



**Composite Technologies**

## **OPERATING GUIDE**

**Flexpipe™**  
**Flexpipe™ High Temperature**  
**Flexcord™**

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## **1 Introduction**

This document is mainly addressed to pipeline operations personnel and is intended to provide general guidance on the operation of Flexpipe Spoolable Products. Please refer to the Flexpipe Technical Manual and Installation Guide (available at [www.flexpipesystems.com/resource-library/](http://www.flexpipesystems.com/resource-library/)) or consult a Flexpipe Applications Engineer for project-specific advice or additional recommendations.

This document is intended solely as a reference for use by persons of technical competence. It is the responsibility of the pipeline operator to ensure the suitability of Flexpipe products for any specific pipeline application. While the information contained in this document is believed to be correct as of the date of issue, under no circumstances will Flexpipe, or any of its subsidiaries, be liable in any way for any loss, damage or injury of any kind (whether direct, consequential, punitive or otherwise) incurred as a result of any omissions in this document or as a result of reliance on any information contained in this document. This document does not contain any warranty, express or implied.

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## **2 Product Information**

### **2.1 Application Reviews**

Every order that Flexpipe receives requires an Application Review and approval by Flexpipe Engineering for the specific application that the pipeline is intended for. Flexpipe recommends that the Application Review is easily accessible on site for reference.

If there is any change to the intended operating parameters, including but not limited to the type of service, chemical composition, normal or maximum operating temperature, pressure, cycles/day, pump style, or the system layout, the pipeline application must be reviewed again.

Refer to the Flexpipe Technical Manual, Installation Guide, and technical bulletins (see [www.flexpipesystems.com/resource-library/](http://www.flexpipesystems.com/resource-library/)) for information on the performance and installation parameters of Flexpipe (FP), Flexpipe High Temperature (FPHT), and Flexcord (FC) products. The Application Review is supplemental to the information contained in the published Flexpipe literature.

## 2.2 Pressure Ratings

The maximum allowable operating pressure (MAOP) for each product line is shown in Table 1.

**Table 1: Pressure Ratings**

Pressure Rating (MAOP)	2,068 kPa (300 psi)	5,171 kPa (750 psi)	10,342 kPa (1,500 psi)	13,789 kPa (2,000 psi)	15,513 kPa (2,250 psi)	15,513 kPa (2,250 psi)
Flexpipe Grade	150	301	601	801	901	901 AB
Product Line	Nominal Size (inches)					
FP	3", 4"	2", 3", 4"	2", 3", 4"			
FPHT		2", 3", 4", 5", 6"	2", 3", 4", 5", 6"			
FC				3", 4"	3", 4"	2"
Maximum Pressure Rating (MPR)	3,087 kPa (448 psi)	7,715 kPa (1,119 psi)	15,437 kPa (2,239 psi)	13,789 kPa (2,000 psi)	15,513 kPa (2,250 psi)	15,513 kPa (2,250 psi)

## 2.3 Temperature Ratings

The maximum allowable operating temperature (MAOT) for each product line is shown in Table 2.

**Table 2: Temperature Ratings**

Product Line	Maximum Allowable Operating Temperature		Minimum Allowable Operating Temperature (Standard O-rings)		Minimum Allowable Operating Temperature (Alternative LT O-rings, Standard for Canadian Applications)	
	(°C)	(°F)	(°C)	(°F)	(°C)	(°F)
FP	60	140	-10	14	-29	-20
FPHT	82	180	-5	23		
FC	60	140	-10	14		

*Note: LT O-rings are supplied as standard for all Canadian and low-temperature applications installed after 2020. If you are unsure of what type of O-rings the pipeline was installed with, contact Flexpipe Engineering.*

## 3 Operations

### 3.1 Pressurization

Flexpipe requires a gradual or stepped flow increase to allow for gradual temperature and pressure changes in the system.

Liquid systems (i.e., no significant gas) must be pressurized in a manner to prevent exceeding the MAOP, initiating water hammer, or creating uneven stress distribution due to rapidly changing pressures in the pipeline. It is recommended to pressurize the system at no more than 1,400 kPa/minute (200 psi/minute).

### 3.2 Pigging

Flexpipe supplies tags for installation on risers to inform operators of the temperature and pigging limitations of the pipe. Flexpipe recommends medium-density (5 lb) foam bullet pigs for dewatering and Flexpipe polyurethane disk pigs for removing wax build-up.

