

## **PE pressure pipes made from PE 100-RC – Design and calculation of gas- or water pipelines for a minimum service life of 100 years**

Sven Nonhoff (speaker), Dr. Joachim Hessel,  
HESSEL Ingenieurtechnik GmbH

The relevant failure modes for PE pipes under service conditions are brittle fractures throughout stress cracking or thermal aging. The material developments of the last years show a continuously increasing stress cracking resistance. The latest PE materials (PE 100-RC) make it impossible to test with the standard test “pipe under internal pressure”. The solution to this problem is the FNCT, which delivers reliable results in reasonable test periods<sup>1,2</sup>. PE 100-RC materials show 300-400 times longer test intervals than standard PE materials. Out of this it is obvious that thermal aging becomes the relevant failure mode. Latest investigations concerning thermal aging show an activation energy of 80-90 kJ/mol<sup>3</sup>. Taking into account this results a service life of over 100 years for PE 100-RC materials is verified.

The aforementioned findings allow to generate new creep rupture curves for PE 100-RC materials.

<sup>1</sup> Brittle fracture the vital factor, James McGoldrick (Borealis), Mats Bäckman (Borealis), Markus Haager (Agru Kunststofftechnik GmbH) und Joachim Hessel (HESSEL Ingenieurtechnik GmbH), 3R

<sup>2</sup> FNCT ein vielseitiges und nützliches Werkzeug bei der Entwicklung von HDPE-Werkstoffen, H.-F. Enderle (Lyondellbasell), Vortrag GfKORR/FGK, März 2009, Darmstadt

<sup>3</sup> Thermal ageing of PE 100 pipes for accelerated lifetime prediction under service conditions, H. Vogt (Lyondellbasell), H-F. Enderle (Lyondellbasell), U. Schulte (Lyondellbasell), J. Hessel (HESSEL Ingenieurtechnik GmbH), Plastic Pipes XIV, Budapest 2008