# Multi-Nozzle Designs Made Simple

# PVPTPro™

## The Ultimate FEA Program For Nozzles

| | |
|---|---|
| | 1.5000 |
| | 1.2162 |
| | 0.93250 |
| | 0.64875 |
| | 0.36500 |



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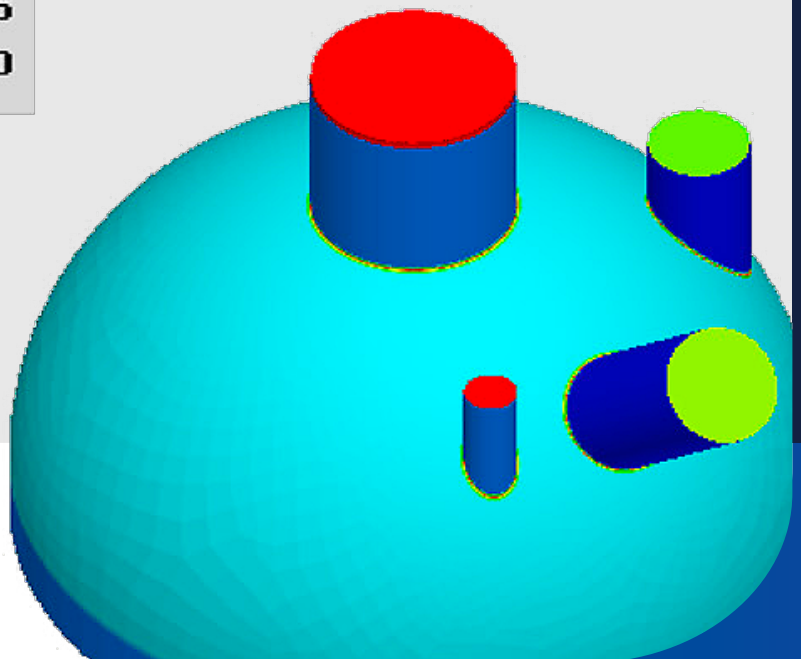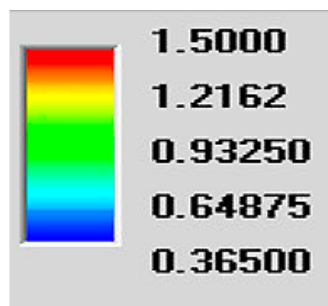
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# PVPTPro™

## Go Beyond the Limits of WRC Calculations!
## Finite Element Analysis For Loadings on Multiple Nozzles

PVPTPro allows users to design ASME code-compliant models with multiple nozzles, spaced or tightly clustered and with or without pressure and external loads. The program uses a finite element analysis approach with **8-noded shell elements** to properly solve code concerns where most common methods come up short.

Through FEA, vessel designers and engineers **gain a comprehensive tool for stress analysis** that outperforms other methods like WRC 107, WRC 297, WRC 537, and STP-PT-074.

You can easily model clustered nozzle designs on a **variety of shells**, including:
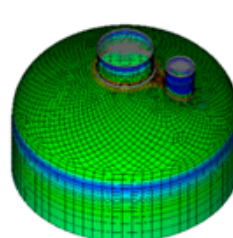
- Flat heads
- Hemispherical heads
- Dished/Torispherical heads
- Elliptical heads
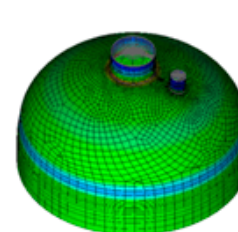- Cylindrical heads
- Conical heads
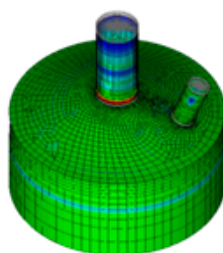


Flat Heads | Hemispherical Heads | Dished/Torispherical Heads | Elliptical Heads

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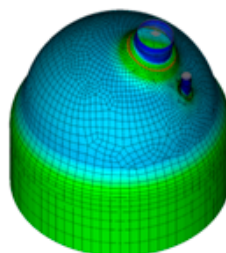
# Software Capabilities of PVPTPro™

## Perform Proper Stress Calculations

All pressure vessels have nozzles, and all nozzles are subject to some sort of external load. Often, this can be overlooked during initial design, and what's more, the supported methods that have been published can be limiting in their scope. **With PVPTPro, calculations are provided to help you determine proper stresses, stress categories, and allowable stresses.**

A finite element analysis can handle external loads due to attached piping as well as internal pressure simultaneously. Whereas WRC calculations are limited to providing stresses to a few points, PVPTPro visibly demonstrates stress throughout the entirety of the model.

The WRC methods rarely provide insight about acceptability criteria, but PVPTPro categorizes the stresses and compares them to the allowables as required for ASME Section VIII, Division 2 Part 5 Code Compliance.

## Analyze Multiple Nozzles Simultaneously

PVPTPro allows you to simultaneously account for the **effect of pressure and external loadings on two or more nozzles.**

You can quickly design and perform FEA on more complicated models with expanded geometric permutations and accurately account for all the nozzles impacting your pressure vessel's design, including:

- Straight
- Pad-Reinforced
- Heavy Barrelas

What's more, nozzles can be located anywhere on the shell, including:

- Center of the head,
- Offset from the center, and
- Titled

Account for the interaction between the pad and nozzle, as well as the interaction of the pad to the shell weld, instantly!

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## Nozzle Analysis, Stress Calculations & More

Additionally, PVPTPro™ provides a variety of other features and capabilities to automate and create efficiency for pressure equipment design and analysis like:

- An easy-to-use interface that includes data fields that are linked to graphical representations clarifying every diameter, thickness and offset values.

- Automatic code compliance reports based on the Design By Analysis portion of the ASME Section VIII, Division 2 (VIII-2), Part 5 for linear-elastic analysis.

- Temperature and pressure load evaluations with input options at multiple points across the model.

- Automatic stress categorization that includes a comprehensive comparison against the allowable stresses shown in the Hopper Diagram from ASME VIII-2, Figure 5.1.

- Easy primary, secondary and fatigue evaluations with the click of a button.

- Data reports in an easy-to-read format that can be exported to Excel, as a PDF or an HTML file.

## How PVPTPro Simplifies Nozzle Design & Analysis

PVPTPro compliments our other suite of design and analysis products like NozzlePRO and FEPipe.

For example, while NozzlePRO supports and analyzes multiple loading options and a variety of host types and sizes, it is designed to support one nozzle or attachment at a time. PVPTPro can analyze multiple nozzles at a time.

And while ASME Section VIII Div 1 and 2 provide methods for evaluating multiple nozzles under pressure loading, it fails to provide explicit guidance on multiple nozzles under external loads. PVPTPro solves this problem (make this bold).

By design, PVPTPro is not limited by certain pressures or a single nozzle. Instead, it allows users to quickly design and perform FEA on more complicated models with expanded geometric permutations without having to pull in various design tools or applications.

So, when you need to fill in the gaps of Div 1 and Div 2 Design By Rule guidelines, PVPTPro can help you evaluate multiple nozzles under pressure loading as well as multiple nozzles under external loads.

*To learn more about designing and analyzing multiple-nozzle geometries, connect with our team of experts at sales@paulin.com or visit our website.*

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