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RESEARCH OF CHARACTERISTICS OF ARC WELDING PROCESS WITH TWO-JET FEED OF SHIELDING GASES

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The welded-notch toughness is an important characteristics of a weld quality. The welded-notch toughness test was developed in response to the inability of conventional welding tests to determine the actual toughness of a weld. Other tests evaluated the toughness of the base metal, the weld metal, or selected areas in thickness, full-penetration welds, typically by cutting out sections for Charpy V notch testing of the heat affected zone.

Impact toughness is the ability of a weld to permanently deform while absorbing energy before fracturing, specifically when stress is applied rapidly – typically in under one second. In simpler terms it is how much rapid-impact energy a weld can take before it cracks.

Filler metals that provide good impact toughness can help minimize the extent and rate of cracking should it occur as the result of an impact or fatigue from cyclic loading. In low service temperature applications such filler metals can also help mitigate the risk of brittle fractures caused by the loss of toughness that steels undergo at subzero temperatures.

Welding wire “G4Si1” and machine “FRONIUS TransSteel 3500” were used for the experiment.

Four metal plates were tested in my work. Each sample was analyzed by a chemical spectrometer. In chemical testing, I used spectrometer Solaris GNR SCP. All plates had the same chemical composition, it’s very important for the experiments because differences in chemical composition heavily influence toughness.

Spectrometer analysis is a typical analysis method for metals in which a spark onto a metal surface is applied by an electrode. The high-energy spark converts the metal surface into "discharged plasma". And by determining the specific spectral lines one can analyze various elements in metals.

Actually all plates had the same chemical composition.

Welds were rough-cut into various premachined segments. The impact specimens were machined to remove approximately 2 to 3 mm from the welded notch edge leaving a natural notch depth of about 2 mm. This is the site in which a typical weld notch would start to crack in service.