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The water pressure test according to the stress test method

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Qualität.

High pressure tests on pipelines increase the service life and reduce risk. The stress test is a special form of the water pressure test. As a genuine strength test and loading trial it is intended to stress all pipes of a pipeline up to near the actual yield point without exceeding the permissible strain in the weakest, but fault-free pipes. In contrast to most other testing methods, the stress test is used both for the examination as well as for the improvement of a pipeline and increases the reliability and economic efficiency.

Faults in pipelines must be detected and remedied promptly before they cause any damage. In many cases damage would have been avoidable through prompt information or through a predictive test along the lines of the stress test.

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During the stress test, a pressure as high as possible is applied without impermissible deformation arising. All pipes should be subjected to at least a load of 85% of their yield point to pass beyond the proportionality limit. To determine these parameters, the actual strength characteristic values of the pipes, found during the course of the acceptance test, are statistically evaluated.

Through this pressure test existing impermissible fault locations are eliminated if loads close to the tensile strength occur at their edges. Yielding sets in particularly at their tips and at the locations with high stress concentrations due to the high internal pressure load.
With a fault location, which is positioned above the rupture line, this leads to the failure of the component.
With less significant fault locations it leads to negative pressure prestresses during pressure relief, which means that at the operating pressure, pressure stresses are present at the crack tip which reliably prevent crack enlargement.
The remaining fault locations in the pipeline are therefore repaired.

TÜV Industrie Service GmbH
TÜV SÜD Gruppe
Bereich
Anlagentechnik
Westendstraße 199
80686 München
Deutschland

Telefon: (0 89) 57 91-18 58
Telefax: (0 89) 57 91-18 61
Internet: www.tuev-sued.de

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With shape deviations such as ovalness, edge offset and bulges the stress concentration factors to be considered are reduced to values of two if ovalness and bulges are reduced by the high pressure test. The service life for pipelines subject to changing loads is therefore decisively lengthened.

The high pressure test leads to the reduction and displacement of stresses. The unevenly distributed residual stresses are superimposed by the stresses due to the pressure test and lead to less plastic deformation and therefore to stress reduction at the operating pressure. Due to the hoop stresses applied during the stress test, the residual stresses in components are relieved, similar to stress relief annealing, to 10 to 20% of the yield point.

Due to the stress test, the yield point of soft pipes is raised similar to cold forming, so that after the test is terminated the pipeline exhibits approximately uniform strength properties and the actual strength at each part subjected to pressure has been proven. This represents an important criterion for a later increase of pressure on pipelines.

The stress pressure test on pipelines represents economical quality assurance and quality improvement and, through the prevention of shape deviations due to the reduction of residual and laying stresses and due to the elimination of faults and the improvement of the operating behaviour of the remaining fault locations, leads to an increase in the service life and therefore to an increase in the reliability and economic efficiency of pipelines. The stress test is currently the only test method which itself eliminates dangerous fault locations. It is therefore also known as an intelligent test method.