Stress and strain state of the solid-propellant rocket engine charge fastened to the orthotropic body

© V.P. Pechnikov

Bauman Moscow State Technical University, Moscow, 105005, Russia

The article considers joint deformation of the rocket engine body with fastened charge of the solid-propellant rocket engine exposed to the internal pressure and temperature change. Cylindrical frame of the engine is examined as orthotropic non-propulsive shell while solid charge is a thin-walled tube made of linearly-elastic isotropic material. Stress and strain state of the engine body — charge system is defined for the joint deformations in the longitudinal and radial directions.

The presented analytical solution aims the evaluation of contact pressure in the points of attachment of the engine body and solid charge. The examples of calculations are provided.

It is shown that modifying the rigidity characteristics of the shell in the longitudinal direction leads to a significant change in the nature of deformation of the system. Therefore, taking into account the rigidity characteristics is a prerequisite for reliable evaluating the strength of the engine shell — charge system, as in force, and at a temperature exposure.

Keywords: *Solid charge, orthotropic non-propulsive shell, internal pressure, temperature, stress and strain state, coefficient of thermal expansion, contact pressure.*

Pechnikov V.P. graduated from Bauman Moscow Higher Technical School in 1961. Ph.D., Assoc. Professor of the Spacecraft and Launch Vehicles Department of Bauman Moscow State Technical University. Author of more than 40 scientific papers. Expert in the field of structure mechanics of shell. e-mail: pechnikov@m1.sm.bmstu.ru