For gas lines, if condensate build up is expected, pigging is recommended to clear any liquids trapped at low points.

Flexpipe Spoolable Products do not build up wax as quickly as steel pipelines; however, build up will occur over time. For applications with high wax content where wax or scale buildup is expected, it is required to pig the line often enough or use a wax dispersant program to avoid having the normal operating pressures increase due to a reduced pipe cross section.

For pump jack applications, it is required to pig the line often enough to avoid having the normal operating pressures increase to the point of exceeding the guidance provided for the pressure differential between the upstroke and downstroke.

FP, FC and FPHT products are acceptable in aromatic applications up to 50% by volume at 60°C (140°F), 60°C (140°F), and 82°C (180°F) respectively. For removal of wax plugs using aromatic solvents with a concentration above 50%, it is recommended to limit the pipe exposure time to 8 hours per treatment.

### 3.3 Pig Sizing

Flexpipe Spoolable Products are suitable for pigging; however, Flexpipe Spoolable Product fittings have an ID that is smaller than the ID of the pipe. Flexpipe recommends medium-density (5 lb) foam bullet pigs for dewatering and Flexpipe polyurethane disk pigs for removing wax build-up. Frequent inspection and replacement of polyurethane pigs is recommended. Use of a pig not approved by Flexpipe could result in the pig becoming stuck in a fitting.

Polyurethane pigs are available from Flexpipe in a variety of durometers to suit different pigging requirements, as shown in Table 3.

**Table 3: Pig Durometers**

Size	Durometer	Color
2"	85	Yellow/Blue
	75	Green
3"	85	Yellow/Blue
	75	Green
	65	Purple
4"	75	Green
	65	Purple
5"	75	Green
	65	Purple
6"	75	Green

*Note: Other pig styles with different durometers and lengths are also available. Check with your Flexpipe Account Manager.*

Flexpipe polyurethane pigs cannot be used for threaded fittings and are not recommended for any T fittings or welded thin-wall elbows. They may be used with schedule 40 or 80 welded elbows (45° or 90°). If a pigging program is required on a Flexpipe line joining another line, Flexpipe recommends a Y-lateral joint oriented to allow the pig to enter the joint from one of the two arms and exit from the Y-lateral. Bar-stops and long pigs should be used for custom flow joints that require pigging. Flexpipe pig dimensions are indicated in Table 4.

**Table 4: Pig Sizing**

Pipe Size (nominal)	Standard Flexpipe Polyurethane Pig mm (in)		Flexpipe Polyurethane Pig with Rear Cup mm (in)		Required pressure differential* kPa (psi)
	Diameter	Length	Diameter	Length	
2"	57.15 (2.25)	95.25 (3.75)	N/A	N/A	140 (20)
3"	81.25 (3.2)	133.35 (5.25)	81.28 (3.2)	184.15 (7.25)	210 (30)
4"	104.14 (4.10)	165.10 (6.50)	104.14 (4.10)	228.60 (9.00)	280 (40)
5"	132.08 (5.20)	212.60 (8.37)	132.08 (5.20)	320.55 (12.62)	350 (50)
6"	154.94 (6.10)	218.44 (8.60)	154.94 (6.10)	327.66 (12.90)	420 (60)

*\*Note: Required pressure differential is an approximation and assumes the line is lubricated and pigged using a lower durometer pig. Higher durometers and wax build up may require higher pressure differentials.*

### 3.4 Paraffin/Wax Removal and Hot Oiling

Flexpipe Spoolable Products can be hot oiled. Flexpipe products should never exceed the MAOT of 60°C (140°F) for FP and FC, or 82°C (180°F) for FPHT. Temperature should always be increased and decreased gradually.

For lines that operate above 700 kPa (100 psi), a minimum of 700 kPa (100 psi) residual pressure must be maintained in the line during all stages of hot oiling. For applications with temperature above 38°C (100°F), follow the guidance in the depressurization section. Pressure should always be increased and decreased gradually.

At the start of a hot oil treatment, use a maximum flow of 1.5 GPM for the first 10 minutes. After 10 minutes of operation the hot oil flow can be increased as required, using gradual pressure and temperature changes. Once hot oiling is completed, pig the line with a Flexpipe polyurethane disk pig.

