

# OSPAR compliant synthetic base fluids



A range of ester base fluids for  
formulating high performing  
offshore lubricants

**Cargill**<sup>®</sup>



# Global offshore industry – an environmental challenge

The offshore drilling market continues to grow, as demand for energy increases worldwide, driven by population growth and increased urbanisation.

The maturing of onshore oil fields has shifted the focus of operators towards offshore fields for new exploration and production activities.

Advanced drilling technology enables operators to enter deep-water and ultra deep-water zones to enhance their revenues.

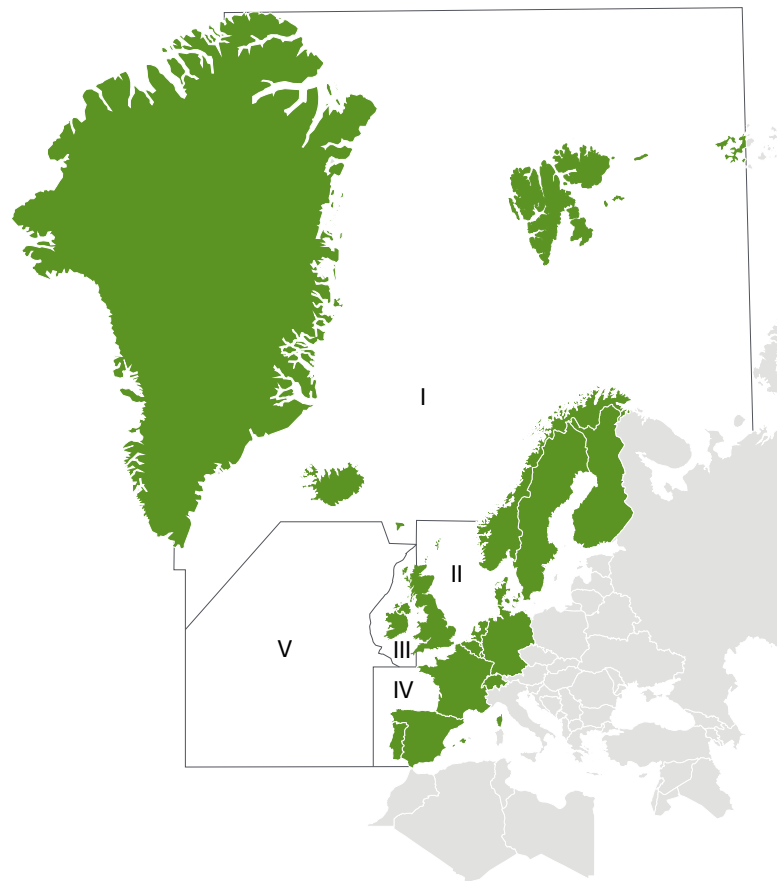
However, there remains one essential overriding consideration; maximising production and maintaining operational efficiency must not have a negative impact upon the surrounding environment.

## OSPAR

OSPAR is the international agreement by which 16 contracting parties co-operate to protect the marine environment of the North-East Atlantic.

Under the OSPAR agreement, pollution of the marine environment is minimised or prevented by reducing discharges, emissions and other losses of hazardous substances.

Chemical suppliers, including lubricants suppliers, must provide national authorities with data about chemicals which are used and discharged offshore. This is enacted via the Harmonised Offshore Chemical Notification Format (HOCNF).



For more information about the work of OSPAR as well as the HOCNF process visit their site at <http://www.ospar.org>

Region I: Arctic Waters  
 Region II: Greater North Sea  
 Region III: Celtic Seas  
 Region IV: Bay of Biscay and Iberian Coast  
 Region V: Wider Atlantic  
 ● OSPAR catchment area

## OSPAR compliance

OSPAR defines hazardous substances as those that are persistent, toxic and likely to bioaccumulate (PBT substances) or cause an equivalent level of concern as PBT substances.

