

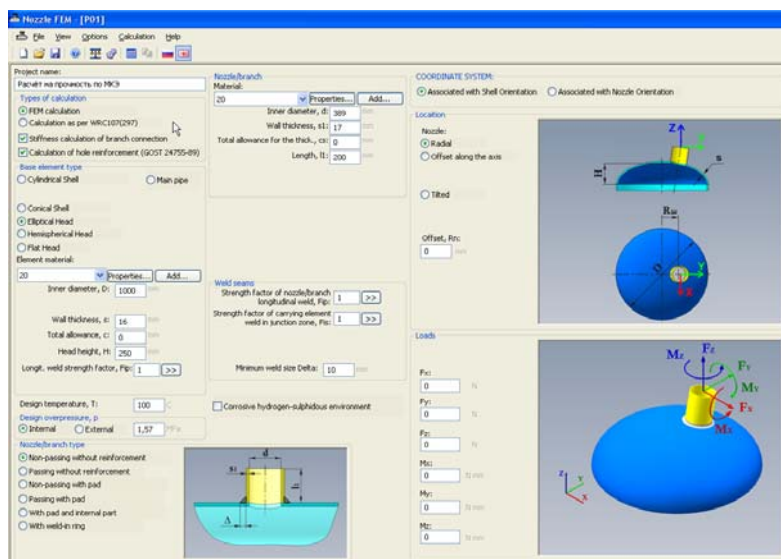


NOZZLE — FEM

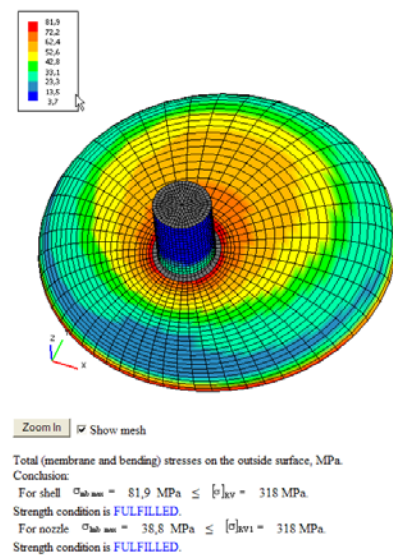
Analysis of stresses, flexibility and allowable loads of nozzle-shell junctions

Nozzle-FEM is designed for stresses and flexibility calculation of nozzle-shell junctions using the Finite Element Method (FEM). The program also calculates allowable loads on the apparatus' nozzles and estimates operability of the nozzle-shell junctions for wide range of geometric configurations and operating conditions. Nozzle-FEM helps to provide higher level of the equipment safety along with reducing labour costs at the design stage. The program is recommended for designing and industrial safety review of oil and gas, refining, petrochemical, chemical, power and other industrial facilities.

Unlike the universal FEM programs (ANSYS, NASTRAN, COSMOS, etc.), this program does not require special training and can be used by any mechanical engineer. Creation of finite element mesh and estimation of calculation results are performed automatically. FEM calculation, as opposed to semi-analytic methods (i.e. WRC 107/297, GOST P 52857.9-2007, etc.), expands the program application range and increases analysis accuracy.



Input data and structure parameters window



Fragment of calculation results

The program performs stress analysis for nozzles of arbitrary geometry connected to cylindrical and conical shells, as well as elliptic, hemispherical and flat heads. It takes into account vessel boundary restraints and loads on the nozzle from the adjacent pipeline. Both nozzle and shell membrane, bending and total stresses can be calculated. Calculation of the pipe cut-in connections is also implemented, enabling detailed stress analysis of non-standard tees and stub-ins within the pipelines.

Along with stress and stability analysis the program also performs nozzle-shell junction flexibility calculation, as this flexibility can considerably influence vessel and piping stresses. During stress analysis of pipeline systems nozzle-vessel junctions are often simulated by anchor supports which leads to overestimation of stresses and tensions. In order to automatically create the appropriate non-standard support in the calculation model, the nozzle-shell junction flexibility calculated by Nozzle-FEM can be copied via the clipboard into the START piping stress analysis program.

Calculated stresses can be estimated using different codes. Current version follows GOST R 52857.1-2007 or PNAE G-7-002-86 (for equipment and pipelines of atomic power plants) for allowable stresses. Shell stress and stability analysis (according to GOST R 52857.2-2007 or GOST 14249-89) is also implemented, as well as reinforcement required of openings under internal pressure (GOST R 52857.3-2007 or GOST 24755-89). Nozzle-shell junctions working in corrosive hydrogen sulphide environment are analysed in accordance with GOST R 52857.10-2007.

Besides finite element method calculation, the program supports CIF and flexibility calculation via semi-analytic methods according to WRC107-79, WRC297-87 (Welding Research Council Bulletins No. 107, No. 297 "Local stresses in spherical and cylindrical casings caused by the external loads") and BS5500-76 (British standard).

The program runs in Windows 9x/2000/XP/Vista.