For internal water jet cleaning of wax and deposits, Contact Flexpipe Engineering for additional guidance.

### **3.5 Clearing Hydrates**

For gas lines, if condensate build up is expected, pigging is recommended to clear any liquids trapped at low points. A chemical injection program can be used to reduce the risk of hydrate formation.

If a hydrate does form, clearing hydrates should always be done slowly and with extreme caution. Depressurizing one side too fast will cause the ice plug to dislodge at high velocity and can cause a line rupture at a change in direction of the pipeline. Always depressurize the pipeline carefully and follow the guidance in the depressurization section.

When clearing or preventing hydrates, ensure the fluid temperature does not exceed the MAOT of the product.

### **3.6 Cyclic Service**

Flexpipe's cyclic guidance is based on a minimum design life of 20 years. The pump type plays a major role in determining the cyclic characteristics of a pipeline system. Flexpipe divides pumps into non-pulsating and pulsating types.

- Non-Pulsating Pumps: Centrifugal, Progressive Cavity, Screw, and Gear pumps.
- Pulsating Pumps: Reciprocating positive displacement pumps such as Triplex, Quintuplex, Diaphragm, or Peristaltic pumps. To protect Flexpipe Spoolable Products from progressive damage, properly designed and maintained pulsation dampeners are required at the pump inlet and outlet, as well as a minimum of 100 feet of steel pipe between the pump discharge and the Flexpipe to assist with vibration dissipation.

For all application types and in order to eliminate large amplitude pressure fluctuations resulting from pump on/off cycles, Flexpipe strongly recommends using a variable frequency drive (VFD) to regulate the flow rate while maintaining continuous operation of the pump, and to provide a soft start/stop whenever the pump shuts down.

Flexpipe offers pressure monitoring of in-service lines as a service to customers to evaluate the typical operation of the pipeline and provide guidance on future operation of the pipeline. Contact Flexpipe Engineering for more information.

#### **3.6.1 Non-Pulsating Pumps**

- FP Products: Applications with non-pulsating pumps can be operated at the full MAOP.
- FPHT Products: FPHT has reduced performance in cyclic applications but is otherwise similar to FP.
- FC Products: FC is suitable for systems subject to severe cyclic pressure conditions at the full MAOP.

#### **3.6.2 Pulsating Pumps**

FP and FPHT are not intended to be used on pulsating pumps. FC has been designed for this service. If FP and FPHT are used in pulsating pump applications, the maximum operating pressure (MOP) must be limited to the values shown in Table 5.

Properly designed, operated, and maintained pulsation dampeners at the pump suction and discharge of pulsating pumps are required to limit the peak-to-peak amplitude of pulsations to lower than the values listed in Table 5. The pulsation dampeners require monthly monitoring to ensure the peak-to-peak pulsations do not exceed the recommendations.

**Table 5: Pulsating Pump Requirements**

Product	Maximum Operating Pressure (Pulsating Pump Applications)		Maximum Allowable Peak-to-Peak Pulsation Amplitude (High Frequency)	
	kPa	psi	kPa	psi
<b>FP301</b>	1,030	150	100	15
<b>FP301 HT</b>	1,030	150	70	10
<b>FP601</b>	1,720	250	170	25
<b>FP601 HT</b>	1,030	150	140	20
<b>FC801</b>	13,790	2,000	1,030	150
<b>FC901</b>	15,510	2,250	1,550	225
<b>2" FC901 AB</b>	15,510	2,250	350	50

*Note: Guidance is based on a frequency of up to 25 cycles per second.*

### 3.6.3 On/Off Cycles

Reference the Application Review for specific on/off cyclic information for your project. For questions on specific cyclic information contact Flexpipe Engineering.

### 3.7 Pump Jacks

For FP, FPHT, and FC products, it is recommended to use a properly installed and maintained pressure shut-off switch set at no more than 700 kPa (100 psi) above the upstroke pressure for all pump jacks. Routinely monitor the upstroke and downstroke pressure values using a calibrated pressure gauge mounted between the well head and the flow line.

Table 6 provides examples for the allowable pressure differentials between the upstroke and downstroke pressures for pump jacks. In general, as operating pressures increase, the allowable pressure differential decreases. For upstroke pressures above 2,410 kPa (350 psi), contact Flexpipe Engineering for guidance or refer to the project-specific Application Review.

