MacDermid
OFFSHORE SOLUTIONS

TECHNICAL DATA SHEET

OCEANIC HW 443

Subsea Production Control Fluid

Product Code: 174937

DESCRIPTION

OCEANIC HW 443 is a high performance, high temperature water based hydraulic fluid for use in open and closed loop Subsea Production control systems and in Blow Out Preventer (BOP) control systems.

OCEANIC HW 443 is stable up to 145°C (293°F) & remains mobile until it freezes at <-45°C (<-49°F). OCEANIC HW 443 offers excellent technical and environmental performance.

OCEANIC HW 443 contains a fluorescent leak tracer dye. Other OCEANIC HW 443 fluids are available with and without leak tracer dyes (fluorescent red pink dye in OCEANIC HW 443 R, and no dye in OCEANIC HW 443 ND) and high glycol for cold/arctic climates and hydrate resistance (OCEANIC HW 460 R).

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

Features	Benefits
Stable up to 145°C / 293°F	Suitable for some operations at 145°C and specified for high temperature wells with downhole temperature ≤135°C / 275°F including a comfortable safety margin.
Excellent corrosion protection (liquid & vapour phase) and lubrication properties	Ideal for projects with long design life (≥25 years) & recommended for long term equipment storage
ISO13628-6 specified, approved for use by major equipment manufacturers	Suitable for use in most subsea production control equipment
Resistant to microbial infection	Extends operational life of fluid
Outstanding stability with high levels of seawater ingress	No solids formation in hydraulic lines even with 50% seawater contamination
Fluorescent Dye	Aids identification and subsea leak detection
Fully compatible with OCEANIC HW 443, HW 500, HW 500 E, HW 500 P fluid ranges, HW 740 R, XT 900 & PELAGIC 100 fluids	Facilitates flushing from one OCEANIC or PELAGIC control fluid to another

Features	Benefits
Fully compatible with OCEANIC SST 5007 fluids, OCEANIC EPF, OCEANIC Glycol Mixes and OCEANIC 2/00 fluids	Enables flushing to and from OCEANIC preservation, storage & testing fluids
Excellent environmental profile	Meets stringent global environmental discharge regulations
Manufactured & supplied to AS4059 Class ≤6 cleanliness	Good cleanliness minimises equipment wear
Free Fluid Monitoring Program	Helps ensure long service life

PHYSICAL PROPERTIES

Property	Typical Value	Notes
Appearance	Fluorescent Yellow Green Fluid	λ = 490 nm
pH	9.7	
Specific Gravity @15.6°C	1.07	
Kinematic Viscosity (cSt) -20°C (-4°F) 0°C (32°F) 40°C (104°F)	 25 9.2 2.5	
Pour Point	<-25°C (<-13°F)	
Freeze Point	-48°C (-54°F)	
Volumetric Coefficient of Thermal Expansion per °C	0.00043	Ambient Pressure
Bulk Modulus (N/m^2)	3.047×10^9	5°C
Compressibility (Bar)	3.28×10^{-5}	5°C
Specific Heat Capacity $J.kg^{-1}.K^{-1}$	3445	
AS4059 Fluid Cleanliness Class	≤6	Filtration required to maintain Class

APPROVALS

API 6A Temperature Classification(s)

OCEANIC HW 443 is suitable for use in equipment designed to meet API 6A Classes P, R, S, T, U & V.

Equipment Manufacturers

Tested in accordance with FMC PRD 0000021632 Rev D, preferred and/or approved fluid of all major equipment manufacturers.

Environmental

MacDermid maintain worldwide environmental approvals and can offer OCEANIC & PELAGIC Subsea production control fluids suitable for use in every Exploration & Production region around the world.

The current environmental status of OCEANIC HW 443 in your area can be obtained from our environmental specialists.

