

Mechanical Properties Study of HDPE Wall Pipes Exposed to Sulfuric Acid and Toluene-Methanol Mixture: Comparison Between Filament and Standard Specimens

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Abstract : In this paper, results of two experimental studies are presented and compared. They concern the evolution of mechanical properties through the wall of a HDPE pipe used to transport natural gas. In the first study, specimens filaments (ISO 3341) machined in the form of continuous and uniform chips are used, while the second considers standard shapes according to ISO 527. Both approaches have shown that there is a significant variation in the mechanical properties through the tube wall from the outer side towards the inner side. The filament method is quicker and easier in preparation compared to the second method which comprises complicated machining operations. Immersion in aggressive environments such as sulfuric acid and toluene-methanol showed degradation of major properties. The mechanical properties obtained with the filaments are generally greater (between 6% and 14% higher), but in the case of H₂SO₄, the difference can reach up to 32% in comparison with control samples. The linear relationship between E and ν_y is preserved in those oxidative environments indicating the usefulness of HDPE filaments testing

Keywords : polyethylene, Pipe, mechanical properties, pipe wall, aggressive environment, degradation