**Table 6: Pump Jack Pressure Differentials**

Upstroke Pressures	Below 1,030 kPa (150 psi)	1,031-1,720 kPa (151-250 psi)	1,721-2,410 kPa (251-350 psi)
<b>Product</b>	<b>Allowable Pressure Differential</b>		
<b>FP301</b>	520 kPa (75 psi)	350 kPa (50 psi)	310 kPa (45 psi)
<b>FP601</b>	700 kPa (100 psi)	520 kPa (75 psi)	480 kPa (70 psi)
<b>FP301HT</b>	350 kPa (50 psi)	210 kPa (30 psi)	170 kPa (25 psi)
<b>FP601HT</b>	520 kPa (75 psi)	350 kPa (50 psi)	310 kPa (45 psi)
<b>FC</b>	3450 kPa (500 psi)		

Flexpipe products on pump jacks require the use of properly maintained check valves to minimize the pressure fluctuation in the pipeline. If operating parameters change, contact Flexpipe Engineering for a re-evaluation of the operating conditions.

### 3.8 Dump Valves

It is recommended to limit the pressure differential generated by the dump valve of an oil emulsion separator. Table 7 provides guidance for operating pressures below 1,030 kPa (150 psi) and a dump frequency of up to once every minute.

**Table 7: Dump Valve Pressure Differentials**

Operating Pressures	Below 1,030 kPa (150 psi)
Product	Allowable Pressure Differential
FP301	830 kPa (120 psi)
FP601	1,030 kPa (150 psi)
FP301HT	930 kPa (135 psi)
FP601HT	1,030 kPa (150 psi)

For faster dump frequencies or higher operating pressures, contact Flexpipe Engineering or refer to the project-specific Application Review.

### 3.9 Liquid Flow

Flexpipe recommends limiting the fluid velocity of liquids to a maximum of 1.5 m/s (5 ft/s). High velocities (e.g., more than 1.5 m/s (5 ft/s)) can lead to flow-related damage due to changes in momentum, rapid starts/stops, severe slug flow, or rapid valve open/close events. If high fluid velocities are expected, appropriate precautions should be taken. Typically Flexpipe does not recommend exceeding a liquid velocity of 3 m/s (10 ft/s). Table 8 indicates the flow rate by pipe size.

**Table 8: Liquid Flow Rates by Pipe Size**

Size	Flow Rate at 1.5 m/s (5 ft/s)		Flow Rate at 3 m/s (10 ft/s)	
	m <sup>3</sup> /day	Bbl/day	m <sup>3</sup> /day	Bbl/day
2"	300	1,887	600	3,774
3"	609	3,828	1,218	7,655
4"	1,014	6,380	2,028	12,760
5"	1,602	10,075	3,204	20,150
6"	2,093	13,163	4,186	26,325

FP, FPHT, and FC can resist full vacuum for short time durations at 20°C (68°F). The use of an isolation valve to protect the pipeline from vacuum is recommended. For hotter operating temperatures, resistance to vacuum will be decreased. For additional information, contact Flexpipe Engineering for guidance.

There must be a mechanical protection device in place to prevent the line from being over pressured. A high-pressure shut-off should be installed and set to a pressure between the maximum typical operating pressure and the MAOP of the pipe. A pressure relief valve should be installed and set to relieve the system pressure at no higher than the MAOP of the pipe. The set points of both devices should be inspected and recorded regularly (e.g., monthly). The devices should be function tested periodically (e.g., yearly).



The installation of a soft start/stop motor is strongly recommended to reduce water hammer or pressure surge for all pump types. The installation of a Variable Frequency Drive (VFD) is recommended to reduce the number of on/off cycles to as low as possible, for maximum service life.

### 3.10 Gas Flow

Flexpipe recommends limiting the fluid velocity of gases to 30 m/s (100 ft/s). Table 9 indicates the flow rate by pipe size for gases compressed to 6,900 kPa (1,000 psi).

**Table 9: Gas Flow Rates by Pipe Size**

Size	Flow Rate at 30 m/s (100 ft/s) and Compressed to 6,900 kPa (1,000 psi)	
	e <sup>3</sup> m <sup>3</sup> /day	MSCFD
2"	275	9.7
3"	619	21.8
4"	1,096	38.7
5"	1,811	63.9
6"	2,419	85.4

### 3.11 Permeation and Venting

Composite pipelines allow more permeation than steel pipelines do, and permeation through the pipe walls of Flexpipe products is normal. Flexpipe Spoolable Products have a self-venting design which allows permeated gases to travel through the annulus (reinforcement layer) and are released at the fittings through a vent hole. If the fittings are submerged in water, bubbles may be present. Permeated gases may also be released along the length of the pipeline.

