Materials Research Innovations ›
Volume 19, 2015 - Issue sup5: Global Conference on Materials Science and Engineering (CMSE 2014)

Research Papers

Research on burst pressure for thin-walled elbow and spherical shell made of strength differential materials

L. Yan, Z. Junhai, X. Ergang & C. Xueye

Pages S5-80-S5-87 | Received 20 Oct 2014, Accepted 12 Dec 2014, Published online: 30 May 2015

Download citation https://doi.org/10.1179/1432891715Z.0000000001340 Check for updates

Abstract

This paper derived the computational formulae of burst pressure for thin-walled elbows and thin-walled spherical shells with arbitrary curvatures, using the finite deformation theory and the unified strength theory, and considering the intermediate principal stress, the strength disparity effect of materials and the strain-hardening effect. The quantitative relationship between the burst pressure of thin-walled elbows and thin-walled spherical shells was obtained as well. Additionally, this study analysed how the strain-hardening index, the thickness/radius ratio, the curvatures of elbows, the strength disparity effect of materials and the intermediate principal stress affected the burst pressure of thin-walled elbows and thin-walled spherical shells and the burst pressure ratio. The deduced formulae provide the solution for burst pressure with different yield criteria, which is of wide applications and guidance for security design and integrity assessment of thin-walled pressure vessels.

Keywords: Unified strength theory | Thin-walled elbow | Thin-walled spherical shell | Burst pressure | SD effect | Intermediate principal stress

Previous article | View issue table of contents | Next article

Related research

Recommended articles | Cited by 3

Burst pressure of perforated-steel strip composite pipe

Qiang Q. Shao et al.
Ships and Offshore Structures
Published online: 6 Apr 2021

Residual strength of corroded subsea pipelines subject to combined internal pressure and bending moment

Mohd Hairil Mohd et al.
Ships and Offshore Structures
Published online: 24 Jul 2015

Condition assessment of damaged elbow in subsea pipelines

Geon Ho Lee et al.
Ships and Offshore Structures
Published online: 22 Jan 2016

View more