The data set required for HOCNF is used to establish whether the use of any chemicals could have a negative effect upon the marine environment. As such, the data set is extremely thorough, following specific validated test methods. It requires up to four trophic levels of the marine environment to be tested which are representative of the different levels of the marine food chain.

Substitutable chemicals within lubricant formulations are required to be phased out of products, leading to the reformulation and recertification of products.

<p><b>Components are NOT permitted for use if they appear on;</b></p>	<ul style="list-style-type: none"> <li>• OSPAR Prohibited list</li> <li>• REACH Annex XIV or XVI</li> </ul>
<p><b>Components are SUBSTITUTABLE* if they meet any of the following;</b></p>	<ul style="list-style-type: none"> <li>• Inorganic substance with acute toxicity (EC50 or LC50 &lt;1mg/l)</li> <li>• Organic substances with biodegradability of BOD28 &lt;20%</li> <li>• Substances that <b>FAIL</b> to meet two of the following pre-screening criteria:                             <ul style="list-style-type: none"> <li>- Biodegradability ≥60% in 28 days.</li> <li>- Bioaccumulation potential log Pow ≤3 or molecular weight ≥700</li> <li>- Acute toxicity LC50 or EC50 ≥10mg/l</li> </ul> </li> </ul>
<p><b>Components are ACCEPTABLE if :</b></p>	<ul style="list-style-type: none"> <li>• They meet two of the three pre-screening criteria described above, or</li> <li>• They are PLONOR (Pose Little or No Risk to the Environment) chemicals, or</li> <li>• Are on REACH Annex IV or meet the criteria of REACH Annex V</li> </ul>

\*The substitution of harmful chemicals is an important part of the Harmonised Mandatory Control Scheme (HMCS). Local/country authorities, are obliged to implement the policy to replace chemical substances identified as candidates for substitution.

## Measurement methods – environmental profiling of components

### Marine toxicity

Measured by establishing the concentration of the substance which kills 50% of the population of four types of marine organism; algae, crustaceans, fish and sediment re-worker.

### Marine biodegradation

A measure of how a substance is broken down by biological activity within the marine environment within a given time period. In order to be considered as readily biodegradable in the marine environment a substance must achieve  $\geq 60\%$  in 28 days according to OECD 306 test method.

### Bioaccumulation

A measure of the tendency of a substance to accumulate within the tissue of living organisms, and therefore be transferred up the food chain. A

substance is classified by its preferential solubility in octanol compared to its solubility in water; expressed as  $\log P_{ow}$  where  $P_{ow}$  is the octanol/water partition coefficient. Substances with a  $\log P_{ow} < 3$  are considered to be non-bioaccumulating under OSPAR. Molecules with a high molecular weight ( $> 700$ ) do not bioaccumulate as they are too large to enter gill or cell membranes.

Data must be considered for every discrete chemical component contained within a formulated lubricant, regardless of level present.

Pre-screening of components according to OSPAR criteria is used to establish whether components are acceptable or substitutable.

Our global technical team actively look to work with formulators in developing high performing OSPAR compliant offshore lubricants.



## Formulating with confidence for OSPAR

We have invested in the full suite of applicable HOCNF test data to demonstrate that our ester lubricant base fluids are in accordance with the OSPAR criteria of being readily biodegradable and non-hazardous to marine organisms. This data set provides formulators with an extra level of confidence in their formulation of high performance, OSPAR compliant lubricants and allows the relevant authorities to facilitate registration of finished lubricant products.

We are world leaders in the development of synthetic ester base fluids for use in environmentally sensitive applications. The table below illustrates our recommendations for OSPAR compliant base oils (or blends of base oils) for hydraulic fluids, gear oils and greases.

Please note that these blends are not the only options and more can be created depending upon your product formulation requirements.

### Our products carry the following benefits:

- Excellent biodegradability (ultimately biodegradable)
- Low aquatic toxicity
- Very high renewability content
- Pre-screened to OSPAR testing requirements and substitution is NOT required
- ISO 22 – 1000 base fluid viscosities
- Excellent low temperature flow properties
- Excellent oxidation stability
- Excellent lubrication properties

We have a range of esters which formulators can use to formulate products for OSPAR compliance.

