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Evaluation of Longitudinal and Hoop Stresses and a Critical Study of Factor of Safety (FoS) in Design of a Glass-Fiber Pressure Vessel

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Abstract : The design, manufacture, and operation of thin-walled pressure vessels must be based on maximum safe operating pressure and an adequate factor of safety (FoS). This research paper first reports experimental evaluation of longitudinal and hoops stresses based on working pressure as well as maximum pressure; and then includes a critical study of factor of safety (FoS) in the design of a glass fiber pressure vessel. Experimental work involved the use of measuring instruments and the readings from pressure gauges. Design calculations involved the computations of design stress and FoS; the latter was based on breaking strength of 55 MPa for the glass fiber (pressure-vessel material). The experimentally determined FoS value has been critically compared with the general FoS allowed in the design of glass fiber pressure vessels.

Keywords : thin-walled pressure vessel, hoop stress, longitudinal stress, factor of safety (FoS), fiberglass
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