INFLUENCE OF SHOT PEENING TREATMENT ON EROSION WEAR BEHAVIOR OF HIGH CHROMIUM CAST IRON

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ABSTRACT

Due to the high wear resistance of high chromium white cast irons, these materials are commonly used in the fabrication of components like shot blasting nozzles, rolling mill rolls, crushers, pulverizers, pumping systems for abrasive sludge, ball mill liners or different part of machines in crushing and grinding applications. In most of cases, these components are in contact with particles dragged by a fluid, which impact against the component causing erosion wear failures over time [1].

With the aim to improve erosion wear resistance of this kind of material, different thermal and mechanical treatments (shot peening (SP)) were performed on a 18%Cr white cast iron, with chemical composition shown in Table 1. Table 2 shows specifications of these treatments:

Table 1. Chemical composition of 18%Cr-WCI

%C	***%Si***	***%Mn***	***%Cr***	*%Mo*
3.01	1.17	0.82	18.2	2.05

Table 2. Series designation and specifications

18%Cr-WCI-Q	*18%Cr-WCI + quenched (1000ºC-6h) + air cooled*
18%Cr-WCI-2T	18%Cr-WCI-Q + Double tempered (500°C-8h)
18%Cr-WCI-SP	18%Cr-WCI-Q + SP (100% coverage)
18%Cr-WCI-SP+2T	18%Cr-WCI-Q + SP+2T (100% coverage+ Double tempered (500°C-8h))

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In order to evaluate the influence of these mechanical and thermal treatments on erosion wear resistance of 18%Cr white cast iron, erosion tests were performed in a MTDA / G76 microtest machine, following ASTM G76-13 standard recommendations.

Erosion wear behavior was justified in terms of microstructure, hardness and roughness modification induced by each treatment. Phase changes have been studied by means of microscopical observation and XRD analysis.

Figure 1 and 2 show erosion wear test results and microhardness trend of all different series of samples.

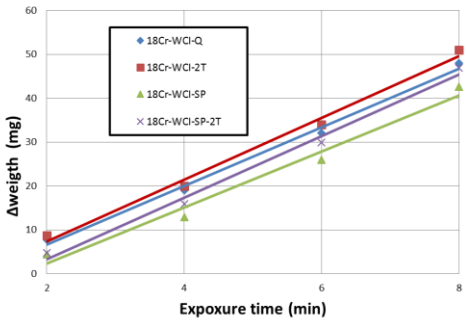

Figure 1.Mass loss versus exposure time

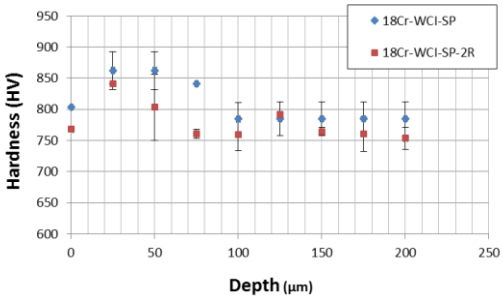

Figure 2. Microhardness profile in specimens after different treatment

Results show the beneficial effect of SP treatments in erosion wear behavior. The workhardened induced in the upper layer of the material by SP contributes to retard mass loss, thus improving erosion wear behavior. Tempered treatments of 500ºC by 8 hours after shot peening have not presented a beneficial effect on erosion wear resistant with respect only shot peened series, because of the softening experimented by the material with time and temperature.

References

[1] J. Dodd Y J.L. Parks, *Factors affecting the production and performance of thick section high chromium-molybdenum alloy iron castings*, Climax Molybdenum Co., U.S.A.