



# ELIXORE

## Aliphatic Diluents for Metal Extraction

taking hydrometallurgy  
to new levels of purity



**TotalEnergies**

[specialfluids.totalenergies.com](https://specialfluids.totalenergies.com) | 

TotalEnergies Fluids SAS - Head office: 24 cours Michelet - 92069 Paris la Défense Cedex - France - T +33(0) 1 41 35 40 00 - Share capital: €6,920,000.00, Registered in Nanterre: RCS B 342 241 908 - Photo credits: Shutterstock, Istock - Desing and Layout: Nobin's - April 2022

The Special Fluids  
division of TotalEnergies:  
A global network  
with a local touch

A recognised  
GLOBAL LEADER

**HEALTH AND SAFETY**  
ARE THE CORNERSTONES  
OF OUR PROCESSES



Storage facilities  
**WORLDWIDE**



MULTI-SKILLED  
TEAMS of passionate,  
seasoned specialists

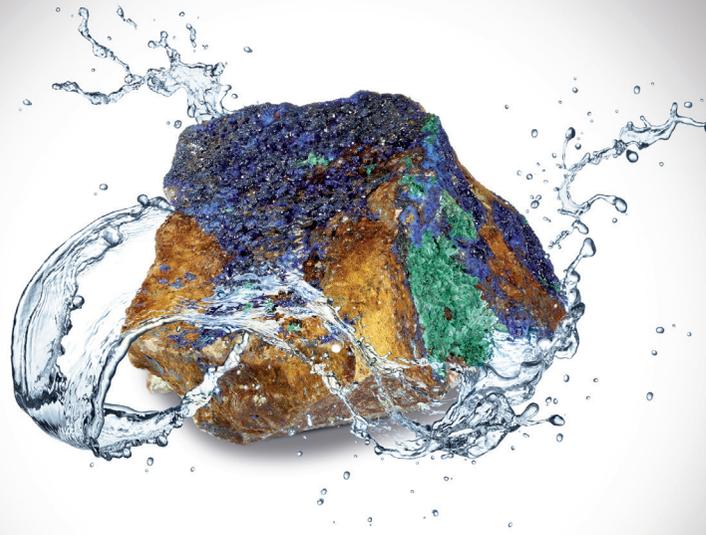
**A WIDE SELECTION  
OF PRODUCTS**  
FOR VARIOUS INDUSTRIAL  
APPLICATIONS



PLANTS  
in France  
and the US



**3 LEADING-EDGE  
R&D CENTRES**  
two in France, one in  
Belgium, and a technical  
centre in India



## ELIXORE: Aliphatic Diluents dedicated to Solvent Extraction (SX-EW)

A comprehensive choice of perfectly inert, colorless  
and odorless diluents with ultra low aromatic  
content.

### KEY FEATURES

- ✓ High **flashpoint**
- ✓ Low **pour points**
- ✓ Narrow **distillation range**
- ✓ Ultra low **aromatic contents**
- ✓ Low **viscosity**
- ✓ Low **evaporation rate**

Each product is tailored to provide the optimal balance between  
desired level of extraction efficiency (viscosity) and necessary  
level of operator safety (high flashpoint).

\*Black Mass of Li-ion batteries: LCO/NMC/NCA

## Applications

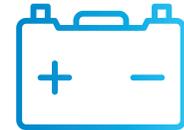
1

Mining  
ORE



2

Recycling of batteries  
BLACK MASS\*



LEACHING



SOLVENT EXTRACTION



Metals that can be extracted  
using ELIXORE as a diluent.



**eco solutions**

The product "ELIXORE Range" has been labelled as Ecosolutions by TotalEnergies. Accredited according to a process verified by an independent expert firm, the Ecosolutions by TotalEnergies label attests a greater eco-efficiency of the labelled products or services compared to reference products\*\*.

