STRESS ANALYSIS AND EXPANSION VOLUME IN TOROIDAL TANK CROSS SECTION OVAL WITH LOADS OF INTERNAL PRESSURE

By :

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ABSTRACT

In order to reduce the Public Service Obligation (PSO/Subsidi) on oil fuel, the government of Indonesia proposed to convert oil fuel to gas fuel (LPG) for passenger cars. To support this program, studies are needed to develop technology in combustion system. One of the systems is storage tank that must be carefully designed to avoid burst type failure. Some previous research shows that circular cross-section toroidal tank can withstand higher limit pressure than an equivalen cylindrical shape. In this research, studies of the pressurized toroidal tank is extended for oval cross-section that might be needed because of space restriction. The toroidal tank will be placed on the position of spare wheel of a passenger car. Membran theory of toroidal shell shows that the higher the radius ratio (R/r) the higher the limit pressure, however the corresponding volume become small. To cater for this, geometry optimation was performed and radius ratio of 3.4 was obtained based on circular cross-section. Studies on the influence of ovality on limit pressure were then extended and the results shows that ovality of 0% (circular cross-section) withstand highest limit pressure both for in-plane and out-of-plane ovality i.e., 1.089 times pressure to yield (p_y). Corresponding volume expansion was 0.238%.

Keywords : toroidal tank, limit pressure, ovality