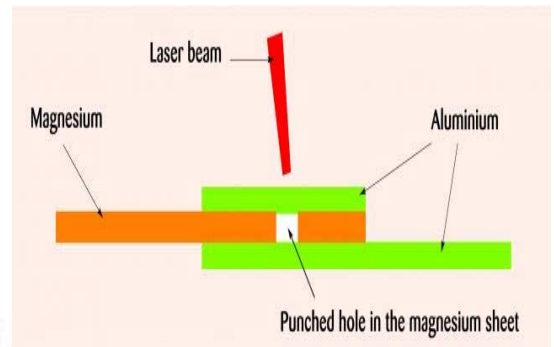


Welding of Dissimilar Materials

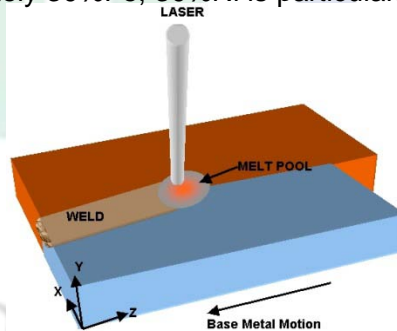
Introduction:

When arc welding two dissimilar materials, there are a number of aspects that need to be addressed, in addition to those associated with welding similar materials.



Development:

Firstly, from a practical viewpoint, it may not be possible to make a fusion weld if the melting points of the two materials are too different, as it is essential to have controlled melting on both sides of the joint simultaneously. Secondly, even if this criterion is met, it may not be possible to produce an adequate joint if the two materials are metallurgically incompatible. When two materials are metallurgically incompatible, it may be possible to make a satisfactory weld by addition of a suitable filler metal. This is exemplified by the joining of steels and stainless steels, when the Schaeffler diagram, or a modification of it, may be used to select a filler metal that is resistant to both solidification cracking and hydrogen cracking. Frequently, where a welding consumable with composition similar to one of the steels is not appropriate, a nickel based filler may be adopted. In addition, these may be used for welding of steels to some copper alloys due to their tolerance to dilution by a range of alloying elements without a phase change. However, care must be taken to avoid Fe/Ni ratios giving sensitivity to solidification cracking, e.g. approximately 30%Fe, 30%Ni is particularly susceptible.



Issues in Dissimilar Welding:

Butt Welding of similar metals/alloys with the heat source placed symmetrical about the centerline on the top would usually lead to microstructural features that are well documented. Weld pool solidification takes place by continuous growth of base metal grains leading to columnar grains with a weld-centerline or equiaxed grains at the centre of the weld. The shape of the weld pool is symmetric about the centerline. But, during welding of dissimilar metals, there are many interesting features that are not completely understood. Physical properties of the two metals being very different from each other lead to complexities in weld pool shape, solidification microstructure and segregation patterns.

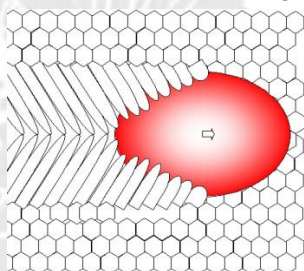


Fig. 1 – Welding of similar alloys

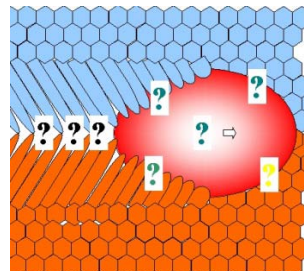


Fig. 2 – Welding of dissimilar alloys