



Externally pressurized compensator

A district heating pipeline had to be able to absorb large axial movements and it was only possible to install one compensator. The solution was an externally pressurized compensator.

This compensator is installed in a major district heating pipeline in Germany where large movements occur and a need for draining exists.

The construction

This type of construction is a little atypical for a district heating installation but it is commonly used in other industries. The construction is used in cases where it must be possible to absorb very large axial movements in a single or a few compensators. In principle, there are no limits to the size of axial movement that can be absorbed by this type of compensator as it is possible to install as many bellows in sequence as necessary to compensate for the movement. In the specific situation, where the casing is subject to relatively strong load by the combination of diameter and pressure, it was decided to manufacture the casing of the stronger P355 steel instead of the more widely used P265, which minimised the compensator's net weight. Based on the customer's wishes, the media contacting layer in the bellows was manufactured in Inconel 625 quality, whereas the other layers were made of 316Ti. This makes it possible to achieve the high corrosion protection of Inconel 625 as well as higher cost efficiency.

Drain

To avoid corrosion it may be desirable to be able to drain the medium surrounding the compensator. Therefore, drains are often installed in the casing.

General information on externally pressurized constructions

In an externally pressurized compensator only the outer side of the bellows is subjected to pressure, while the inside of the bel

lows is only subjected to atmospheric pressure as this side is in direct connection with the atmosphere. This feature gives the compensator some special characteristics compared to a conventional compensator. Being able to compensate for a large axial movement normally requires a soft bellows with many waves. However, due to the balance between flexibility, stability and service life in a bellows, an internally pressurized bellows with sufficient flexibility/service life will, in certain situations, have insufficient stability and will therefore become unstable and buckle out. Where an internally pressurized bellows will become unstable due to the pressure, the pressure around an externally pressurized bellows will have a stabilising effect on the bellows, which makes it possible to achieve a construction with sufficient flexibility and service life after all. The main advantages of an externally pressurized compensator are:

- It can compensate for large axial movement with relatively low spring rate.
- Any aggressive condensates drain off the bellows before corrosion can occur.
- Through the inner sleeve a smooth flow over the compensator is achieved and thus pressure losses are minimised.
- The casing protects the bellows during transport and installation, which increases safety.
- Drain spigots in the casing make it possible to drain the pipeline following pressure testing.

Compensator data

Dimension: **DN 800** | Installation length: **2150 mm** | Design temperature: **+250°C** | Design pressure: **11 bar** | Medium: **Steam** | AX: **+400/-120 mm** | Weight: **1.3 tons** | Bellows: **1.4571** | Welding ends: **P235GH** | Inner sleeve: **1.4571** | Casing: **1.1106**

Further information

For further information about this project or on externally pressurized compensators in general, please contact your daily contact person. Information about our compensators is available on our website: www.belman.dk