### 3.12 H<sub>2</sub>S

Similar to other components in sour service which have fugitive emissions, due consideration should be given to the potential accumulation of H<sub>2</sub>S (hydrogen sulphide, also known as sour gas) around the vent hole of Flexpipe fittings, including accumulation in confined spaces such as valve cans and pump or header buildings. H<sub>2</sub>S is heavier than air. It is recommended to refer to Flexpipe Bulletin 06-1866 *Sour Service Pipeline Bulletin*.

Accumulated H<sub>2</sub>S may be released during pipeline work. Examples of work include tie-ins, repairs, and removal of external tape and insulation from fittings. Non-metallic pipelines may be more susceptible to external damage than metallic pipelines. Damage to or misuse of Flexpipe Spoolable Products may result in the uncontrolled release of the H<sub>2</sub>S-containing fluid being transported, which may result in serious injury or death.

FP and FPHT are compatible with H<sub>2</sub>S. Flexpipe chooses to limit the H<sub>2</sub>S content to 10% by mol in the gas phase of liquids (oil and/or water), gas, or multiphase. Applications above 10% are evaluated on a case-by-case basis. CSA Z662 Clause 13.1 limits the partial pressure of H<sub>2</sub>S in gas to 50 kPa (7.25 psi) for all composite pipe used in sour gas applications. FC is suitable for the transport of liquids (oil and/or water), gas, or multiphase with up to 3000 ppm of H<sub>2</sub>S.

### **3.13 High Pressure Gas and CO<sub>2</sub>**

Adequate protection systems, such as compressor coolers, are required to prevent the gas compressor discharge temperature from exceeding the Flexpipe spoolable product's MAOT. Special care should be taken during maintenance and startups to monitor and not exceed the MAOT.

Temperature monitoring on the compressor discharge or upstream of the Flexpipe product is required. Do not operate the pipeline if the MAOT of the Flexpipe product is exceeded for any amount of time. If the MAOT is exceeded, shut down the compressor and contact Flexpipe Engineering for further guidance.

Flexpipe Spoolable Products can be used for gases or liquids containing up to 100% CO<sub>2</sub> by volume. For applications with both more than 10% CO<sub>2</sub> and operating pressures above 5,171 kPa (750 psi), Flexpipe requires the use of LT O-rings that provide superior performance for these conditions. If you are unsure of what type of O-rings the pipeline was installed with, contact Flexpipe Engineering.

### **3.14 Chemical Injection and Compatibility**

Common injection chemicals used in the oil gathering industry, such as corrosion inhibitors, biocides, paraffin dispersants, surfactants, scale inhibitors, defoamers, and demulsifiers are not considered problematic to the HDPE liner. Flexpipe recommends that chemical injection programs use dilute concentrations or batch treatments, as per the standard practice for HDPE applications as set out by the chemical manufacturing company.

Due to the variety of injection chemicals available, Flexpipe recommends that the pipeline operating company develop an injection program in conjunction with the chemical manufacturing company to ensure there are no chemical compatibility concerns with HDPE or Flexpipe fittings.

Flexpipe standard fittings are electroless nickel coated (ENC) on the wetted surfaces. Bare carbon steel (weld necks) and Duplex stainless steel fittings are also available. The final decision regarding chemical and material compatibility resides with the customer.

Flexpipe products are compatible with up to 50% aromatic and cycloalkane hydrocarbons (e.g., benzene, toluene, ethyl benzene, xylene, naphthalene, and cyclohexane) in gas or liquids.

### **3.15 Methanol and Ethanol**

HDPE has good resistance to concentrated alcohols such as methanol and ethanol at temperatures up to 60°C (140°F). Alcohols may be used in Flexpipe Spoolable Products during hydrotests to prevent freezing. They may also be used in FP and FPHT in batch programs.

Continuous injection of alcohols in FC is not recommended due to the possible introduction of oxygen. Continuous injection of alcohols with FP and FPHT should be evaluated by the end user for compatibility with the metallic fittings.

