

ECOSAFE PLUS

WATER BASED NON-FLAMMABLE HYDRAULIC FLUID EXEMPT FROM GLYCOLS

ECOSAFE PLUS is a **fire-resistant biodegradable hydraulic fluid** (type HFC and viscosity grade ISO 46). Its innovative formulation is based on a mixture of polymers and biopolymers, and it is **glycol-free**. Compared to traditional water/glycol based HFC hydraulic fluid, ECOSAFE PLUS allows for **easy disposal** of the exhausted fluid and **improved environmental safety**. ECOSAFE PLUS possesses highly stable physical and chemical characteristics during operativity (% H₂O, viscosity, pH, etc.), thanks to its **high lubricity** and hence to the great stability of the raw materials that compose the formulation. ECOSAFE PLUS is particularly suitable for hydraulic circuits located in close proximity to sources of heat, thanks to its absolute non-flammability, associated to its exceptional durability and to the optimization of the performance of the single formulation components, that give highly lubricant characteristics to the product.

BENEFITS

- ✓ Very high safety thanks to its properties of non-flammability
- ✓ No glycols in the formula
- ✓ Good compatibility with elastomers and other materials thanks to the absence of glycols in the product
- ✓ High anticorrosion and antiwear performance for the material and for the circuit
- ✓ Sustainable disposal in a plant for the biological treatment of wastewater or in similar systems without having to be treated as special or dangerous waste
- ✓ Good deaerating performance and low foaming
- ✓ High stability of the value of viscosity in relation to working life
- ✓ Good lubrication and therefore limited heat production during its use in hydraulic systems
- ✓ Good compatibility with paints

CHEMICAL-PHYSICAL CHARACTERISTICS

Appereance:	clear red liquid
pH:	8,5 ÷ 9
Relative density (20 °C, g/ml):	1,05
Viscosity (40°C, cSt):	41,4 ÷ 50,6
Solubility:	water soluble
Flammability (°C):	non flammable
Corrosion test (IP 135):	passed
Foam test (ASTM D 892-13):	passed (100/0 ml)

ECOSAFE PLUS has a high resistance to alterations at chemical level, and the danger of the formation of deposits is accordingly very small. This feature allows to use ECOSAFE PLUS for a long time, provided that the external contamination are eliminated with an effective filtration system.

TRIBOLOGICAL TESTS

ECO SAFE PLUS has been tested by accredited laboratories with tribological trials, carried out by comparison with a standard product, in order to evaluate the lubricant characteristics:

Brugger test (DIN 51347)

ECOSAFE PLUS has passed Brugger test with **far superior performance** compared to the traditional product, as shown by the graph below:

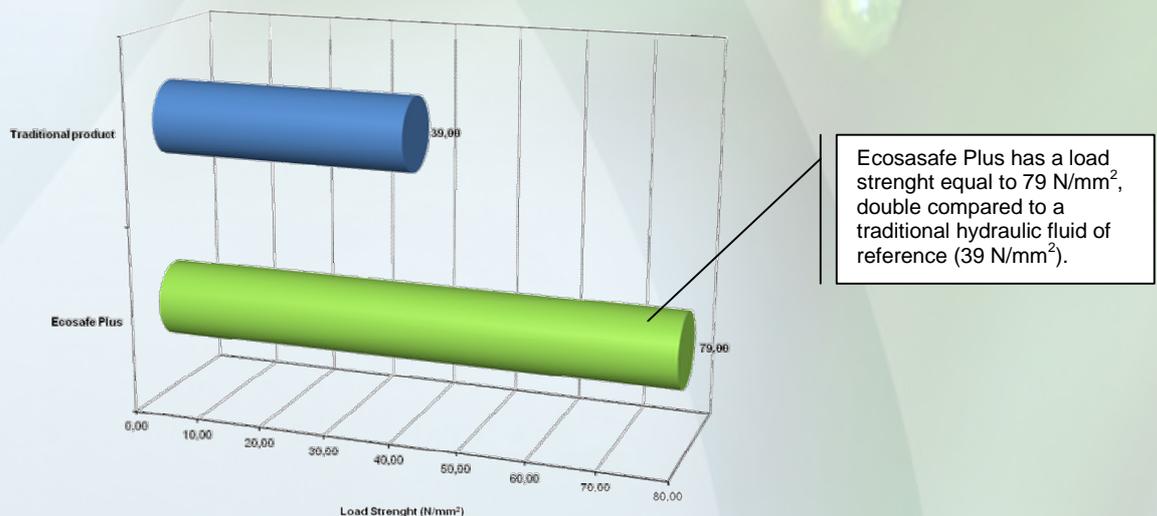


Figure 1- Brugger Test; Ecosafe Plus compared to a market leader hydraulic fluid based on water/glycol formulation.

