PIPELINE INERTIZATION

Pipeline inertization

Inertization of the pipe is performed for

• ensuring of the non-explosive environment in the pipeline or
• due to the permanent suppression of the development of corrosion (conservation) of the inner surface of the pipeline.

Inertization can be performed after construction, before starting of operation, during shutdown or after the shutdown of the pipeline operation.

A specific way of inertization is removing of flammable media from the pipe using the pressure nitrogen mixture to ensure the non-explosive environment.

Principle of the inertization of the pipe

The principle of the inertization is filling in of the inner space of the pipeline by gaseous nitrogen mixture, respectively minimisation of the oxygen content in the space.

Gaseous nitrogen mixture

The nitrogen gas mixture is considered to be gaseous mixture of nitrogen and oxygen with oxygen concentration at the most 10%. The maximum value of the oxygen concentration was taken from the company standard of the largest oil transporter in the world, the company Transneft of Russia, which is generally regarded as the best practice and it allows performing the inertization of the pipeline transporting oil only by a mixture with this oxygen concentration.

Technological process of inertization

Technological process of inertization can be carried out in two ways

• multiple purging of the inerted pipe, respectively inerted space by gaseous nitrogen mixture,
• by pushing in the compressed gaseous nitrogen mixture into the pipeline under the simultaneous use of disc or cup pig as a dividing part between displaced media (e.g. crude oil, diesel, natural gas, air) and mixture; the pig is pushed through the pipeline using a nitrogen mixture and when moving ahead displaces from the pipeline the original media.

Production of gaseous nitrogen mixture directly on site

Company CEPS disposes a mobile generator N₂,1100 of its own design and construction for the production of gaseous nitrogen mixture producing nitrogen by the method of membrane separation from the atmospheric air that is compressed by the compressor.
This generator, developed and manufactured by CEPS in cooperation with Air Products Norway, is inbuilt in a standard container ISO.

In the generator is first of all from the compressed air eliminated the condensed water and dust by separators. The cleaned air is then after heating adjusted in the membrane separator, where it is from it—on the principle of different permeability of oxygen and nitrogen—partly removed oxygen.

The obtained nitrogen mixture with the optional nitrogen concentrations (90, 93 or 95%) and the pressure up to 14 bar is released through the pressure hoses into inerted pipes. Depending on the chosen nitrogen concentration is approximately half of the compressed air, enriched by the separated oxygen, discharged back into the atmosphere.

As for the performance the generator is designed for the conversion of the compressed air in quantities of 1,800 Nm³/h supplied by the modern mobile two-stage compressor AtlasCopco XRHS 506. The device is completely independent of the supply of electricity—the supply of electric power is provided by a built-in generator ENDRESS ESE40 DL-B.

Generator N₂,1100 respects the standard requirements of CEPS for mobility; the entire technology is built into 20-foot (6 meter long) container which is movable due to its size also by off road heavy trucks. This allows easy handling by truck crane and subsequent transport of equipment at considerable distances by trucks and even its easy deployment in the field conditions.

Use of technology of nitrogen production on site brings significant savings in setting up the building site and ensuring its transport services.

<table>
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<tr>
<th>Performance parameters of the generator N₂,1100</th>
<th>when using the compressor XRHS 506 as a source of the compressed air</th>
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<tbody>
<tr>
<td>nitrogen concentration in the produced mixture [%]</td>
<td>95   93   90</td>
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<tr>
<td>outlet pressure [bar]</td>
<td>14   12   9</td>
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<tr>
<td>quantity of produced nitrogen mixture [m³/h]</td>
<td>800  930  1,080</td>
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Deployment of technology is very flexible and time saving. This differs from the used gasification technology of liquid nitrogen dependent on the production and dangerous transport of liquid nitrogen using cryogenic tanks in the required quantity and time to the site, which in some European countries can be large, and sometimes also unsolvable problem. It also eliminates the need for technologically demanding process of gasification of liquid nitrogen on site.

The source of energy in the course of compressing the air and production of electricity are modern diesel engines meeting the current emission requirements called EURO 5.

**Practical application of the method of pipes inerting**

Pipe inertization by the gaseous nitrogen mixture produced by a mobile generator N₂,1100 was for the first time performed on the 100 km long oil pipeline DN 700 Polock–Ventspils in Latvia in 2011. From the referred part of the pipeline between pumping station Džūkste and the state border with Lithuania was in 2010 the crude oil removed. In 2011 was this part of the emptied pipeline decontaminated and filled in by nitrogen mixture at a concentration of nitrogen 95%. Subsequently, the pressure of the nitrogen mixture in the pipeline was increased to the value 3 bar due to monitoring of pipeline hermetic.

Thus produced nitrogen mixture was during 2012 inerted or emptied about 150 km crude oil pipelines DN 700 in the Czech Republic and Latvia for companies MERO and LatRosTrans. The longest independent section of inerted pipes was more than 130 km long of the pipeline between the Latvian port city of Ventspils and the pumping station Džūkste.

**About CEPS**

Founded in 1999, CEPS a.s., provides its clients with comprehensive servicing of pipeline systems for the transport and distribution of gases, crude oil, oil products and chemicals. The company offers pipeline cleaning and drying, stress tests and hydraulic pressure tests, pipeline rehabilitation, repair and refurbishment, assessment of the service life and reliability of pipeline systems, and other services.

CEPS has been certified by Det Norske Veritas under ISO 9001:2008, ISO 14001:2004 and under OHSAS 18001:2007. The company has been certified in the GAS system for work on gas installations and steel pipelines without any limitations on size and pressure. The company’s welding system has been certified under ISO 3834-2:2005. CEPS is a member of the prestigious professional organisations Czech Gas Association and Czech Association of Pipeline Contractors.