### 3.16 Freezing Weather Operation

In cold temperatures where there is a risk of the fluid freezing in the Flexpipe Spoolable Products (i.e., temperatures below 0°C / 32°F), methanol (or other antifreeze agents compatible with HDPE) can be mixed into the test fluid to lower the freezing point. Ensure that the fluid is not allowed to freeze in the pipeline as it will damage the pipe and require replacement of the affected section.

When fluid flow is shut down during freezing ambient temperatures, Flexpipe Spoolable Products should be drained when possible, similar to other equipment and piping. If trapped water is blocked inside the pipeline and then freezes, it may burst the pipe. For more detailed information on frozen pipelines, see Flexpipe Bulletin 06-4091 *Pipeline Shutdowns During Freezing Weather*.

### 3.17 Wildfire Exposure

If a wildfire comes into contact with exposed Flexpipe Spoolable Products, Flexpipe recommends visual inspection of the pipeline for any external damage (e.g., blistering, melting, bulging, etc.). All damaged pipe must be replaced using the guidelines found in the Flexpipe Installation Guide.

### 3.18 Excavations

Excavations near installed Flexpipe is the most common risk to the integrity of operational Flexpipe products due to the potential for external damage. The preferred method for excavating buried Flexpipe is hydro-excavation (HydroVac).

#### CAUTION!



Use caution when using heavy equipment to directly excavate the pipeline as they may strike the pipeline and cause damage.

#### CAUTION!



Hydro-excavation can damage Flexpipe Spoolable Products if proper techniques are not utilized. Never apply a constant spray directly on Flexpipe Spoolable Products. Continuously move the spray wand side to side to avoid damaging the pipe.

The following practices are recommended to minimize the risk of external damage to the pipe:

- Identify the location of the Flexpipe product using the tracer wire installed with the pipe.
- Follow hydro-excavation procedures that comply with industry best practices for excavation of thermoplastic piping, including:
  - Use of protective tips (i.e., rubber, neoprene, etc.) on spray nozzles and suction hoses.
  - Use of multi-jet nozzles with diverging spray patterns; not oscillating, rotating, or converging pattern nozzles.
  - Continuous movement of the spray wand while excavating.
  - Maintaining a minimum distance of 12" between the spray nozzle and the pipe.
  - Spray pressures as low as practical and not above 13,790 kPa (2,000 psi).
  - Water temperatures below 60°C (°F).

- Inspect the exposed pipe thoroughly after the excavation is complete.
- Support the weight of exposed pipe by using sandbags at intervals of not greater than 6 meters (20 feet).
- Take appropriate precautions to avoid impact or sustained pressure from sharp or heavy objects.
- Exercise care during any mechanical excavation near Flexpipe products.
- Inspect all exposed Flexpipe products for external damage prior to backfilling. Refer to the Flexpipe Installation Guide for assistance in identifying external damage.
- Replace any sections of Flexpipe Spoolable Products that are damaged during excavation.
- Use proper backfill procedures.

### **3.19 Static Electricity**

Standard operating and maintenance procedures for handling non-conductive pipe and dissipation of static electricity apply when working with Flexpipe Spoolable Products. Discharge of static electricity in the presence of a flammable gas-air mixture may cause an explosion or fire and result in property damage and/or personal injury.

When conditions exist such that a flammable gas-air mixture may be encountered and static charges may be present, all company procedures (i.e., pipeline operator, utility, contractor, etc.) for static electricity safety and control should be followed, including procedures for discharging static electricity and personal protection. For reference, information on handling static electricity in plastic pipelines is available in the US Occupational Safety and Health Administration “Hazard Information Bulletin Static Electricity Buildup in Plastic Pipe” (<https://www.osha.gov/publications/hib19880930>).

## **4 Shutdown**

### **4.1 Depressurization**

For depressurization of liquid systems, the line pressure should decrease at no more than 1,400 kPa/minute (200 psi/minute), for example in the case of a valve closure, pump shut down, or power loss.

In order to reduce the potential for liner collapse on oil emulsion (i.e., with gas) and gas applications (including CO<sub>2</sub>) using FP, FPHT, or FC at service temperatures above 38°C (100°F), it is required to slowly depressurize the pipeline (i.e., no more than 3,450 kPa (500 psi) per hour) to 700 kPa (100 psi) and hold for a period of time as indicated below. This is to allow enough time for some of the gas in the annular space to vent out to the atmosphere, and to allow the pipeline to cool.

