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SOME STUDIES ON INVESTIGATING THE CONCEPT OF AN EFFECT OF IMPACT ANGLE AND IMPACT RATE ON SLURRY EROSION BEHAVIOR AND MECHANISMS OF SS304

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Abstract

In that empirical work the erosion wear due to the departure of material with the activity of particles handling ash-liquid (slurry mixture) on stainless steel 304 has been inspected in a slurry pot tester. With the assistance of jigs and fixture it holds the specimen with slurry pot tester. The erosion wear arises in the work piece is due to the flow of slurry. While performing the experiment concentrations of the mixture is distinct speed at various times to ascertain the effect of these particles on the work piece. Thence the kinetic energy of slurry particle increases which may result alternation in wear rate.

***Keywords-*:** *SS304, Authentication, Erosion wear, SEM.*

I. INTRODUCTION

In last few decades, the engineering materials demanding are increasing day by day. Becoming to this mechanical construction such as wear, corrosion, oxidation, erosion rate the materials have prone to cavitation [1]. This will occurs due to failure under high heat load. The greatest industrial application has been accomplished to rectify the efficiency, productivity and surface heat treatment applied science. This has been fascinating a great deal which additioning the cost cycle and life cycle of component materials. In distinct words the whole surface appearance is created a problem with high concentration in most of industrial components. The distinct types of wear such as adhesive, abrasive, dry and wet erosion endure in the material [2]. Thence consequently slurry erosion is also represented as wet erosion which is significantly importance is deciding the service life of the major constituents which handling the slurries that containing hard abrasives. In diverse chemical handling apparatus such as marine, turbine pump materials can be accomplished by slurry erosion particles. Slurry erosion is fundamentally represented as decrease the (wear or loss) life of material which handling high concentration of slurry particles usually water [3]. This is the greatest problem which is generated in engineering application. From this source the intimately prevalent areas which is conceited by the slurry erosion problem comprise mining, machinery constituents, hydraulic carriage of solids in pipe lines, oil gas industries etc. the wear rate of solid particles is hardly affected by slurry particles because the high amount of slurry particles such as sliding or impact of solids, gases. Its normally takes place cutting and deformation.

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Thence, slurry particle variable includes shape, size, and hardness. The properties of materials which comprise such as hardness of material, work hardening, behavior & micro hardness [4].

II. PARAMETER'S AFFECTING ON EROSION WEAR

Impact angle (angle between the target surface and direction of impacting velocity of particles)

Hardness (it is the mysterious effect on surface of the material)

Velocity of solid particle (it depends upon the particle size, shape)

Solid concentration (it is the percentage by weight or volume)

III.EXPERIMENTAL DETAILS

Nickel chromium powder was exquisite as coating material by HVOF technique. The substrate material was exquisite as SS304. SS304 has a large number of applications in various industrial sectors. The SS304 has unmatched combination of more excellent mechanical properties and toughness. There is such limitations related to SS304 which is poor wear and erosion resistance regards its engineering applications. The work piece has the micro hardness which was evaluated using Vickers hardness-tester. We lay upon the load of 100g for 10s was adopted for both specimens. During this performance the micro defect must not be shown in the indenters mark. The hardness of the stainless steel is 107 VHN.

Test carried for both specimen (coated and uncoated) using a slurry erosive wear tester in shown in fig. 1. The test specimen is rigid with spindle with the help of jigs and fixture. The spindle revolves at maximum speed for the cause that which is connected with electronic motor which has maximum speed 1400 rpm using a belt drive. Totally these samples dipped in ducom which has capacity of 1.8litre. The 1.8l slurry has been filled with ducom. From this source the bottom ash and distilled water mixture is used for the slurry particles. Therefore experiment has been performed at distinct solid concentration (30, 50, and 60%.) varying with distinct rotational speed (800, 1000, 1300, 1500rpm.) with time duration (80,100,120,150min.).

Figure.1 Slurry Pot Tester

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Fig.2 Parts Of Slurry Tester DUCOM

VI. EXPERIMENTAL PARAMETRES

Parametres	**Specifications**
Material Used	Stainless Steel 304
Erosdent Used	Bottom Ash + Sand
Particle Size	>300micro Meter
Slurry Concentration	30 To 50 %
Speed In Rpm	>1500
Time In Min.	**Min. Required**

Fly ash-: the bottom ash has been collected from ropar thermal power plant(punjab)India.

5.1 Sand particle

the sand particle will be collected from bhakra dam nangal(punjab). The size of sand particle does not more than 300 micrometer.

