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Test Method

Residual stress in polyethylene pipesJan Poduška^{1,2}, Pavel Hutař¹, Jaroslav Kučera³, Andreas Frank⁴, Jiří Sadílek³,Gerald Pinter⁵, Luboš Náhlík⁶¹Institute of Physics of Materials, Žižkova 22, 616 62 Brno, Czech Republic²Brno University of Technology, Technická 2, 616 69 Brno, Czech Republic³Polymer Institute Brno, Tkalcovská 36, 656 49 Brno, Czech Republic⁴Polymer Competence Center Leoben GmbH, Roseggerstrasse 12, A-8700 Leoben, Austria⁵Montanuniversitaet Leoben, Otto-Glöckel Str. 2, A-8700 Leoben, Austria⁶CEITEC IPM, Institute of Physics of Materials, Žižkova 22, 616 62 Brno, Czech Republic**Abstract**

This paper deals with residual stress in polyethylene (PE) pipes as an important factor that influences their lifetime. Residual hoop stress distribution in a PE pipe was determined using a methodology previously carried out by the authors on polypropylene pipes. Axial residual stress magnitude was determined by comparison of experimental data and finite element modelling. Based on the obtained results, a new simplified methodology for determining the residual hoop stress is proposed. The method needs only one circular specimen made of pipe, but, unlike older methods, provides a more precise estimation of residual hoop stress distribution taking into account its exponential shape. Some older results from literature are recalculated using this method and residual hoop stress of various PE pipe grades and dimensions are then compared. To provide an idea of residual hoop stress influence on lifetime of a pipe, a lifetime estimation is carried out for the examined pipe.

Keywords

polyethylene pipe, residual stress, ring slitting method, lifetime estimation

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