CORE LINEPIPE
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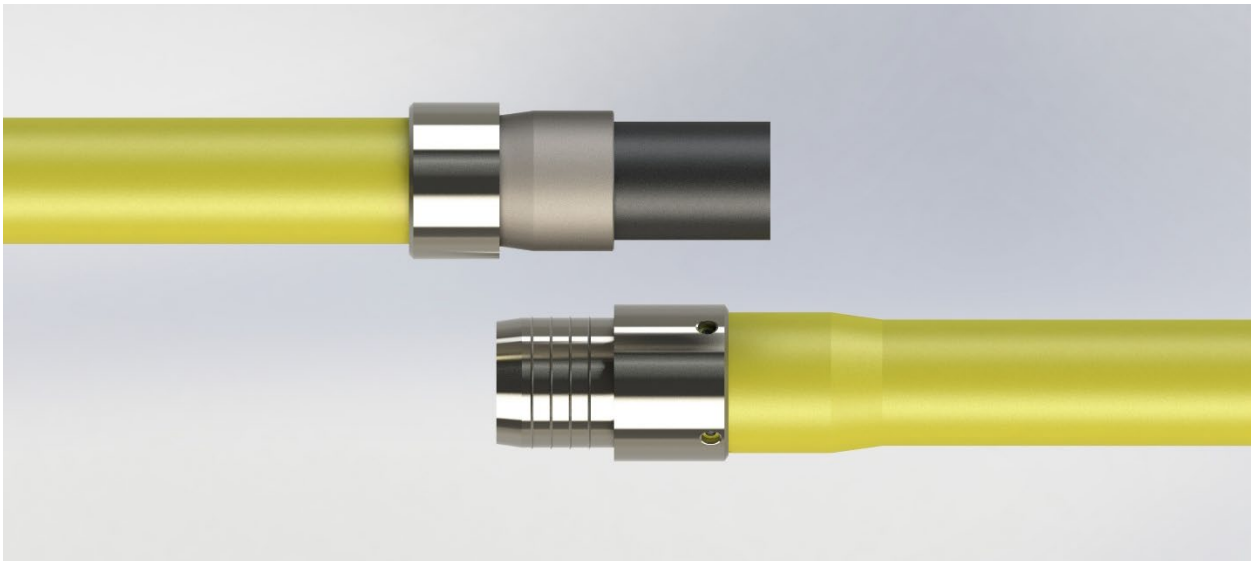
CORE Liner® Startup, Operation, & Shutdown

I. Background

CORE Liner® is a pipe-in-pipe system that utilizes an outer steel pipe for structural strength and an inner polymer liner pipe for corrosion resistance. The outer steel pipe is joined using the proprietary ClickWeld® joining system, eliminating steel welding in the field. The inner polymer liner is joined using electrofusion fittings. CORE Liner® combines the strength of carbon steel and the corrosion resistance of polymers.

Similar to other piping systems, CORE Liner® should be operated in accordance with the requirements of CSA Z662 and the applicable regulations.



II. Startup

After the pipeline has been hydrotested and commissioned, the routine start-up procedure of a CORE Liner® system should include a controlled and gradual flow increase to allow the pipeline to gradually adjust to the temperature and pressure of the operating fluid. It is recommended to have the pipeline vents open during the pipeline pressurization. The aim is to allow the gas that is present in the annular space to vent out, and to check that the liner is leak tight, i.e. no bore liquids are able to reach the annular space.

III. Venting

Gas molecules have a natural ability to very slowly move through piping materials. This is called gas permeation. Gas permeation occurs through polymer materials at a higher rate than through metallic materials. In the case of lined steel products, the permeated gas can gather in the annular space of the