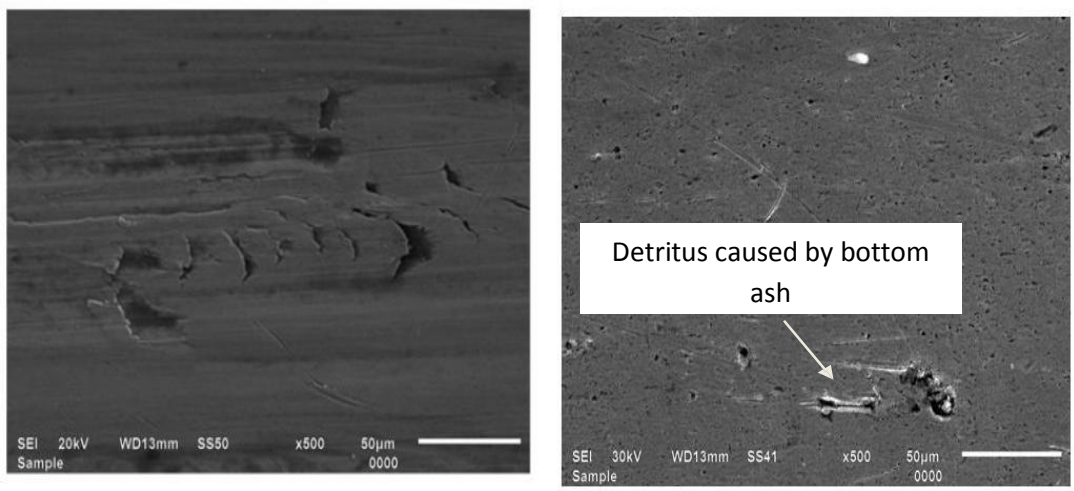

Fig.3 HVOF Machine

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VI. SLURRY EROSION TEST

The uncoated SS304 slurry erosion wear before and after in fig.4 & fig.5. From this place the uncoated steel 304 has high slurry erosion wear as relatively to coated SS304. The coated SS304 has higher yield strength. Nickel chromium is good erosion resistance. From this cause the wear resistance increases, increase the amount of coating thickness of base metal.

Fig.4. the Erosion behavior of uncoated steel (a) before and (b) after erosion wears at 1000rpm with 50% wt. concentration of bottom ash.

6.1 Effect of slurry concentration

Higher the speed of slurry particles impinge on the test specimen that causes deformation(loss of material).the uncoated SS304 increases its mass loss. The slurry erosive wear loss is reduces due to increasing the thickness of material. Therefore increase the mass loss of material means prone to high cavitation, porosity and deterioration of materialfrom its surfaces.

6.2 Effect of speed of slurry revolution

owing to high speed of slurry particle in the ducom there is little amount loss of material for coated SS304. When the spindle revolve at more than1300rpm that means removal rate of material happened. At the time that slurry particle increases at high speed of rotation which means the kinetic energy of abrasive particles increases that blast the separate spots of test specimen that causes cavitation.

6.3 Effect of test duration

During performing the test duration , the loss increasing contionousuly uncoated SS304. The mass loss of material at120, 140min. is different respectively. hence identified that the loss of material is high during test duration.

In figure.5. Scanning electron microscope shows distinct removal wear rrates in the photograph. The chromium steel304 which is eroded by slurry particles was examined that the extend of damage. Increased coating thickness has ability to reduce the surface damage as observed in micrographs. SEM graph shows major removal rate of uncoated material which has poor resistance to

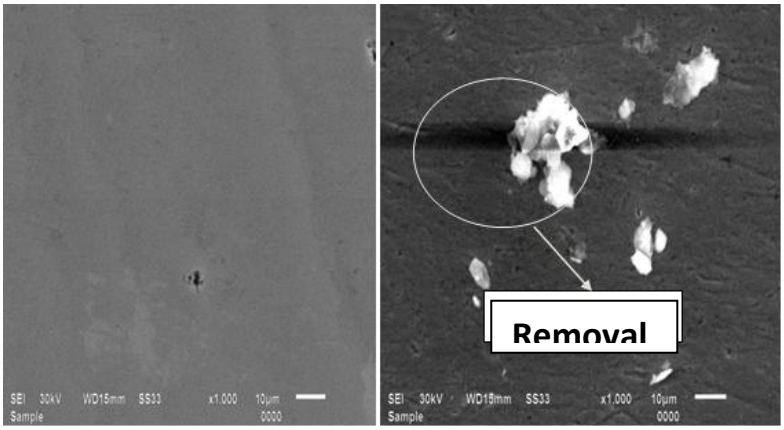

Fig.5. SEM of coated and uncoated 304with 50% wt. concentration at 1300 rpm.

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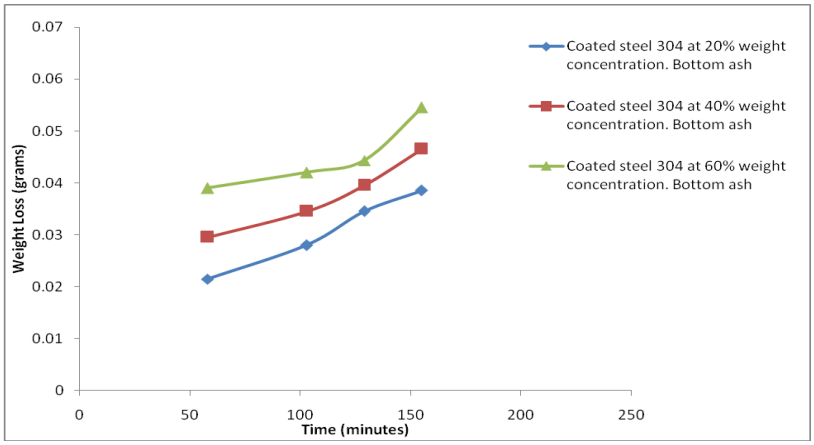

Figure 6 shows erosion wear of Coated steel 304 at 700 rpm speed.

