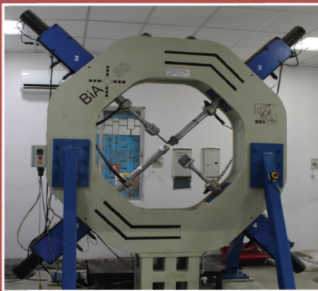


Material Testing and Welding Offerings

Summary:

Sheet metal forming is one of the important processes used in the automotive industry. To design a robust forming process, it is important to know about the deformation behaviour of steel sheets.



Bi-axial tension test setup

Tensile Test:

The tensile test is carried out using specimens machined as per ASTM standard E8M specification. The specimens were tested in five different directions, with the tensile axis being parallel (0), 30, diagonal (45), 60 and perpendicular (90).

Hole Expansion Ratio:

Premature ductile fracture occurring in stretch-flanging processes, such as hub hole forming for automotive wheels has been observed. Conventional approaches to assess formability such as the forming limit diagram are not sufficient to describe the ductility and fracture behaviour in stretch-flanging. The hole expansion test has been recognized as a discriminating method to characterize the forming behaviour in stretch-flanging processes.



Servo Hydraulic Forming Press

Uniaxial Tensile Test

Tensile test is carried out using specimens machined as per ASTM standard E8M specification. The specimens were tested in five different directions with respect to the rolling direction, with the tensile axis being parallel (0), 30, diagonal (45), 60 and perpendicular (90). The tests were performed using a 100 kN electromechanical type universal testing machine (Instron make, Model 5582). The standard tensile properties namely, 0.2% yield stress (YS), ultimate tensile stress (UTS), uniform elongation (eu), total elongation (ef), strain hardening exponent (n) and strength coefficient (K) were determined from the load – elongation data obtained from these tests.



Uniaxial Tensile Test

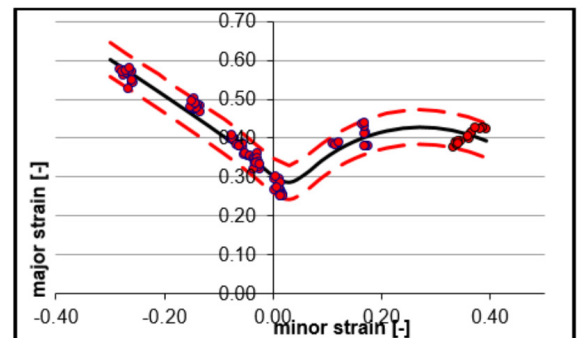
Fatigue:

Fatigue is the major failure mechanism in the components subjected to repeated and fluctuating loads, which accounts for a large percentage of failures in automotive components. As the automotive components have been designed to withstand the service loads (generally well below the yield strength of the material) for a large number of cycles ($> 10^6$ cycles), high cycle properties of steels become important, Thus the realization of fatigue property becomes important in design and performance evaluation of automotive components. In stress- controlled, high cycle fatigue testing, the sample is subjected to different stress amplitudes, below the UTS. The fatigue data is commonly presented as the S-N curve, where the stress (S) is plotted against the number of cycles (Nf) to failure in a double logarithmic plot. Fatigue strength is generally defined as the maximum stress corresponding to a finite number of cycles to failure.

Forming Limit Diagram:

The forming limit diagram (FLD) is the diagram showing the safe and failure zones for different combinations of in-plane strains. In this test, a curve is plotted that shows maximum strain at fracture for different strain ratios under a biaxial state of stress. This curve represents the boundary between the strain combinations that produce fracture and those that are permissible in forming operations. To evaluate the strain ratios at fracture

rectangular strips of different widths are stretched over a rigid hemispherical punch with the ends of the strip being held down by a blank holder as shown in the figure.



Friction Test:

Successful and efficient forming operations depend on material properties and process variables like temperature, friction, lubrication and deformation rate. In most of metal forming operations, excess friction is undesirable because it restricts material flow. Also, the tool life and power required to deform the component depend on friction. Excess friction leads to high wear on the tool surfaces and will add to the tool cost per component.

To conduct the friction test, a specific amount of oil is applied & distributed uniformly throughout the sample by a rubber roller.

