PRESSURE VESSELS AND PIPE COMPONENTS STRENGTH UNDER LOW-CYCLE LOADING

A. P. GUSSENKO

Mechanical Engineering Research Institute,
4, Griboedov Street, Moscow, Centre, U.S.S.R.

SUMMARY

New design methods of pressure vessels and pipe components strength under low-cycle loading are developed. Calculations and experimental data for bellows and large diameter pipes stress-strain states are made. Numerical solution for beyond yield point cyclic loaded bellow is used. Also there are small based strain gages for large deformations measurements and photoelastic models used. In the latter case for defining of stress and strain concentration factors in maximally loaded zones beyond yield point the Neuber rule is involved.

With the use of the worked out test systems and methodiques there are obtained experimental data for natural components low-cycle strength (such as pipes under internal pressure, bellows and metal sleeves under axial tension—compression and bending).

Components low-cycle strength calculations are carried out on the basis of the deformation—kinetics criteria. They are based on the calculated and experimental data on the components local stresses with cycle-by-cycle deformation kinetics taken into account and are made with the use of low-cycle deformation and failure resistance characteristics of the component material.

The worked out design methods of internal pressure pipes, bellows and metal sleeves low-cycle fatigue are in good accordance with the experimental data found in components tests.