Evaluation and Simulation of HTHA Damaged Specimen using UT Advanced Techniques

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High Temperature Hydrogen Attack (HTHA) is a well-known phenomenon that impacts the design, operation, and maintenance for syngas production facilities (e.g. hydrogen and carbon monoxide plants). Material selection and inspection are driven by an API document API 941, that recently evolved after Tesoro accident. The new rules have highlighted the need to adapt inspection with more advanced NDT methodology, enabling to detect the early stage of HTHA, then supporting a Fitness For service approach. This paper makes an overview of various projects funded by MTI regarding the assessment and improvement of the performance of such UT advanced NDT for HTHA detection, by means of NDT simulations in CIVA software after a detailed metallographic review and statistical modeling of material inclusions and HTHA damage distributions of field samples. HTHA damage inputs and comparisons between experimental and simulated UT images are very satisfying for different damaged samples (different levels and types of damages, especially for welded samples), different UT acquisition settings and different inspection frequencies. The unprecedented use of HTHA damage laws and NDT simulations of material defects and HTHA damage are very promising tools which is then used to assess the limits of existing NDT and to define optimized probes and procedures which rely on advanced ultrasonic examinations. Keywords: HTHA Damage, Advanced UT Inspection, NDT Simulations and Acquisitions, CIVA Software