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Weldability of Materials and Suitability of the Processes and Positions

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Welding Bead on plate or overlay or buttering, fillet or lap and different types of grove joints and position in which you weld are all vastly different and one cannot compare performance in each of these categories with others.

Weldability of materials and suitability of the processes and positions in which each of the alloys can be welded with best possible process is well defined.

I am raising and discussing this issue as I find we do a wrong comparison saying a combination of processes and consumables and gases and other non essential variables were kept sane but I find results different in each toe of joint or positions. Is it not that we should expect a fine variation and instead of having comparison and with it get surprised.

Let us discuss what kind of shrinkage forces surface tension and cooling pattern we will get in bead on plate, fillet and groove. Let us keep other variables off position constant for time being otherwise it will become too complex.

Bead on plate has base material only on the bottom of the weld for 1G or down hand position. Fillet will have it on bottom of the weld and even at right angles bit when we talk of groove it has base material at bottom of the weld except root run where penetration will be floating but has walls of base material on both sides. In other words bead in plate exposed weld to almost 70%, fillet to 50% and groove it is just 25% to atmosphere so cooling patterns and shrinkage stresses it is going to develop are in reverse proportion of 30-50-75%. Surface tension is also equally proportional. If you have dissimilar weld or varying thickness in fillet and groove we have more complexity. Welding parameters may be same or within-+10% but weld properties, finish, level of defects, may vary to great extent. Visual appearance and ease of cleaning beads after it cools down can vary and mislead at occasion to start worrying beyond a point on machine behaviour. In such cases we shall use our engineering judgment and as long as hygiene factors like cleanliness, preheat if required, machine maintains, consumables baking, storage, physical parameters like stick out, angle at which arc is struck, speed and direction... are same or maintained as per WPS, PQR we shall be able to predict behaviour in different types and positions. This knowledge of variations those will come due to overhead welding or vertical up or down welding or all position welding is essential to have by welding engineer. Welding engines shall also be familiar with NDT and metallographic studies and results for a better understanding and rational for weld visual and NDT results. Assuming no defects in the sample variation in results of physical properties would be purely metallurgical these other variations could be due to combination of metallurgical behaviour and physical variations due different types and positions.

To allow certain joints to deform may be a good idea rather than constraining it and developing stresses in the joint & HAZ.