To learn more about the Ecosolutions by TotalEnergies program: [ecosolutions.totalenergies.com/en/](https://ecosolutions.totalenergies.com/en/)

## Benefits



### Environment Friendly

- ▶ Readily biodegradable according to OECD guidelines.
- ▶ Low Volatile Organic Carbon (VOC) emissions.



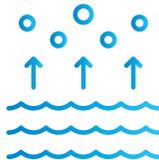
### Unmatched Health Benefits

- ▶ Safer for operators on Mixer Settlers.
- ▶ Not classified as Carcinogenic, Mutagenic or Reprotoxic (CMR).
- ▶ Not classified as a substance with acute or chronic toxicity.
- ▶ Extremely low vapor pressure ensuring low odor and fume emissions.



### Performance

- ▶ Equivalent or superior performance v/s classical aromatic diluents.



### Less Evaporation Loss

- ▶ Lowest evaporation rate among products of same viscosity and flash point range.
- ▶ Less evaporation > lower diluent consumption > cost savings.



### Less Crud Formation\*

- ▶ With no aromatics, ELIXORE is inert to oxidation, thus degradation.
- ▶ Less degradation > less crud formation > bigger change interval > low operational cost.



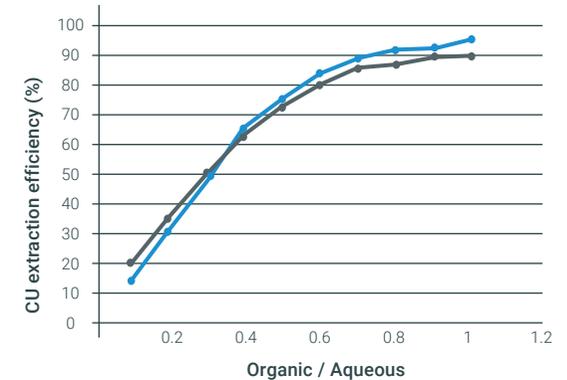
ELIXORE 205

AROMATIC > 15% DILUENT

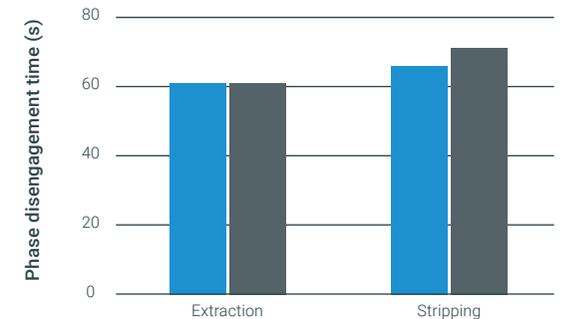
After (acid + oxidant) 6 months degradation

ELIXORE 205 AROMATIC > 15% DILUENT

### EXTRACTION EFFICIENCY\*\*\*

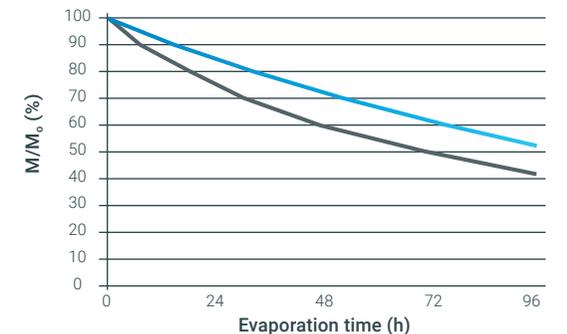


### PHASE DISENGAGEMENT TIME\*\*\*



### RATE OF EVAPORATION\*\*\*\*

At 30° C (86°F) wind - 1 km/h



\*Diluent Stability Study carried out at CSIRO Mineral Resources, Australia

\*\*Reference products, as determined according to the Ecosolutions by TotalEnergies labelling referential

