Product Data

Transaqua™ SP-HC

Water-based subsea production control fluid

Description

Castrol Transaqua™ SP-HC is a water-based hydraulic control fluid specifically formulated for use as the control medium in subsea production control systems, and in particular high pressure gas wells. Castrol Transaqua™ SP-HC helps mitigate the risk of hydrate formation in control lines where there is a risk of hydrate formation due to gas ingress. Castrol Transaqua™ SP-HC delivers excellent all-round subsea production system protection.

Castrol Transaqua™ SP-HC has been developed and qualified using rigorous industry and equipment manufacturers quality standards. Qualification testing was carried out in accordance to Industry Standard API 17F Annex C (Rev4, November 2017) requirements.

Application

- Castrol Transaqua™ SP-HC is suitable for high-pressure, deep-water gas projects (up to 20.000 psi, 1379 bar), where entrained gas may contaminate control lines creating a risk of hydrate formation.
- Can operate over a temperature range of -50ºC (-58ºF) to 150ºC (302ºF).
- Suitable for use within Electro-Hydraulic Multiplex (EH-Mux) or direct hydraulic control systems.
- Designed for use throughout the production and workover control systems, including downhole SSSV and intelligent well completions.

Advantages

- Helps mitigate the risk of hydrate formation in control lines of high-pressure gas wells.
- Tested and registered according to OSPAR Environmental requirements in the UK and Norway.
- Environmental testing completed to meet legislation in key geographies.
- Protects against corrosion of carbon steels with up to 30% seawater contamination.
- Excellent materials compatibility performance across a wide range of subsea production system materials.
- Excellent stability with common system contaminants such as seawater (up to 50%) and completion brines.
- Corrosion protection of hardware during long term storage, filled and partially filled.
- Fully miscible in all proportions with other products in the Castrol Transaqua™ range and other water-based subsea control fluids for easy retrofit.
- Low pour point allows operation in extremely low ambient temperature environments.

Typical Characteristics

Name	Method	Units	-25ºC	0ºC	25ºC	40ºC	100ºC	150ºC
Density	ASTM D4052	g(ml	1.178	1.1011	1.0843	1.0742	1.0339	1.004
Density	ASTM D4052	lb/ft^3	69.78	68.74	67.69	67.06	64.54	62.45
Kinematic Viscosity	ASTM D445	cSt	91.39	17.21	5.97	3.74	1.13	0.64
Bulk Modulus	calc. from measured datapoints	N/m^2 (x10^9)	3.26	3.07	2.87	2.75	2.26	1.82
Bulk Modulus	calc. from measured datapoints	psi (x10^5)	4.72	4.45	4.16	3.99	3.27	2.64

Data in table above shows rheology at ambient pressure

Castrol Transaqua™ SP-HC

General Properties

Property	Method	Units	Typical Value
Appearance	-	-	Clear Mobile Fluid
Colour	-	-	Light Yellow
Pour point	ASTM D97	^{o}C (^{o}F)	-75^{o}C (-103^{o}F)
Flash Point	ISO 2719 / ASTM D93	^{o}C (^{o}F)	N/A
pH @ 20^{o}C (68^{o}F)	-	-	9.0
Coefficient of Thermal Expansion	ASTM D1903	$^{o}C^{-1}$	0.0006
Thermal Conductivity	ASTM D 77896-19	W/m^{o}C	0,36
Specific Heat	-	kJ/kg^{o}C	3,054
Particulate Cleanliness (at point of fill into packs)	SAE AS4059F		max. Class 6 B-F

The above figures are typical of those obtained with normal production tolerance and do not constitute a specification. Detailed Pressure/ Viscosity/Temperature (PVT) data is available on request.

