

# Optimizing the process parameters for controlling wear and improving hardness

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*Abstract—Globe valve is one of the most important valve in many applications regarding opening, closing and regulating the flow of fluid. Wear is one of the most common problem being faced effecting the durability of valve. It is very important to take necessary actions to reduce wear up to some extent so as to increase durability of valve. Coating is one of the method to be used in decreasing the wear.*

*Index Terms—Wear, Globe valve.*

## I. INTRODUCTION

Hard facing is a metalworking process where harder or tougher material is applied to a base metal to resist wear and prolongs working life. Hard facing is also known as hard surfacing. The harder material is welded to the base material, and is generally takes the form of specialized electrodes for arc welding or filler rod for TIG and oxyacetylene welding.



**Fig 1: Damage at the seal seat of a globe valve due to wear**

## II. MODULES OF PROJECT

The globe valve, is a valve that opens by lifting a round or rectangular globe/wedge out of the path of the fluid. Valve seat is an integral part of a valve. The Erosion of valve seat causes Galling, Destruction of the valve and even may cause plant shutdown. The figure shows the place where wear occurs.



**Fig: 2 Specimen for abrasive wear with colmonoy 4 coating/welding in industry**

## III. EXPERIMENTAL DETAILS

TIG Welding for Depositing layers of colmonoy 4 on specimens

Parameters	Labels	Level 1	Level 2	Level 3
Applied Load (In kgs.)	A	1.5	3	5
Sliding velocity (mm/minute)	B	20	35	40
Welding Current (Amp.)	C	180	190	210
Filler rod Diameter(mm)	D	3.5	5	6.5

Table: 2, Process parameters and levels of the experimental design

Taguchi Experimental Design for wear test L27 is used for experimentation. Process parameters and level selection The table below shown below shows process parameters selected for the study and at three different levels.

**Abrasive wear test**



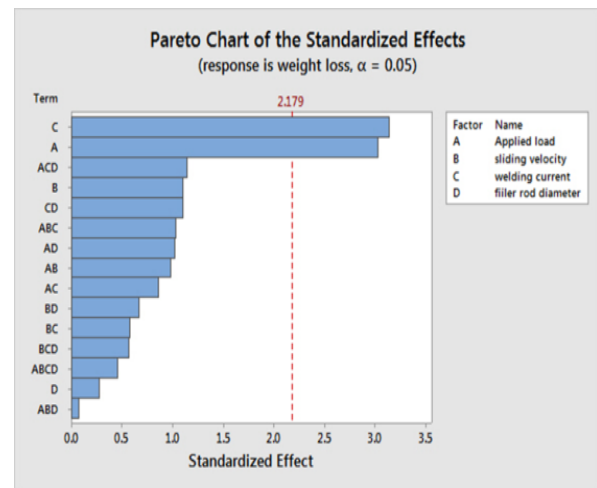
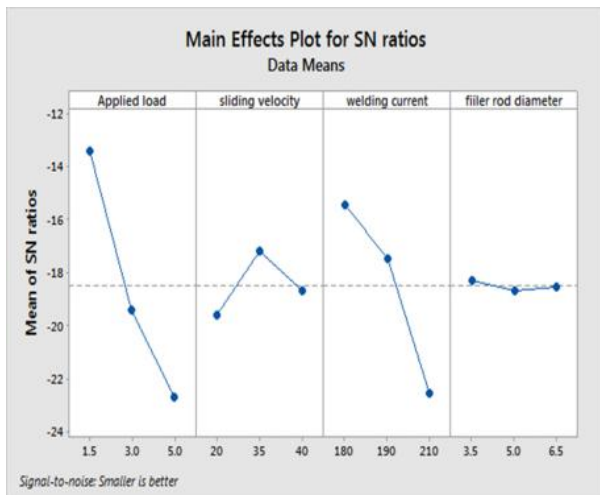
Fig: 3, Machine for conducting wear test (pin on disc wear testing machine)

**IV. RESULTS AND DISCUSSION**

The optimum value for minimum wear loss

sno	Parameters	Optimum setting
1	Applied Load	1.5
2	Sliding velocity	40
3	welding current	180
4	Filler rod Diameter	6.5

Table: 3 The optimal set of factors for wear test



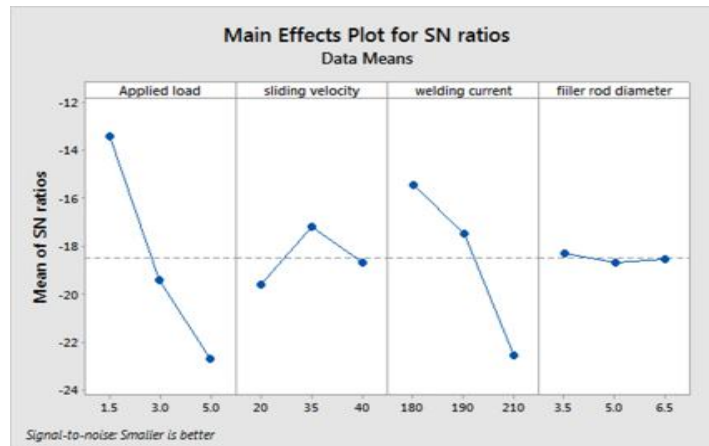


Fig 4 Results from taguchi test

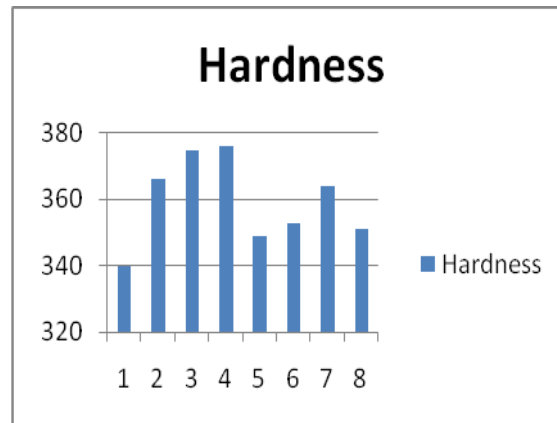


Fig 5 Hardness values

For the above figure it can be observed that specimen no. 4 has a high hardness value (376 BHN) as compare to other specimens it is more wear resistant and this is also proved from figure. This bar chart shows that high hardness value has also good wear resistance property.

## V. CONCLUSIONS

1. The Taguchi method is found to be effective for study of effect of variables on the wearresistance.
- 2The welding current has maximum effect on wear followed by applied load, sliding velocity and filler rod diameter.
- 3 With the above set parameters, the minimum weight loss is 2 mg.

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