

Formulas for calculating maximum pressures (MAWP, MAP)

Considerations regarding the calculation of the maximum pressures for a component.

Online version: <https://nextgen.sant-ambrogio.it/KB038150>

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One of the most frequently asked questions concerns the lack of formulas relating to maximum pressures (MAWP, MAP) in the calculation report of the components validated with NextGen.

NextGen cannot produce such formulas since the system for calculating these pressures is based on an iterative process, therefore a direct formula is not adopted.

The iterative process involves the following:

- the program assumes a maximum pressure, for example 100 MPa, and checks if the component is stable with this pressure
- if the component is stable, the pressure is doubled; if the component is unstable, the pressure is halved

This process continues with a series of doubling and halving until an acceptable pressure value is found.

For certain components, the standards provide a direct formula for calculating the maximum allowable pressure, generally this is an equation related to that for calculating the minimum thickness.

Nonetheless, time and experience have led us not to adopt these single equations because while it is true that they quickly return a pressure value, they generally do not take into account further checks that need to be conducted and which also affect the MAWP.

$$t = \frac{PD}{2 \cos \alpha (SE - 0.6P)} \quad \text{or} \quad P = \frac{2SEt \cos \alpha}{D + 1.2t \cos \alpha}$$

For example, for the conical section of a reducer the direct formula is available in ASME, but this completely ignores what happens to the knuckle, the flare and the junctions with the adjacent cylinders, returning only the maximum pressure of the straight section. NextGen instead calculates the maximum pressure of the entire cone, including joints, considering both the conical section and any bevels and joints.