The sample is clamped between tool material (D2 material) with predefined normal load and then the sample is pulled up at specified speed. During the test, the force required to pull the sheet is recorded. The tangential and normal force is used to calculate the coefficient of friction. Friction coefficient value is important for Finite element simulation as one of the important input process variables in sheet metal forming analysis.



Uniaxial Tensile Test



Uniaxial Tensile Test

Static or Dynamic Dent Resistant Test

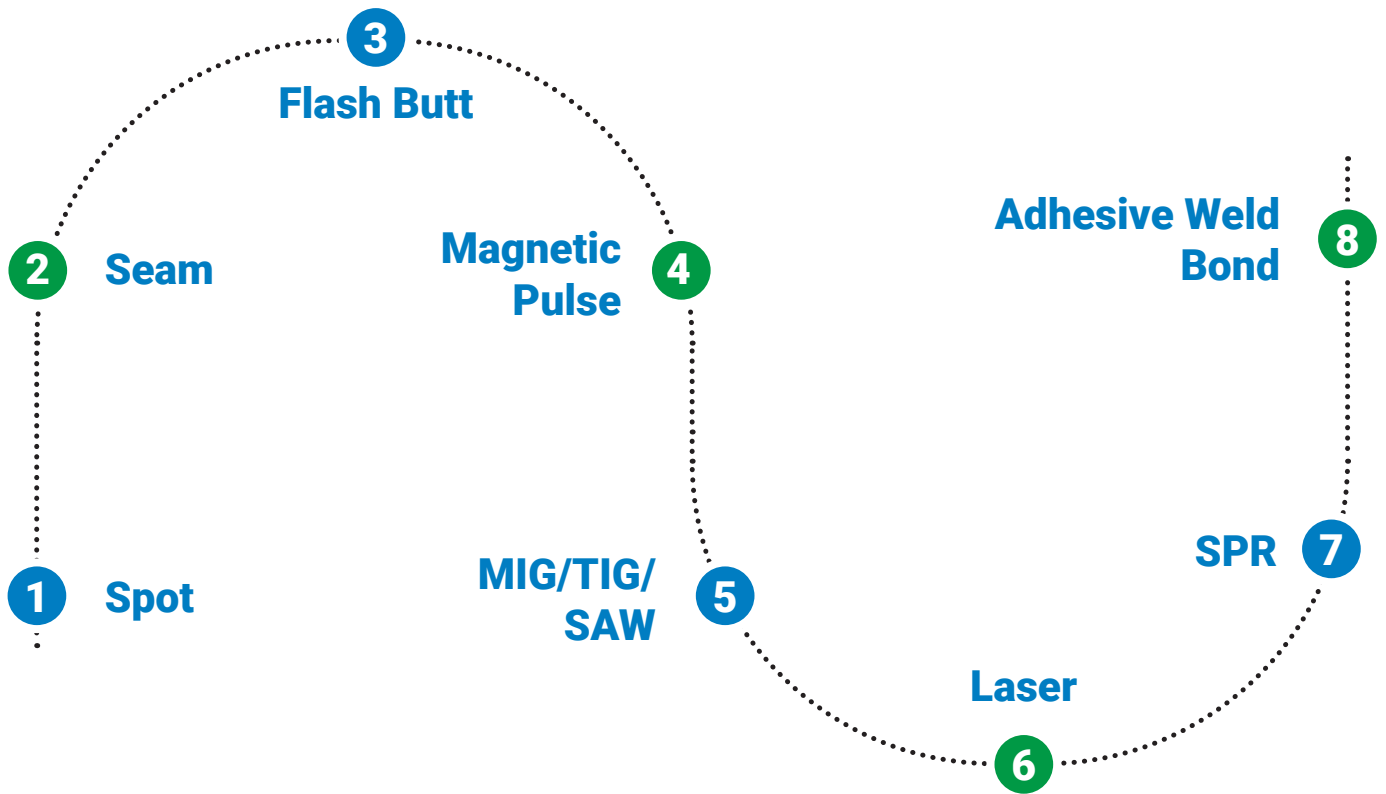
The static or dynamic dent resistance is a measure of the panel resistance to permanent deformation caused by static/dynamic forces which can occur during handling, at parking lots, by hands and elbows or by luggage, stone impact etc. The static/dynamic dent resistance is a measure of the critical force required for a residual indentation of a certain depth.

