

Article Abstract

Title:	Minimization of material volume of three layer compound cylinder having same materials subjected to internal pressure
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Abstract:	A thick cylinder storing fluid with large internal pressure has second order non-linear variation in the hoop stress across the wall. Utilization of material of the cylinder is not up to its full capacity. For more uniform hoop stress distribution, compound cylinders are formed by shrinkage process where outer cylinder is heated until it will slide freely over inner cylinder thus exerting the required shrinkage pressure on cooling. Using the calculated shrinkage pressures between two contacting cylinders, it is possible to reduce the hoop stress and make it more or less uniform over the thickness. This paper introduces the methodology for minimization of volume of shrink-fitted three layer compound cylinder and to get equal maximum hoop stresses in all the cylinders. The analytical results are validated in comparison with FEM in ANSYS Workbench. Both the results agree with each other. Thus methodology can be applied to multi-layer compound cylinders used in real-world applications.
Keywords:	multi-layer cylinders, hoop stress, residual stress, shrink fit, shrinkage (contact) pressure, optimum design.