

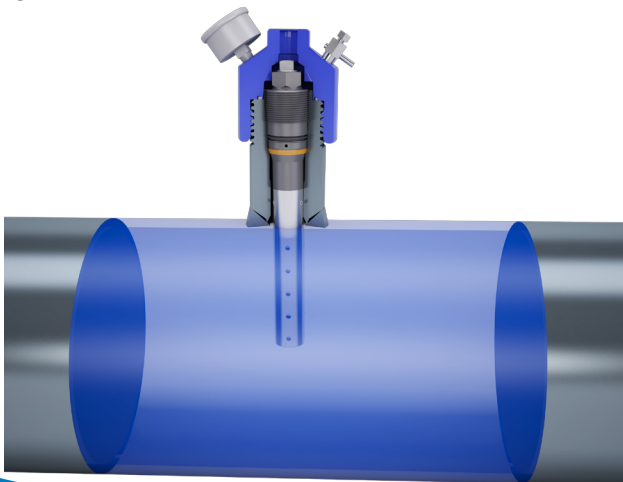
COSASCO® POLYMER COUPON MONITORING

Flexible Pipe-Polymer Coupon Monitoring

Flexible risers are now more common in recent years due to the increase in deep water oil and gas exploration. The flexible riser is a connection between typically a floating production system, and the subsea well or pipeline and often a means of transporting Oil & Gas. A Flexible Riser is composed of both metallic and polymer layers designed for optimal strength, weight, and flexibility under high pressures and temperature variances. The polymer sheath layer contains the process fluid and consists of certain types of polymers to form a pressure barrier that has to be resistant to chemical and mechanical degradation over time.

To maintain the integrity of the flexible riser it is important to monitor the condition of the polymer in the pressure barrier sheath. The Cosasco® Polymer Monitoring System is used for determining the potential breakdown or ageing of the polymer material under operating conditions. A number of Polymer coupons of the same material as the sheath are inserted into the flow for a certain period of time and then removed one at a time and analyzed to evaluate the condition of the pressure sheath. Based on a quantitative analysis of the coupons, an estimate of the remaining service life of the pressure sheath may be determined along with any changes to the molecular structure or chemical properties that may affect the overall strength and structural integrity of the sheath.

The Cosasco® Polymer Monitoring System consists of a polymer coupon holder and solid plug assembly installed in a standard 2" Access Fitting that would normally be located in a topside rigid pipe, downstream of the riser end connection. The assembly is also offered for use in the Cosasco 2" Hydraulic Access Fitting System. The polymer coupon assembly may be installed and retrieved under pressure using a Cosasco RSL or RBS/RBSA Retriever and Cosasco Single or Double Block and Bleed Service Valve.



Features

Determines Potential Breakdown and Ageing of Polymer Material Under Operating Conditions to Estimate Remaining Service Life of Pressure Sheath

Robust Construction (Plug and Holder) for Maximum Durability and Insertion Length Under Variable Flow Conditions

Fits in all Cosasco and Standard 2" Access Fittings

Removable Under Pressures up to 6000 psi

Options

Material —SS316 or Duplex Stainless Steel

Accommodates up to 10 or more Polymer Disc Coupons

Disc, Dog Bone, Notched, and Bar Coupon Types Available

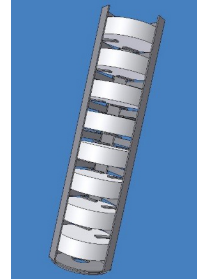
Flexible Pipe-Polymer Coupon Monitoring

The coupon holder assembly is designed for maximum strength/insertion length and to reflect the process conditions the polymer sheath will be exposed to under normal production conditions over time. Depending on the type of quantitative

analysis required, i.e. chemical or mechanical properties, there are four types of coupons available, including Disc, Dog Bone, Bar, and Notched.

Disc Coupons

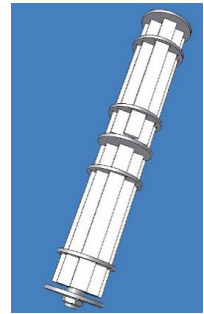
Disc polymer coupons are the most common type used for determining changes in molecular weight, chemical properties and hardness of the polymer pressure sheath. Typically they are arranged in the coupon holder in quantities of 8-10, spaced, for full exposure on all sides. The number of coupons will depend on the pipe diameter and insertion length, determined by the flow conditions in the pipe. This design allows for a similar process fluid environment as would be encountered in the riser pressure sheath and carcass. Each disc has the same thickness of the polymer pressure sheath and specially cut from the original sheath material.



Disc Coupons

Dog Bone Coupons

Dog Bone shaped coupons are designed for analysis of both chemical and mechanical properties of the pressure sheath including torsion and tension. In addition they can also be used to measure chemical properties and hardness. The coupon holder consists of 12 to 16 pieces of pre-machined, dog bone shaped bars. This design allows for the simulation of the inner wall surface with the thin sample and provides a larger number of samples to be exposed.



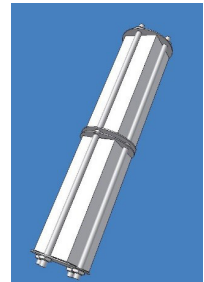
Dog Bone Coupons

Notched Coupons

Notched coupons are designed to simulate the thermal stress that occurs in the pressure sheath. The notch represents a machined crack that may occur in the pressure sheath due to the effects of temperature variance. A visual inspection method is used to analyze potential crack propagation.