Test with Vickers pump V-104-c (test derived from ASTM D 2882)

ECOSAFE PLUS has been compared with a market leader water/glycol based hydraulic fluid: after 600 hours of operation, it **has shown a value of wear** of the vanes, of the stator and of the rotor **equal to 25% than the one measured** after the same period of operation **with the competing product**:

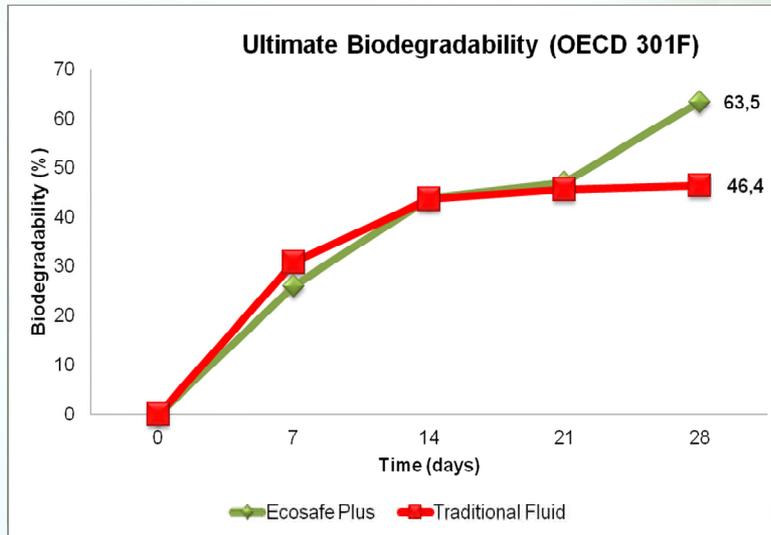
TEST RESULTS
Weight difference (g)

	Rotor	Vanes	Stator	Total weight loss
Traditional product	0,402	0,045	4,159	4,606
Ecosafe Plus	0,050	0,104	1,523	1,677

Table 1- Results of Vickers test refer to Ecosafe Plus and to a market leader hydraulic fluid based on water/glycol formulation.

BIODEGRADABILITY

ECOSAFE PLUS has been tested by accredited laboratories according to OECD 310 F and found to be **biodegradable (biodegradation > 60% after 28 days)**, as opposed to water/glycol hydraulic fluids of normal use, which in this aspect have much lower performance (biodegradation < 40% after 28 days).



The biodegradability does not affect the technical properties of ECOSAFE PLUS, which remain stable during exercise, but simply facilitates the disposal of exhausted product. During operation, ECOSAFE PLUS is not subject to any alteration of the chemical-physical characteristics and to any alteration of biological nature.

Figure 2 - Biodegradability of Ecosafe Plus compared to a market leader hydraulic fluid based on water/glycol formulation.

The biodegradability is an important advantage of this new technology without glycol, as it puts on the market a safer product from the point of view of hygiene and environmental safety; not least, the disposal of the product at the end life will prove to be easier and cheaper than the traditional product.

COMPATIBILITY

ELASTOMERS

The majority of the seals and the rings of security compatible with mineral oils can also be used with ECOSAFE PLUS. In particular, ECOSAFE PLUS is compatible with the following elastomers (ASTM D471):

Red and white silicon, Viton, Teflon, EPDM, Polyurethane, NBR

PUMPS

ECOSAFE PLUS can be used with most of the types of pumps and gears present in the hydraulic circuits, such as pistons and vanes.

It is possible to use the flexible elements commonly compatible with conventional mineral oil based hydraulic oils, checking in advance the compatibility with different types of elastomer.

PAINTS

In contrast to the traditional non-flammable fluids, ECOSAFE PLUS contains no glycols in the formulation, compounds to which the majority of paints currently used in the plants shows incompatibility; for this reason, ECOSAFE PLUS should have a less aggressive behavior.