Castrol Transaqua™ SP-HC Typical Performance Characteristics			
Property		**Method**	**Performance**
Seawater Stability		API 17F Annex C	Stable with up to 50% seawater at seabed temperatures
Lubrication - 4 Ball (MWSD) (1hour, 30 Kg, 1460 rpm)		IP239	0.9 mm
Environmental Performance		OSPAR Requirements	All components tested for toxicity, biodegradation and bioaccumulation.
Compatibility	Metals	API 17F Annex C	Compatible with a wide range of metals. For a core set of commonly used metals see Table 3.
	Elastomers	API 17F Annex C	Compatible with a wide range of elastomers and plastics. For a core set of commonly used compounds see Table 4.
	Umbilical Testing	API 17E	3 months compatibility testing completed successfully with Nylon 11 TLO and Ducoflex.
Valve Testing	DCV	OEM specific	Qualified on LP/HP/Choke valves from leading suppliers.
	SSSV	OEM specific	Qualified through cyclic testing and materials review by key suppliers.

Please contact Castrol for a more extensive list of technical data and OEM approvals.

Hydrate Inhibition Characteristics

Castrol Transaqua™ SP-HC has been specially formulated to prevent gas hydrate formation in downhole valve control lines. This can occur if methane gas enters the high-pressure control line due to worn valve seals. The gas can migrate up the line, through the tubing hanger to the tree. Here the conditions are cold, and on application of high pressure (to open the valve), hydrate crystals can form, blocking the line. This issue has been experienced in deepwater gas wells, so understanding the risk is vital to ensure correct control fluid selection.

To determine the risk of gas hydrate blockage, Castrol has generated hydrate dissociation curves on which the duty conditions can be plotted, see below (Figure 1). Seabed temperature versus control line pressure can be plotted on the graph, and if the duty point is to the left of the curve there is a risk of hydrate formation. For a complete analysis, gas composition should also be considered, as the hydrate dissociation curves move to the right when the gas composition is less than 100% pure methane.

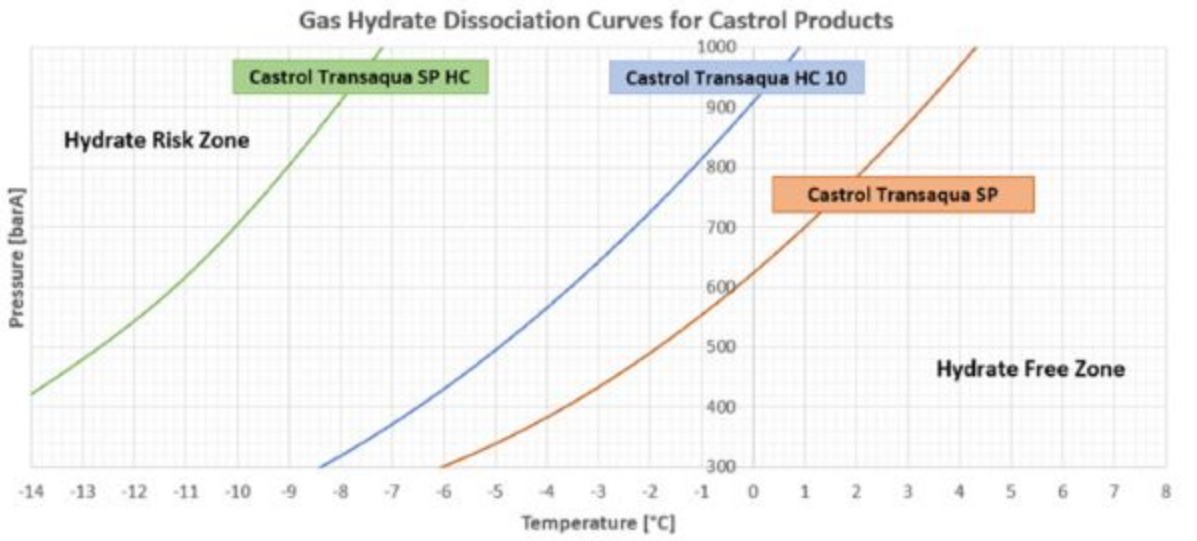

Figure 1: Methane Hydrate dissociation curves for Castrol Transaqua grades under 100% pure methane conditions
Please contact Castrol for support on fluid selection for high pressure gas wells.

