CHAPTER - 3

THE OBJECTIVES AND THE SCOPE OF RESEARCH WORK
CHAPTER 3

THE OBJECTIVES AND THE SCOPE OF RESEARCH WORK

Low carbon steel has wide applications in various fields because of easy availability, machinability and good weldability to get desired shape. These components require protection from corrosion and wear for various industrial applications including pressure vessels for petrochemicals, chemical pumps and transition joints for critical components fabrication. Protection against corrosion and wear can be achieved by depositing metal layer like stainless steel by friction surfacing over the low carbon steel. Anticorrosive stainless steel material is the consumable termed as mechtrode for depositing over the surface of the low carbon steel called as substrate. Special properties for the surfaced deposits such as bonding strength, shear strength and tensile strength, corrosion resistance, wear resistance and surface finish are required to be established for qualifying this process.

The work showed in this thesis is the study of several aspects of deposition of stainless steel over low carbon steel by friction surfacing. Evaluation of friction surfacing deposit as conceivable manufacturing process for these combinations, must be made on the deposits produced under optimum friction process parameters.
First part of the work is therefore, selection and parameters optimization, which is carried out by using a statistical design of experiments. The deposits are made by using the optimized parameters which are then tested for bending, metallography, corrosion and evaluating quality of the deposit for the utilization in various fields.

The thesis deals with:

- Requirement of the properties of the base materials to be considered for selection of the process parameters
- Determination of the process parameters for stainless steel and low carbon steel materials combination
- Determination of the process parameters for the bond strength using statistical design of experimental approach.
- Influence of the process parameters on physical characteristics of deposit such as width, height and surface roughness, and mechanical properties such as tensile strength and shear strength
- Evaluation of characteristics of deposit by metallography, microhardness survey, bends test and corrosion test.

The following schematic diagram shows various activities involved to get the desired quality of stainless steel friction surfaced deposit over the low carbon steel.
Fig 3.1: Cause and Effect diagram to get defect free friction surfaced Stainless steel over low carbon steel.
CHAPTER 3

THE OBJECTIVES AND THE SCOPE OF RESEARCH WORK

Low carbon steel has wide applications in various fields because of easy availability, machinability and good weldability to get desired shape. These components require protection from corrosion and wear for various industrial applications including pressure vessels for petrochemicals, chemical pumps and transition joints for critical components fabrication. Protection against corrosion and wear can be achieved by depositing metal layer like stainless steel by friction surfacing over the low carbon steel. Anticorrosive stainless steel material is the consumable termed as mechtrode for depositing over the surface of the low carbon steel called as substrate. Special properties for the surfaced deposits such as bonding strength, shear strength and tensile strength, corrosion resistance, wear resistance and surface finish are required to be established for qualifying this process.

The work showed in this thesis is the study of several aspects of deposition of stainless steel over low carbon steel by friction surfacing. Evaluation of friction surfacing deposit as conceivable manufacturing process for these combinations, must be made on the deposits produced under optimum friction process parameters.
First part of the work is therefore, selection and parameters optimization, which is carried out by using a statistical design of experiments. The deposits are made by using the optimized parameters which are then tested for bending, metallography, corrosion and evaluating quality of the deposit for the utilization in various fields.

The thesis deals with:

- Requirement of the properties of the base materials to be considered for selection of the process parameters
- Determination of the process parameters for stainless steel and low carbon steel materials combination
- Determination of the process parameters for the bond strength using statistical design of experimental approach.
- Influence of the process parameters on physical characteristics of deposit such as width, height and surface roughness, and mechanical properties such as tensile strength and shear strength
- Evaluation of characteristics of deposit by metallography, micro hardness survey, bends test and corrosion test.

The following schematic diagram shows various activities involved to get the desired quality of stainless steel friction surfaced deposit over the low carbon steel.