

Estimated life time in an HDPE pipe with a semi-elliptical defect under internal pressure

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Abstract: High density polyethylene has been widely used in marine and gas transportation, storm sewers, culverts and city drainage system. Compared with other conventional pipes, it has its own advantages, such as, chemical and corrosion resistance, toughness, flexibility, easy splicing and consequent easy handling and installation. In this paper, and in order to predict the remaining lifetime of a pipe having a defect and subjected to internal pressure, it is necessary to estimate KI stress intensity factor during the propagation of the crack. The finite element method is used to assess the values of the stress intensity factor of an axially oriented semi-elliptical crack located at the inner surface of an HDPE pipe. The crack configuration is described by the relative wall thickness (t/R), the relative crack depth (a/t) and the crack aspect ratio (a/c). The lifetimes presented are discussed according to the size of the crack and the stress intensity factor in each case.

Keywords : HDPE pipe, Crack, rupture, Finite Element Method FEM, stress intensity factor, Lifetime