ISO 13628-6 : Design and Operation of Subsea Production Systems

Tested in accordance with ISO 13628-6 Annex C

Property	Performance
Thermal Stability – High Temperature	Stable at 145°C / 293°F. (Free oxygen can cause oil-like droplets to form at 145°C /293°F if exposed to this environment for exceptionally long periods)
Thermal Stability – Low Temperature	Stable at -25°C / -13°F (Fluid is stable below this, -25°C ISO fully tested)
Thermal Stability – High Temperature with 10% Seawater contamination	Stable at 145°C / 293°F. (Free oxygen can cause oil-like droplets to form at 145°C /293°F if exposed to this environment for exceptionally long periods)
Seawater compatibility	No visible solid or liquid separation with 50% seawater contamination
Control Fluid compatibility	Compatible with all industry standard control fluids (e.g. OCEANIC HW 500 / HW 500 E / HW 500 P series, OCEANIC HW 443 R, OCEANIC HW 740 R, PELAGIC 100 fluids, Transaqua HT fluids)
Completion Fluid Compatibility	Compatible with monovalent completion brines (e.g. K formate, Cs formate & NaCl). Solids formed when mixed with divalent brines (e.g. $CaCl_2$, $CaBr_2$ & $ZnBr_2$).
Compatibility with Miscellaneous Operational Fluids	Compatible with methanol and up to 10% Hydrochloric acid contamination. Immiscible with Compensation fluid (Elf Nemis SN sank) and Reference oil (IRM903 floated)
Metal Compatibility	All ferrous metals tested met acceptance criteria at all test temperatures (5°C /41°F to 145°C / 293°F) Non-ferrous metals (Aluminium bronze, beryllium copper, WCNi and electroless Nickel) tarnish and corrosion rates increase with temperature and available air/oxygen. High corrosion rates observed with aluminium bronze & beryllium copper.

Property	Performance
Elastomer Compatibility	NBR, HNBR, PTFE & PEEK compatible. FKM not recommended for use at ≥50 °C / 122°F.
Thermoplastic compatibility	Successful Umbilical hose pressure cycle test with Nylon 11 hose liner
Filterability	Excellent filterability (ISO13357-2, Stage II >80%)
Fluid Lubricity and Wear	Exceeds Falex Test requirements (i.e. <25 in lb Torque & <40 wear teeth)
Microbiological Resistance	No microbial activity after multiple challenges with mixed bacterial and fungal inoculum
Acid Buffer Capacity	Excellent buffer capacity (> 1% glycolic acid required to lower pH to <8
Metal Ion Compatibility	Excellent metal ion compatibility (>5000ppm Ni or Cu ions required to form permanent solids)

MATERIAL COMPATIBILITY

OCEANIC HW 443 contains performance additives which ensure high levels of compatibility with materials typically used in subsea production control equipment.
OCEANIC HW 443 contains a vapour phase corrosion inhibitor to protect small airspaces/ headspaces where humidity/condensation from the control fluid could cause corrosion.
Extensive material compatibility tests have been performed:

Material	Compatibility
Ferrous metals (cast iron, carbon steel, low & high alloy steels, stainless steels...)	Compatible
Non-ferrous metals (copper, brass, bronze	Compatible with alloys typically used in subsea production control equipment.
Other metals and alloys (1)	Avoid Al, Cd, Mg, Pb and Zn metals. Aluminium has a tendency to blacken/tarnish. Hard anodizing improves compatibility, but is porous and susceptible when scratched.
Coatings and ceramic materials	Avoid porous coatings. Compatible with most ceramic parts. Check ceramic coatings
Packaging & sealing materials (2) (elastomers and thermoplastics)	Compatible with standard NBR, HNBR, FFKM, VMQ/FMVQ, CR, TFE/PTFE, PEEK. Some FKM & AU/EU/PU have proven to be incompatible at elevated temperature (i.e. ≥50°C / 122°F)
Umbilical hose liner thermoplastics	Compatible with Nylon 11, PE and Polyether ester copolymers
Absorbent gasket materials	Avoid cork, leather, cotton impregnated materials
Paints	Avoid painting internal surfaces Cured epoxy, phenolic and nylon based paints are satisfactory. Avoid less resistant paints as they soften. Wash spillages immediately with water
Filter elements	Polypropylene and glass fibre filter elements recommended over paper filters

Note 1 : Alkaline fluids generally corrode these types of metal and alloys at rates that exceed guidance by ISO 13628-6 and API 17F. Processes such as hard anodizing of Aluminium have been reported to improve compatibility in certain cases.