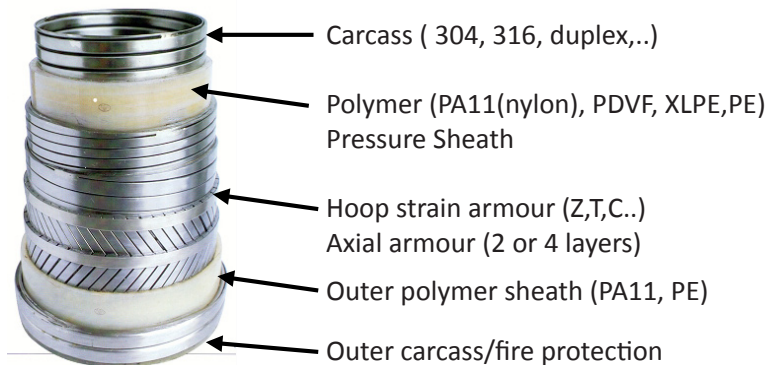
Bar Coupons

Bar coupons are designed for mechanical testing. The bar coupon holder consist of 8 separate pieces with spacing in-between. They provide a fewer number of samples in comparison with the Dog Bone coupons, but provide a larger surface area and appropriate pressure sheath thickness for a variety of tests.



Bar Coupons

Typical Flexible Pipe Composition



Ordering Information Polymer Disc Coupon Holder

Model	Polymer Disc Coupon Holder					
PCH	Polymer Disc Coupon Holder Assembly					
XXX	Code Plug Assembly – Enter code for plug type from options below					
	Type (1st Digit)		Alloy Mat'l (2nd Digit)		Packing Seal (3rd Digit)	
	0	Not Req.	0	Not Req.	0	Not Req.
	1	Solid	1	316/316L S.S.	1	Viton O-Ring Teflon Primary Packing - * -15 to 400° F (-26 to 204°C)
			3	Hastelloy C-276	2	Ethylene Propylene O-Ring Vespel Primary Packing - * -70 to 250°F (-56 to 121°C)
			4	Nitronic 60	3	Kalrez O-Ring Vespel Primary Packing - * -15 to 450°F (-26 to 232°C)
			5	Carbon Steel	4	No O-Ring Nitronic 60 Primary Packing - * -50 to 450°F (-45 to 232°C)
			6	Inconel 625	5	Hydrin O-Ring Teflon Primary Packing - * -40 to 275°F (-40 to 135°C)
			7	2205 Duplex S.S.	6	Nitrile O-Ring Teflon Primary Packing - * -30 to 250°F (-35 to 121°C)
					7	Ethylene Propylene O-Ring, Teflon Primary Packing - * -70 to 250°F (-56 to 121°C)
					8	EDR Viton O-Ring Teflon Primary Packing - * -15 to 400° F (-26 to 204°C)
					9	Kalrez O-Ring Teflon Primary Packing - * -15 to 450° F (-26 to 232°C)
					A	HNBR EOL 101 O-Ring Teflon Primary Packing - * -13 to 320° F (-25 to 160° C)
					B	HNBR EOL 985 O-Ring Teflon Primary Packing - * -67 to 302° F (-55 to 150° C)
					C	AFLAS 69/90 O-Ring Teflon Primary Packing * 32 to 392° F (0 to 200° C)
				D	Viton "B" (VB185-70) Teflon Primary Packing * 15 to 400° F (-26 to 204°C)	
	Code Shroud Body Material					
	S31603	316/316L Stainless Steel				
	N10276	Hastelloy C-276				
	S21800	Nitronic 60				
	K03011	Carbon Steel				
	N06625	Inconel 625				
	S31803	2205 Duplex Stainless Steel				
	Code Order Length					
	LL.LL		Order length in inches (.25" increments)			
PCH — 111 — S31603 — 5.00 ← Example						

* Nominal Temperature Range

Access Fitting

Cosasco 2" Access fitting for coupon retrieval under pressure. Flareweld or Flanged, material to suit. See Access Fitting Datasheets for ordering information. The assembly is also offered for use in the Cosasco 2" Hydraulic Access Fitting System.

Polymer Coupon Holder Options

Dog Bone, Bar, and Notched Coupon Holders-Consult Factory.

Polymer Coupons

Polymer Coupon Type	Description	Size	Part Number
Disc Coupons	Typically 8-10, spaced, with full exposure all sides.	Typically 23mm dia x sheath thickness	Consult Factory
Dog Bone Coupons	12-16 pieces, spaced, exposure one side.	Designed to suit holder length	Consult Factory
Bar Coupons	8 pieces, min 1 mm clearing between sides.	Approx. 60mm x sheath thickness	Consult Factory
Notched Coupons	Notched coupon, clamped at either end	Designed to suit holder length	Consult Factory

Note: Customer will supply polymer pressure sheath material.

Cosasco Representative :
INSTRUMENTS & CONTROLS
 BP13, 4 Rue Panhard
 91830 Le Coudray-Montceaux
 France
 Tel: +33(0)1 64 93 92 30
 Fax: +33(0)1 64 93 91 57
 e-mail: insco@insco.fr
 web: www.insco.fr

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Rohrback Cosasco Systems Corrosion Monitoring Equipment is manufactured and sold under one or more of the following US Patents: 4138878, 4238298, 4338563, 4514681, 4537071, 4587479, 4605626, 4625557, 4755744, 4839580, 4841787, 4882537 5243297.

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