These range in viscosity from ISO 22 to ISO 1000.

ISO Grade	Hydraulic Fluids	Gear Oils	Greases	Examples of OSPAR Compliant Base Fluids & Blends
22	●		●	Priolube 3970
32	●		●	Priolube 3970 + Priolube 1973 blend
46	●		●	Priolube 2089 or Priolube 1973
68	●	●	●	Priolube 1973 + Priolube 3987 blend
100		●	●	Priolube 1973 + Priolube 3987 blend
150		●	●	Priolube 3987
220		●		Priolube 3987 + Priolube 1847 blend
320		●		Priolube 3987 + Priolube 1847 blend
460		●		Priolube 3987 + Priolube 1847 blend

Product name	Kinematic viscosity at 40°C (mm <sup>2</sup> /s)	Kinematic viscosity at 100°C (mm <sup>2</sup> /s)	Viscosity index	Pour point (°C)	Flash point (°C)	Oxidation stability (mgKOH/g)	Tests to verify OSPAR compliance							
							OECD 117 Log Pow*	Molecular weight*	Ecotoxicity data crustacea (Acartia tonsa) <sup>**</sup>	Ecotoxicity data algae (Skeletonema costatum) <sup>††</sup>	Ecotoxicity data sediment reworker (Corophium volutator) <sup>‡‡</sup>	Ecotoxicity data fish (Cyprinodon variegatus (P3970 & P1847), Scophthalmus maximus (P2089, P1973, P3987) <sup>§§</sup>	Biodegradability OECD 306*	Renewability (%)
<b>Priolube 3970</b>	20	4.4	140	-51	250	High	≥7	≥500	≥10,000 mg/l	≥10,000 mg/l	≥12,200 mg/kg	≥10,000 mg/l	Pass (≥60%)	82
<b>Priolube 2089</b>	44	8.7	181	-54	315	Medium	≥7	≥600	≥10,000 mg/l	≥10,000 mg/l	≥13,858.7 mg/kg	≥3,200 mg/l	Pass (≥60%)	88
<b>Priolube 1973</b>	46	8.0	148	-44	280	High	≥7	≥600	≥10,000 mg/l	299.8 mg/l	≥1,250 mg/kg	≥299.8 mg/l	Pass (≥60%)	88
<b>Priolube 3987</b>	145	18.2	140	-33	320	High	≥7	≥700	≥10,000 mg/l	44.52 mg/l	≥3,170 mg/kg	≥44.52 mg/l	Pass (≥60%)	97
<b>Priolube 1847</b>	1040	85	167	-24	300	High	≥7	≥700	≥10,000 mg/l	6,080 mg/l	≥6,080 mg/kg	≥10,000 mg/l	Pass (≥60%)	85

\*Data used to pre-screen products and confirm that substitution is NOT required.

\*48hr LC50

†72hr EC(r)50

‡10 day LC50

§96hr limit test



## Who are we?

The Energy Technologies business in Cargill Bioindustrial creates, makes and sells specialty chemicals and additives for the global energy market. Working in close collaboration with our customers, we apply sustainable concepts and deep scientific expertise so that together we can efficiently power the world of tomorrow.

At our core, we are experts in synthetic ester and polyalkylene glycol chemistries, taking products from lab scale through to full manufacturing. Investing in the development of new chemistries allows us to support our customers in meeting new industry challenges.

For those who dare to imagine a brighter future, we establish long lasting relationships and create bespoke industry solutions through our integrated research & development and global manufacturing capabilities. Being both global and local, you have direct access to our network of technical experts. We look forward to talking to you.

## Further information

Cargill Bioindustrial sales and distribution are coordinated through an extensive worldwide network of technical and commercial experts. For further information or guidance please contact us:

**[energy\\_technologies@cargill.com](mailto:energy_technologies@cargill.com)**

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