# Expansion bellows on a DN 750 hot duct

A large-diameter line at 450–650 °C and below 0.5 bar: why bellows must be modelled as hinges, how fixed a "fixed point" really is, and how mitre bends change the stress picture.

## PROJECT DATA

| | |
|---|---|
| **Line** | DN 750 (OD 762 mm), mitre bends |
| **Temperatures** | 650 °C on the first section, 450 °C on the second |
| **Pressure** | Below 0.5 bar — outside the scope of the Pressure Equipment Directive |
| **Software** | Bentley AutoPIPE |
| **Scope** | Local check between two fixed points for the rerouting of the bend zone |

## KEY POINTS

- Never omit bellows from the model: they are hinges, and the line between them must be guided and supported.
- If bellows data are unknown, take no credit for axial absorption but keep realistic angular and lateral stiffness.
- Bound the behaviour of "fixed points" with at least two boundary assumptions.
- Model mitre bends with their actual number of cuts: their SIF and flexibility are not those of an elbow.

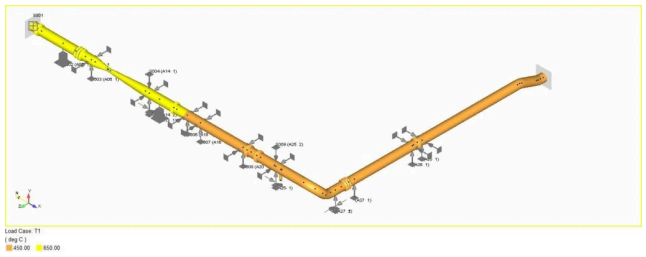


Fig. 1 — Operating temperatures: 650 °C section (yellow) and 450 °C section (orange), Bentley AutoPIPE.

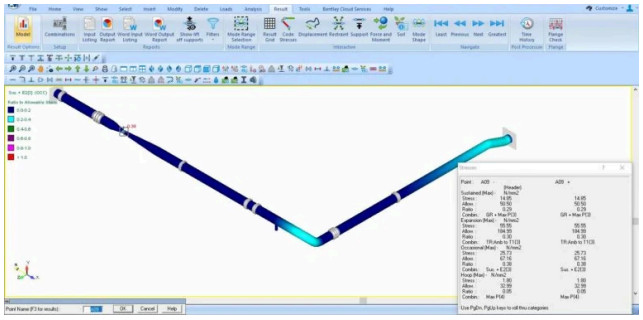


Fig. 4 — Code stress ratios: low everywhere except at the geometric bottleneck of the layout.

## OUTCOME

Despite the high temperatures, the stress ratios are low along most of the line. They rise only at the geometric and structural bottleneck of the layout — a natural weak point of this type of system — which became the focus of the recommendations for the new routing.



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