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Effect of straightening of steel pipe segment on tensile and fracture mechanical properties of the resulting semiproduct

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Fracture - mechanics specimens concerned with pressure pipelines are usually manufactured from a flat sheet obtained by press straightening of a pipe segment. Some researchers are somewhat sceptical about the validity of fracture toughness values obtained on straightened specimens for occurrence of plastic strains which might have been induced in straightened semiproducts during the process of press straightening. In order to clarify a substantiation of this scepticism we have carried out fracture mechanical tests on CT specimens manufactured from a CSN 411353 steel pipe of 266 mm in diameter and 8 mm in wall thickness by a common procedure, i.e. from a pre-straightened sheet, and also on curved CT specimens which simulated, to some extent, stress conditions in the pipeline wall loaded by internal pressure. Examination of R curves for flat (straightened) and curved CT specimens showed that besides differences in the slope of the curves and a lower position of the R curve in the J - Δa diagram for curved CT specimens the fracture toughness parameters $J_{0.2}$ and J_m for curved CT specimens were smaller by less than 3% as compared to flat CT specimens. Moreover, we have also performed basic stress - strain tests on straightened, and non - straightened tensile specimens taken from L360NB steel pipe of 530 mm in diameter and 8.6 mm in thickness, the specimens being oriented circumferentially. Examination of the stress - strain diagrams for straightened and non-straightened tensile specimens showed that press straightening does not influence the behaviour of steel above the yield stress, including the U.T.S., since the stress - strain curves practically coincide above the yield stress. The only change, induced by straightening, is removing of the Lüders region and subsequent change in the magnitude of the yield stress.

**Přednáška koná ve čtvrtek 7. listopadu 2019 v 10:00 hodin
v malé zasedací místnosti ÚTAM v Praze na Proseku, Prosecká 76.**