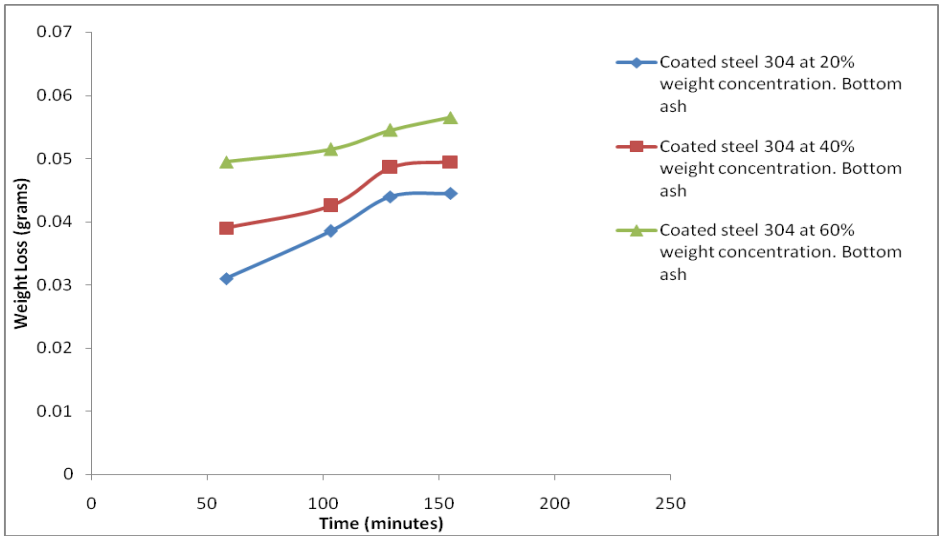

Figure 7 shows erosion wear of Coated steel 304 at 1000 rpm speed.

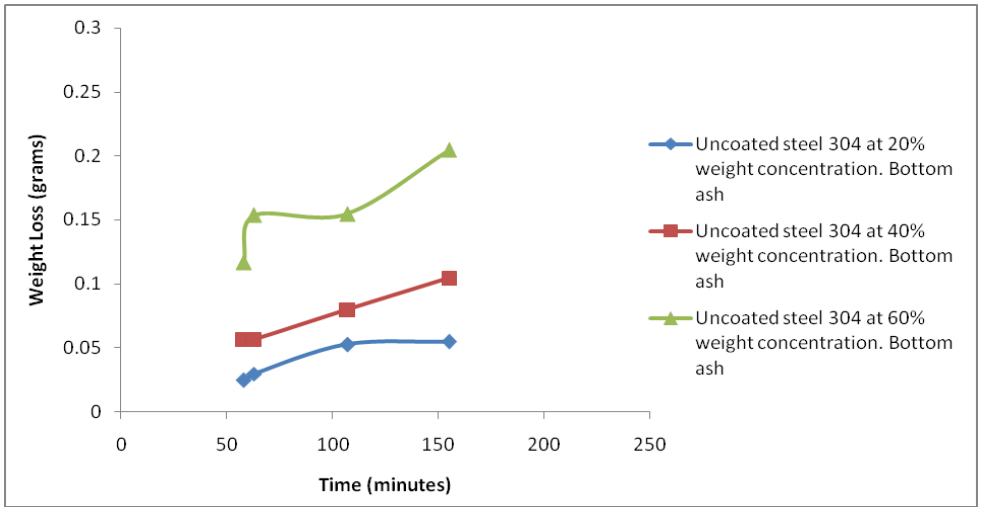

Figure 8 shows erosion wear of Uncoated steel 304 at 1000 rpm speed.

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VI. CONCLUSION

Hence The yield strength of coated steel 304 is more as equivalently to uncoated steel. And it has better corrosion resistance. Increasing the thickness of coating decreases the porosity and increase the rate of hardness. Appropriate compostion of nickel and chromium is the good for improved the slurry wear resistance. More than two times better performance than uncoated steel.

REFERENCES

[1]. V. Sehadri, SN Singh(1995). Prediction of uneven wear in a slurry pipeline. on the basis of measurement in a pot tester.

[2]. S.V Joshi, M.Kamaraj[2006]. Slurry erosion studies on surface modified 13 Cr-Ni Steels. Effect of angle of impingement and practice size distribution

[3]. D.Puri, Harpreet Singh[2007]. Wear and oxidation behaviour of shrouded plasma sprayed fly ash coatings.

[4]. Alok Satpathy, Narendra M.Dube[2009]. Experimental technique to analyze the slurry erosion wear due to turbulence.

[5]. B .Venkataraman,R. Keshavamurthy. Slurry erosive wear behaviour of thermally sprayed Inconel-718 coatings by APS process wear.