

## OP 106

### Mechanical properties of one-sided welding for the low-temperature steel using a high-current MAG welding

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Single-sided single-pass submerged arc welding is commonly applied in the shipbuilding industry for hull assembly, but its applications do not extend to liquefied petroleum gas storage tanks as it lacks impact toughness at low temperatures. In this study, we developed a high-current metal active gas welding process to perform one-sided welds with a low heat input and applied it to low-temperature steel. The strength of the welded joint was higher than that of the base material, and the average hardness of the weld metal and the heat-affected zone in the sample were 58 Hv, 7 Hv higher than that single-sided single-pass submerged arc welding, respectively. In low-temperature ( $-60$  to  $-10$  °C) impact toughness tests, the ductile-to-brittle transition temperature of H-MAG weld metal was 10 °C lower than SAW and met the Classification Society's requirement ( $-60$  °C and 34 J). Although martensite-austenite constituents was identified in the weld metal of H-MAG, it showed excellent impact toughness because the presence of fine acicular ferrite microstructures.