CHAPTER - 3
AIM & OBJECTIVE OF PRESENT RESEARCH WORK

3.1 Problem Identification

3.2 Aim & Objective of Present Research Work
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3.1 PROBLEM IDENTIFICATION

So far research has been done on AISI 1020 steel depositing various alloying elements like Chromium, Cobalt, Molybdenum, Manganese, Silicon, Niobium, Tungsten, Vanadium, Titanium, etc. It was observed that the hard facing deposit layers are developing cracks and also the intended life that was supposed to extend after hardfacing was not seen. The following are some examples of such cases.

PLATE: 3.1CRACKS IN HIGH ALLOY HARDFACED PARTS

These cracks seen in the above photograph propagated through the thickness of the weld bead and stopped at the parent metal.
PLATE: 3.2 FAILED AISI 1020 PARTS – ADHESIVE WEAR

Adhesive wear dominates in machine parts made of AISI 1020 such as engine shaft, gear teeth sprockets etc. and these are critical parts which cause further damaging of the machine in addition to stoppage of process. High alloy welding done with Cr-Mo consumables have not prevented wear progress and failure occurred after weld hardfacing. Failure resulted due to improper choice of consumables or wrong welding procedure or both.

PLATE: 3.3 FAILED AISI 1020 PARTS – ABRASIVE WEAR
Railways use extensive shovels made of AISI 1020 for stacking ballast which were damaged or broken because abrasion wear. Loaders are used to dig out sand gravel for transport which was damaged or broken due to the load and abrasive nature of the material. These were repaired using weld hardfacing with high alloy elements but failed again. These are hammers made of AISI 1020 used for crushing small quantities of Baryte and mica. These hammers resist impact or blow or quashing forces. These hammers were again broken after reconditioning with high alloy elements.

PLATE: 3.4 FAILED AISI 1020 PARTS – IMPACT WEAR

3.2 AIM & OBJECTIVE OF PRESENT RESEARCH WORK

As per the literature survey made the problems mentioned above are not touched by the researchers. Also as AISI 1020 steel expands and contracts very easily during welding, and the alloying elements deposited expand easily but contract less during cooling, this was leading to failures. This is not only leading to the cracks but also reducing the life of the hardfaced part.

Also it was concluded by previous researchers that, additional alloying with molybdenum, tungsten, or vanadium has increased the hot hardness and abrasion resistance.

Microstructure is the most important factor than hardness in determining low stress abrasion resistance of iron-based hardfacing alloys. The most abrasion-resistant
microstructure in these alloys is primary carbide with austenite-carbide eutectic. The second most abrasion-resistant microstructure in these alloys is near-eutectic austenite-carbide.

Carbon is the most important element determining microstructure, and therefore abrasion resistance, of iron based hardfacing alloys. Dilution from the base metal can cause the first (and even the second) layer of hardfacing to have a different microstructure from that of very low-dilution or multiple-layer deposits. With dilution effects, hardfacing properties may not be as expected [80].

Hence this problem is taken up in the present research. Instead of using a hardface alloy, base metal itself is used as filler metal.

3.2.1 Aim

The aim of the present research work is

- To find better suitable weld hardfacing process for parts made of AISI 1020 steel subjected to different wearing conditions.
- In order to reduce the costs, hardfacing by simple processes using available general material is aimed at.
- To reduce the failure rate and also optimise the available process in the local vicinity.

3.2.2 Objective

The objective of the present research work is to optimise the process selection and parameters in order to select the best process of hardfacing on AISI 1020 steels. It is meant to be achieved by conducting the following:

- Depositing AISI 1020 steel on the same material which is taken in the form of pin.
• Determining the wear factor by measuring the wear volume at different sliding velocities and loads, using pin-on-disc tester.

• Measuring the friction coefficient by finding out the friction values at different sliding velocities and loads, using pin-on-disc tester and then dividing those friction values by applied load.

• Assessing the micro hardness of the worn samples at base metal and deposited metal using micro hardness tester.

• Studying the micro structure of the base metal and deposited metal and also the wear tracks of worn out metal using scanning electron microscope.

• Suggesting a suitable wear mechanism operating in the system.
BIBLIOGRAPHY