- 38 to 49°C (100 to 120°F), hold at 700 kPa (100 psi) for 1 hour
- 50 to 60°C (121 to 140°F), hold at 700 kPa (100 psi) for 2 hours
- 61 to 71°C (141 to 160°F), hold at 700 kPa (100 psi) for 8 hours
- 72 to 82°C (161 to 180°F), hold at 700 kPa (100 psi) for 24 hours

## 4.2 Respooling

Flexpipe Spoolable Products are limited to a maximum of 5 deployment cycles per API 15S. A deployment cycle includes unwinding and stringing the pipeline along the right-of-way and rewinding or respooling the pipeline back onto the reel provided by Flexpipe. Due to current handling concerns, only 2"-4" products can be re-deployed. Contact Flexpipe Engineering for respooling larger diameter pipelines.

## 4.3 Pipeline Abandonment

HDPE absorbs gas under pressure, and when the pipeline is depressurized, the gas will desorb from the HDPE. H<sub>2</sub>S and methane will desorb from the HDPE after depressurization and create a measurable concentration in the pipeline.

When a pipeline will be abandoned, allow time for the gases to desorb and monitor the pipeline using a gas monitor. The pipeline may need to be purged again until gas monitors read 0 ppm H<sub>2</sub>S when held 1" away from the open end of the line. Once this occurs, the pipeline can be deemed safe.

Follow all local regulations for pipeline abandonment procedures and requirements.

## 4.4 Pipeline Design Life

All product lines have a minimum of 20 years protection against exposure to ultraviolet (UV) light. For UV exposure over 20 years, Flexpipe recommends a visual examination of the pipeline to confirm integrity of the HDPE jacket (i.e., confirm there is no jacket cracking, as seen in Figure 1).



**Figure 1: UV Cracking Damage to Surface Pipeline**

The MAOP for all Flexpipe product lines is determined using a 20-year reference time. Flexpipe products may be suitable for operation beyond 20 years if no degradation mechanisms exist.

For pipelines operating in cyclic service, Flexpipe's cyclic guidance is based on a service life of 20 years. Flexpipe recommends the operator assess the construction and operation of the pipeline to determine if integrity testing is required.

## 5 Integrity Management

### 5.1 Hydrotesting

The field hydrostatic hold pressure test level for new pipelines depends on the type of the Flexpipe Spoolable Product, the pressure rating of the Flexpipe Spoolable Product, and the class of the metallic flanges being used. For detailed hydrotesting information, refer to Flexpipe Bulletin 06-4026 *Field Pressure Testing of New and Existing Pipelines*.

Frequent hydrotesting of a pipeline after it has been commissioned into operation is not recommended. Hydrotesting pipelines to a pressure greater than MAOP is generally only appropriate prior to a new pipeline being commissioned into operation, for infrequent integrity testing, or infrequent testing after repairs. Hydrotesting pipelines up to MAOP is typical after pipeline tie-ins, for frequent integrity testing, or when reactivating a shut-in pipeline. Contact Flexpipe Engineering for clarification as required.

### 5.2 Field Investigations

Flexpipe provides technical investigations for integrity verification and failures, including visual inspections, dissections, and short term burst tests. Flexpipe offers pressure monitoring of in-service pipelines as a service to customers to evaluate the typical operation of the pipeline and provide guidance on future operation of the pipeline. Additional tests can be added as deemed necessary through the investigation. Recommendations resulting from the investigation are typically around the continued operation of the pipeline at the current operating conditions or recommendations to change the operating conditions based on the investigation results.

Field investigations require the completion of Flexpipe document 14-4007 *Field Investigation Form*, which is available in the Resource Library at [www.flexpipesystems.com/resource-library/](http://www.flexpipesystems.com/resource-library/). Contact Flexpipe Engineering for more information.

#### CONTACT US!



All pipe failures should be investigated by a Flexpipe representative to determine the cause of failure. At a minimum, Flexpipe should be notified of any failures or product quality incidents. Please contact your Flexpipe Project Coordinator or your Field Operations representative to report an in-service failure, a pressure test failure, or any pipeline incident through our toll-free number or through the Contact Us form on the website:

**+1 888 FLX PIPE (+1 888 359 7473)**

[www.flexpipesystems.com](http://www.flexpipesystems.com)