INTERGRAPH®

BENEFITS:

- Improved WRC 107/297 analysis for nozzles and attachments.
- More accurate analysis on saddle supports (Zick).
- More accurate design and analysis.
- Better analyses of components in cyclic service.
- More cost-effective designs.
- Reduced design changes and iterations.
- More accurate nozzle-loading conditions.
- More accurate allowable loads on nozzles.

FEATURES:

- Analyze components outside code limits.
- Calculate more accurate SIFs and k-factors.
- Use FEA results in PV Elite® and CAESAR II®.
- Perform rigorous FEA of special components:
    - Hillside nozzles.
    - Nozzles on heads.
    - High-temperature analysis.
    - Basic FFS evaluation.
    - Nozzles with attached piping.
    - Complex loading conditions.
    - Saddles, pipe shoes, and clips.
- Access a complete material properties database.
- Support axisymmetric and brick models.
- Create tabular and graphical result reports.
- Generate fatigue calculations.

PAULIN RESEARCH GROUP NOZZLEPRO™ FOR INTERGRAPH® PV ELITE® AND CAESAR II®

NozzlePRO is a standalone solution that enables users to quickly and easily perform Finite Element Analysis (FEA) of individual pressure vessel and piping components. Engineers can perform FEA without the need for extensive knowledge of FEA modeling or analysis techniques.

Proven Track Record

NozzlePRO is easy to use and its interactive graphics provide clear and intuitive guides. Take the guesswork out of building the design model and benefit from on-the-fly plotting of the analysis model for verification. NozzlePRO quickly generates analysis results in graphical and tabular formats and clearly represents system pressures, moments, temperatures, and loads. A powerful interactive toolbox enables you to dissect and manipulate models.

NozzlePRO from Paulin Research Group is available for purchase from Intergraph®.

Integrate FEA with CAESAR II and PV Elite

Since NozzlePRO enables FEA results to be seamlessly incorporated within traditional code-based analysis, projects can benefit from the accuracy of FEA and the practicality of code-based analysis. For example, the flexibilities and SIFs analysis results can be easily combined with Intergraph's CAESAR II or PV Elite to improve the overall analysis of piping systems or vessels so they are neither over- nor under-designed.

Extend Beyond Code-Based Analysis

NozzlePRO can analyze components that fall outside code limits. It can also calculate more accurate maximum allowable loads and stresses. Therefore, it is able to accurately establish consistent safety factors for analysis. These more accurate results lead to improved efficiencies in design and help increase the life span of piping systems and associated equipment.

Quickly Build Accurate Analysis Models

Component input is quick and straightforward while also allowing customization of the mesh and boundary conditions. For even more accurate evaluation of loads and displacements on the nozzle and in the piping system, users can pipe away from a piping junction on a vessel head or cylinder to evaluate the effect of the thermal expansion on a nozzle. Straight sections, elbows, bends, intersections, and linear restraints may all be included in the nozzle analysis.

Results and Analysis Based on Research

Realistic flexibilities in a nozzle typically result in much lower stresses (higher allowable loads) on nozzles. The original design code SIF values for intersections were derived from work performed in the 1940s by A.R.C. Markl. Most of these experiments were performed on a single-size piping run. All other SIF values were extrapolated from this piping run.

The SIF values in NozzlePRO are based on the testing done by Markl plus many real-world and finite element calculations performed since those original tests. This means NozzlePRO provides the most comprehensive evaluation of SIFs and K-factors for nozzle connections to date.

Industry-specific FEA Analysis

A distinguishing feature of NozzlePRO compared to general purpose FEA solutions is that it performs automated code compliance reports for ASME Section VIII – Division 2 stress categories. This saves you time because there is no need to perform additional post-processing or compliance checks.

Why Use Nozzle Pro?

NozzlePRO can be used in a variety of tasks. The software provides extra value and accuracy to help you:

- Analyze stress of nozzles or evaluate allowable loads on nozzles that:
  - Have multiple thermal or operating loads.
  - Are in cyclic service.
  - Fall outside code limits.
- Deal with pad-reinforced nozzles.
- Perform FEA when pad-reinforced lugs, clips, or other support are placed on the knuckle radius of a dished head.
- Analyze horizontal vessels with saddle supports (such as the Zick replacement).
- Accommodate ASME Section III, Part NH requirements (high-temperature service).
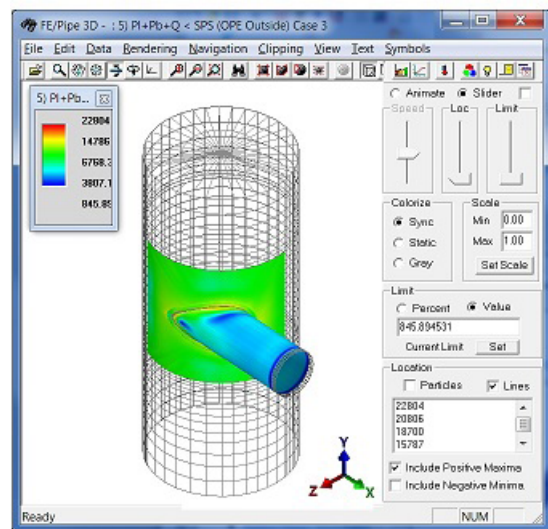- Perform a quick, somewhat conservative FFS analysis (API 579).

- Evaluate overturning moments on vessel skirts.
- Determine the effect of an integral vs. non-integral pad on a nozzle located on a head.
- Design pipe shoes for self-weight, liquid weight, and axial loads.

Technical Specifications

- Microsoft® Windows®-compatible.

Application Areas

Process and Plant Design, Piping, Vessels, Exchangers, Tanks (Nozzles), Equipment, Steelwork, Petrochemical, Chemical, Power, Offshore, Food, Beverage, Brewing, Pharmaceutical, Water Treatment, Building Services, Shipbuilding, and Architectural.

Easily add FEA accuracy to your models and analysis with NozzlePRO.

ABOUT INTERGRAPH

Intergraph helps the world work smarter. The company's software and solutions improve the lives of millions of people through better facilities, safer communities and more reliable operations.

Intergraph Process, Power & Marine (PP&M) is the world's leading provider of enterprise engineering software enabling smarter design and operation of plants, ships and offshore facilities. Intergraph Security, Government & Infrastructure (SG&I) is the leader in smart solutions for emergency response, utilities, transportation and other global challenges. For more information, visit www.intergraph.com.

Intergraph is part of Hexagon (Nordic exchange: HEXA B; www.hexagon.com), a leading global provider of design, measurement, and visualization technologies that enable customers to design, measure and position objects, and process and present data.