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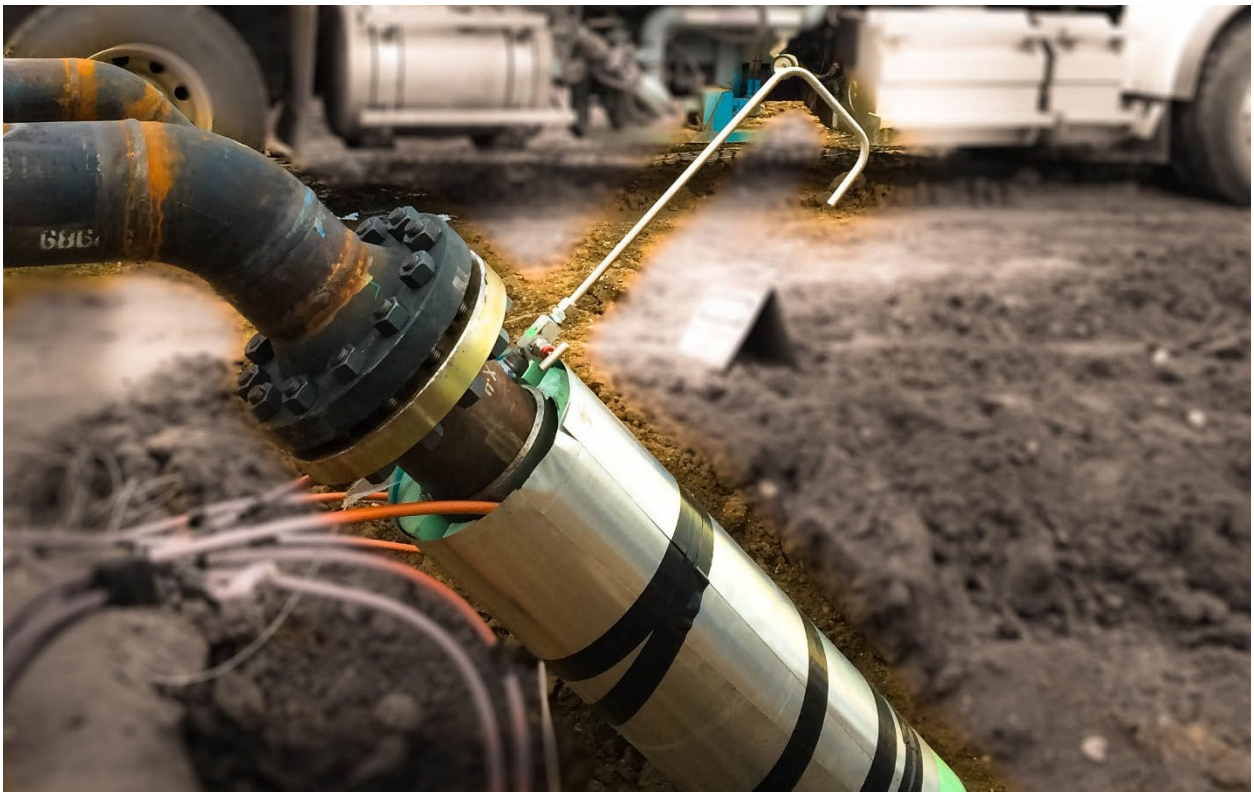
pipeline and increase the pressure of the annular space. As described in CSA Z662 clause 13.2.8.1, and similar to other lined pipelines, it is essential that the pressure in the annular space of CORE Liner® is kept lower than the bore pressure of the pipeline. This is achieved by routinely venting the annular space of the pipeline via the vents provided at the CORE Liner® flanged connections. The vents should be kept open until the venting almost stops. For pipelines in multiphase or gas service, and depending on the pipeline operating parameters and distance between vents, adequately venting the annular space may take up to a few hours. Consult CORE Linepipe® for project specific guidance.

The venting frequency should be determined by the operating company based on the specific operating parameters of each pipeline. CORE Linepipe® recommends starting with a venting frequency of once a week. If minimal amounts of gas are being vented, the venting interval can be extended gradually by a week every time. CORE Linepipe® recommends venting the pipeline system at least once every month. It is required to vent pipelines containing a gas phase in the bore and subject to operating pressure fluctuations as frequently as practical to keep the annular pressure as low as possible.



IV. Depressurization

The annular space of CORE Liner® should be completely vented prior to fully depressurizing the pipeline bore. It is recommended to depressurize pipelines containing a gas phase slowly and in steps to allow the gas that permeated the liner to vent out of the annular space. Fully depressurizing the bore while the annular space is still under pressure may result in liner buckling and possibly collapse.

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V. Vacuum

CORE Liner® is generally able to resist full vacuum. Nevertheless, to prevent liner collapse, the pipeline vents should not be opened while the liner is under vacuum conditions. In addition, in services where vacuum is expected to last for more than one hour per occurrence, countermeasures such as vacuum breakers are recommended as an additional level of protection.

VI. Pigging

CORE Liner® may be pigged using medium-density foam pigs or custom-made polyurethane disk pigs. Typically, medium-density foam pigs are used for dewatering, while polyurethane disk pigs are used for removing wax buildup. Steel wire brush pigs should not be used with CORE Liner® as they may scrape and damage the polymer liner. The pipeline should be pigged frequent enough to prevent any substantial buildup from occurring. Pigging a pipeline containing a substantial buildup or blockage may result in pipeline damage or in the pig getting stuck. It is recommended to vent the system immediately before and after the pigging to confirm that the liner is leak tight, i.e. no bore fluids are coming out of vents.

VII. Hot Oiling

Where hot oiling a CORE Liner® is needed, the pressure and temperature during the hot oiling should not exceed the following values:

	300 ANSI	600 ANSI
Maximum Allowable Pressure	4,960 kPa (720 psig)	9,930 kPa (1,440 psig)
Maximum Allowable Temperature	60°C (140°F)	

It is recommended to vent the system immediately before and after the hot oiling to confirm that the liner is leak tight, i.e. no bore fluids are coming out of vents.

VIII. Alcohol Injection

The internal HDPE layer of CORE Liner® is resistant to alcohols. Methanol and ethanol can be used with CORE Liner® both in continuous dosing or as batch treatment. If continuous alcohol dosing is used, adequate countermeasures should be in place to mitigate the effects of the potential presence of oxygen in the alcohol being injected.