Note 2 : As material compatibility varies from compound to compound and supplier to supplier, consult supplier for recommendations or request specific compatibility tests.

FLUID MONITORING PROGRAM

The Fluid Monitoring Program is designed to optimise fluid performance and service life. Fluid Monitoring laboratories are available on every continent, for your local laboratory, please contact MacDermid Offshore Solutions.

Sample test results are accessible via our secure website (www.macdermid.com/offshore).

FLUID MONITORING PROCEDURES & KITS

Sample frequency for Subsea Production Control fluids is typically 3-6 months. Fluid samples should be:

- good quality & representative of the system
- taken from a recognized sample point
- sufficient volume for all tests (typically 500ml/1 pint)
- taken in a clean container, suitable for transport
- in a clearly labelled container (Fluid Name, Sample Point, Installation/Site, Company Name and Date Taken) with any relevant comments & requests (e.g. Routine analysis, AS 4059 Cleanliness check, suspected contamination…)

Typical Fluid Sampling Procedure:

- Operate system for at least 30 minutes prior to sampling.
- Open sample point valve to produce a steady flow. Do not touch sample point again until sampling is complete.
- Flush valves and lines clean, into a catchment tray or bucket, with at least 500 ml (approximately 1 pint) of fluid.
- Inspect sample bottle and cap to ensure that they are visually clean.
- Collect at least 200ml without bottle or cap touching surfaces.
- Rinse the inner surfaces of the bottle and lid with the fluid and discard fluid.
- Repeat bottle flushing and rinsing steps
- Collect 250-500ml into sample bottle.
- Immediately cap and seal the sample bottle.
- Close the sampling point valve.
- Label sample fully, package securely and send to laboratory.

Sample bottles are available on request.

Fluid Cleanliness Kits:

Plant/Workshop Cleanliness Kit (Code# 5100550001)

Field/Offshore Cleanliness Kit (Code# 5100560001)

STORAGE INFORMATION

Recommended storage conditions are dictated by packaging, rather than the product.

Containers of OCEANIC HW 443 should be stored in dry conditions, ideally out of direct sunlight. Normal storage temperature range is -20°C (-4°F) to 40°C (104°F).

Shelf life is 5 years from date of manufacture when sealed in the original packaging under recommended storage conditions.

Equipment containing OCEANIC HW 443 should be stored according to equipment manufacturer's recommendations. For guidance, in equipment OCEANIC HW 443 may be stored from -25°C (-13°F) to 50°C (122°F).

Fluid within equipment does not have a shelf/operational life. Regular condition checks on fluid are advised.

SAFETY & WARNING

MacDermid Offshore Solutions recommends that the company/operator read and review the Safety Data Sheets for the appropriate health and safety warnings before use.

Safety Data Sheets are available from MacDermid Offshore Solutions.

WASTE TREATMENT

Prior to using any recommendations or suggestions by MacDermid Offshore Solutions for waste treatment, the user is required to know the appropriate local/state/federal regulations for on-site or off-site treatment which may require permits. If there is any conflict regarding our recommendations, local/state/federal regulations take precedent.

ORDER INFORMATION

Product	Code
OCEANIC HW 443	174937
OCEANIC HW 443 ND	174964
OCEANIC HW 443 R	174832
OCEANIC HW 460 R	114834

CONTACT INFORMATION

To confirm this is the most recent issue, please contact MacDermid Offshore Solutions

http://www.macdermid.com/companies/macdermid-offshore-solutions

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Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE. Emergency directory assistance Chemtrec 1 - 800 - 424 - 9300.