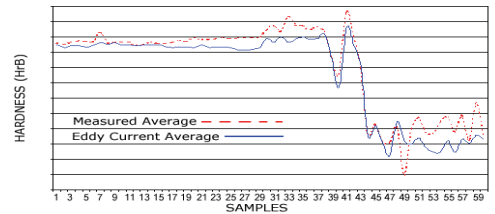
Eddy current testing has been widely used with traditional metal components to verify heat-treat conditions, confirm proper case depth and verify alloy content, in addition to finding component flaws and defects. A compact eddy current testing system was installed directly downstream of the heat-treat furnace.



The system consists of a multi-channel, multi-frequency eddy current instrument, two eddy current hardness testing coils (one for stars and one for rings) and two sorting stations (one per lane). This provides 100% component testing for up to 60 parts/minute with the ability to physically reject out of tolerance components.

Two tests were conducted to develop a correlation between a measured Rockwell hardness (HrB) and the eddy current hardness values. First, 38 sets of 10 samples (380 samples) were tested with eddy current. Next, all 380 samples were sent through a normal Rockwell hardness tester. Twenty-two suspect and failure specimens were tested as well.

In the initial test the correlation between Rockwell hardness and eddy current hardness showed only 1~3 HrB points variation.



Eddy current readings showed a more consistent value compared to the Rockwell readings. This was confirmed with sample production test results where nearly 35,000 samples were tested with eddy current. Random samples were taken and had Rockwell hardness checks completed to verify the results. The eddy current coils inspect more of the component's surface area to compute a more accurate result. The Rockwell hardness readings were only accurate to ± 1.0 HrB while the eddy current testing provided more consistent results.

To 100% inspect and insure that all parts are above the specifications, I believe there is no other way to provide zero defect products than to use an eddy current test system.

— Project Engineer