Different Welding and joining facilities available

Laser welding, CMT, MIG, TIG Resistance Seam Welding, Flash Butt Welding, Self Piercing Rivet and Magnetic Pulse Welding.

Services offered

We offer a variety of welding and joining services. Here are the 8 types of welding services.



Let's take a closer look at each service descriptively.



1. Resistance Spot

Steel Condition: HR, CR

Application in automotive: BIW, Grade approvals White Goods
TWB (Auto), Structural, Coil to coil joining

2. Seam welder

Steel Condition: HR, CR

Application in automotive: Fuel tanks, Cans



3. Self Buttt Welding

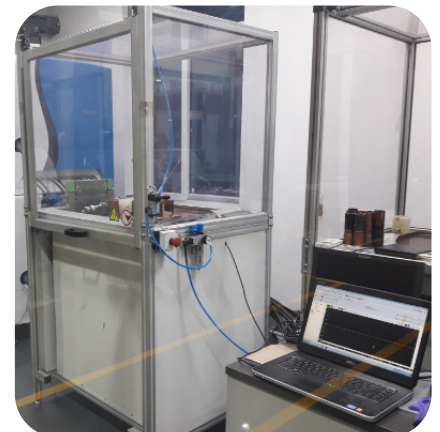
Steel Condition: HR

Application in automotive: Wheels, Coil to coil joining

4. Magnetic Pulse

Steel Condition: HR, CR

Application in automotive: Bi-metallic (steel-aluminum)



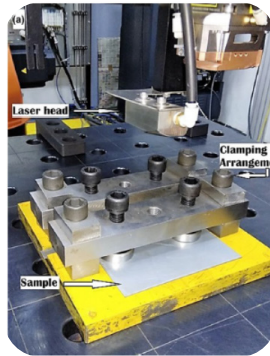
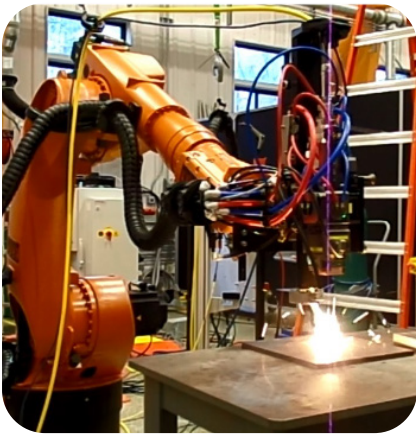
5. MIG/TIG/SAW

Steel Condition: HR, CR
 Application in automotive: Structural, Automotive, O&G, Yellow Goods



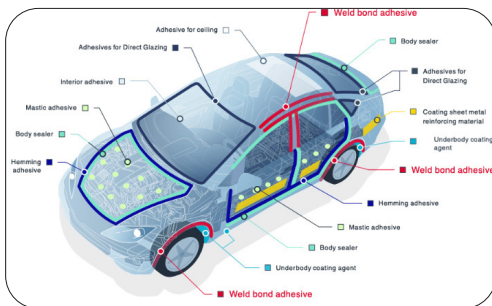
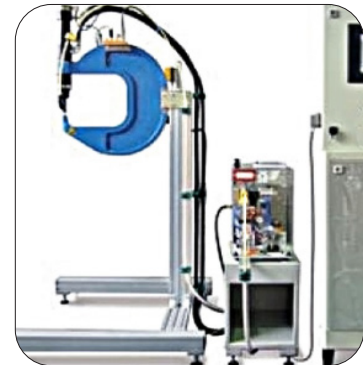
6. Laser

Steel Condition: HR, CR
 Application in automotive: TWB (Auto), Structural, Coil to coil joining



7. Self-Piercing Rivet (SPR)

Steel Condition: HR
 Application in automotive: Structural



8. Adhesive Weld Bond

Steel Condition: HR, CR
 Application in automotive: Sealant