Castrol Transaqua™ SP-HC

Metal and Coating Compatibility

Material	Compatibility	Comments
Carbon Steel S235	Compatible	
Alloy Steel 5160	Compatible	
Alloy Steel 51CrV4	Compatible	
Stainless Steel 316	Compatible	
Stainless Steel 17-4PH	Compatible	
Nitronic 60	Compatible	
Inconel 718	Compatible	
Super Duplex	Compatible	
Beryllium Copper	Compatible	Some tarnishing observed during immersion testing but corrosion rate within acceptable limits set by API17F
Aluminium Bronze UNSC63000	Compatible	Tarnishing observed during immersion testing.
Tungsten carbide - 10% Nickel Bonded	Compatible	
Silicon Carbide	Compatible	
Aluminium	Limited Compatibility	Components can be protected by hard anodizing, avoid rubbing contact
Electroless Nickel Plating	Compatible	Ensure even plating thickness.
Xylan 1424	Compatible	
Everslik 1301	Compatible	
Zinc and Cadmium Plating	Not Compatible	Typically used to protect standard industrial components, will be slowly removed over time by water based fluids

Castrol Transaqua™ SP-HC is compatible with many materials commonly used in subsea control systems. As with any fluid, a materials review should always be carried out before using Castrol Transaqua™ SP-HC.

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Elastomer and Plastic Compatibility

Material	Compatibility	Comments
Nitrile (NBR)	Compatible	Widely used as standard seal material, but care should be taken to select grades with optimised performance.
Hydrogenated Nitrile (HNBR)	Compatible	Improved higher temperature performance.
Low Permeability Nitrile	Compatible	Typically used for accumulator bladders.
Fluorocarbon (FKM-Viton)	Compatible	Performance can vary according to grade. Not recommended for temperatures higher than 90ºC.
PTFE	Compatible	Very inert, and suitable for high temperature and pressure applications.
PEEK	Compatible	Very inert, and suitable for high temperature and pressure applications.
Perfluoroelastomer (FFKM - Chemraz)	Compatible	Suitable for extreme temperature applications.
Polyurethane	Compatible	Performance may vary with grade.
Ethylene Propylene (EPDM)	Compatible	Avoid hydrocarbon based oils and greases.
Nylon 11	Compatible	Tested to API 17 E.
Polyamide Imide (PAI)	Compatible	
Polyoxymethylene (POM)	Compatible	

The data above refer to "standard" compounds recognised by industry. However, performance can vary depending on manufacturer, grade or operational conditions, e.g. manufacturing process, filler materials used in compounds, application, extreme temperatures, etc. We therefore recommend clarification or further testing is sought regarding project specific material compatibility, from either seal vendor or Castrol.

Additional Information

Paint and other Surface Coatings

It is recommended that in accordance with good working practice the internal surface of the hydraulic system should not be coated. However, external surfaces may require coating and as with all control fluids conventional paint systems will tend to soften or strip. It is therefore recommended that these be replaced by cured epoxy, nylon or phenolic types as commonly used subsea. Surface preparation prior to paint application is critical.

Where it is necessary to use internal surface coatings such as PTFE, these should be assessed for suitability of use. Manufacturers guidelines should be observed with regards cure times and temperatures and as with paints systems surface preparation specifications should be adhered to.

Care and Handling

This product has been manufactured to a tightly controlled cleanliness specification. Any container that has been opened for use must be re-sealed to avoid contamination ingress from the environment (e.g. particulates or water). Any contaminants entering the product can affect its performance. The integrity of the product once the container is opened is the responsibility of the end user. It is good practice to use tarpaulins or drum lids to cover all containers to prevent ingress of contamination.

As with all glycol based control fluids, Castrol Transaqua™ SP-HC must never be mixed with control fluids of different base types such as synthetic fluids (e.g. Castrol Brayco Micronic™ SV/3) or mineral oils (such as the Castrol Hyspin range). Contamination of Castrol Transaqua™ SP-HC by either of these types of products can seriously affect the product performance.

If you need advice on any of the above, please contact your local Castrol Technical Service Engineer for more specific details.

Storage

All packages should be stored under cover. Where outside storage is unavoidable drums should be laid horizontally to avoid the possible ingress of water and the obliteration of drum markings. Products should not be stored above 60C, exposed to hot sun or freezing conditions.

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