

Effects of Weld Metal Composition on Preferential Weld Corrosion in Low-Conductive Media

Zehbour Panossian^{1,4}, Juliana L. Cardoso², Marcos L. Henrique², Rodrigo da S. Marques², Petronio Zumpano Junior³, Ilson P. Baptista³

¹ *Institute for Technological Research – IPT, Avenida Professor Almeida Prado, 532 - Predio 53, Cidade Universitaria - CEP:05508-901 - Sao Paulo - SP*

² *Support Foundation of IPT – FIPT, Avenida Engenheiro Heitor Antônio Eiras Garcia, 448 - Conj. 21, Jardim Esmeralda - CEP:05588-000 - Sao Paulo - SP*

³ *Petrobras - CENPES, Avenida Horácio Macedo, 950 – Cidade Universitária CEP:21941-915 – Ilha do Fundão – Rio de Janeiro - RJ*

⁴ *Polytechnic School of the University of São Paulo, Avenida Professor Mello Moraes, 2463, Cidade Universitária - CEP: 05508-030 – Butantã, São Paulo - SP*

zep@ipt.br

Abstract

This work is part of a research program investigating preferential weld corrosion in welded joints. The purpose of this study is to present the contributions of an extensive literature review and the main results obtained for 79 girth welds tested. The literature review revealed that preferential corrosion of welded joints depends on, among other things, the media and exposure conditions, the composition of the base metal and filler metal, and the welding process. Of these, the medium and exposure conditions play an essential role: to apply any criteria for the appropriate selection of the base metal and filler metal, it is crucial to know the characteristics of the medium and exposure conditions. The best-known criteria cited by the literature for predicting the galvanic behavior of a welded joint were based on tests conducted in high-conductivity media and non-conductive to forming a protective layer of carbonates. For the low conductivity media, which is the focus of this work, no consolidated criteria for mitigating preferential corrosion of welds were found in the literature consulted. The tests and analyses carried out in this project have verified that, in low conductivity media, preferential corrosion resulting from the formation of a galvanic pair is limited to a range of 200 μm in the vicinity of the fusion line. The delta criterium, accepted in the literature for high conductivity media, is capable of reliably predicting only the cathodic character of the MS of a welded joint in low conductivity media.

Keywords PWC, condensed water, dragged water, gas pipeline, galvanic corrosion

References

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