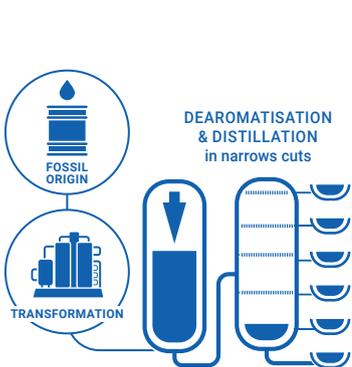
\*\*\*An independent R&D program compared ELIXORE vs the classical aromatic diluent in the same solvent formulation (extractant + diluent)

\*\*\*\*Evaporation Study carried out at IMT Mines Alès, France

## Multiple offers



**Dearomatized**

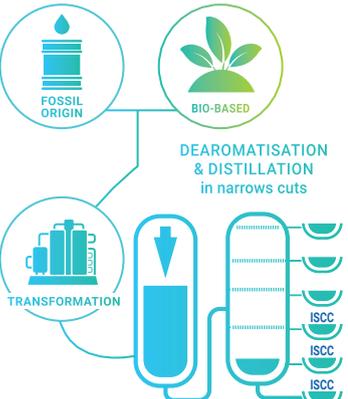


**LCA\*: + 635 kgCO<sub>2</sub>eq / t\*\***

Classic petroleum based offer.  
No sustainability.  
Homologated Usual Range: ELIXORE.



**Carbon neutrality**

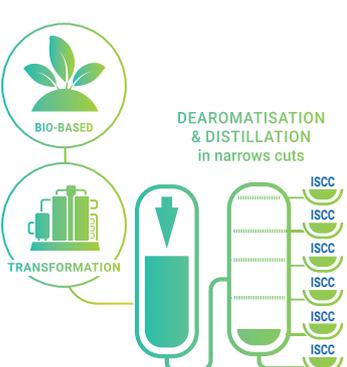


**LCA\*: 0 kgCO<sub>2</sub>eq / t\*\***

Possibility to achieve carbon neutrality.  
Proof of sustainability (POS)\*\*\*.  
Homologated Usual Range: ELIXORE.



**100% Renewable**



**LCA\*: - 648 to - 2438 kgCO<sub>2</sub>eq / t\*\***

Possibility to achieve carbon neutrality.  
Proof of sustainability (POS)\*\*\*.  
Biolife Range.

The EcoLife Range works on the principle of Mass Balance  
1 MT of Bio-based feedstock = 1 MT of POS certified by ISCC = 1 MT of responsible product

\*Peer reviewed: Cradle to Gate (CTG)  
\*\*Value dependent on the feedstock  
\*\*\*POS is a certificate guarantying feedstock origin and CO<sub>2</sub> footprint

## A responsible offer

As part of our commitment to sustainable development, we have developed an ISCC PLUS certified responsible offer which ensures you are using products that contribute to the reduction of your carbon footprint.

To find out more, go to:  
<https://specialfluids.totalenergies.com/en/iscc-plus-certificate>.



Set up by the European Union, ISCC is a certification body that ensures compliance with environmental criteria, labor law, etc. It ensures traceability of raw materials throughout the supply chain.

## Complete range

Properties	Methods	Units	ELIXORE 180	ELIXORE 205	ELIXORE 215	ELIXORE 230	ELIXORE 250
Density	ASTM	kg/m <sup>3</sup>	811	819	819	817	817
Pensky-Martens Flash Point	ASTM D93	°C	66	75	85	104	121
Aromatic content	UV	ppm	< 300	< 300	< 300	< 300	< 300
Initial Boiling Point	ASTM D86	°C	185	198	213	235	257
Dry Point	ASTM D86	°C	214	234	241	262	325
Kinematic viscosity at 40°C	ASTM D445	mm <sup>2</sup> /s	1.4	1.7	1.9	2.4	3.6
Vapor Pressure at 20°C	Calculated	mbars	0.0380	0.0160	0.0110	0.0020	0.0003

↓

Low viscosity for better phase separation

↓

Good balance of viscosity and flashpoint

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High flashpoint for high temperature conditions



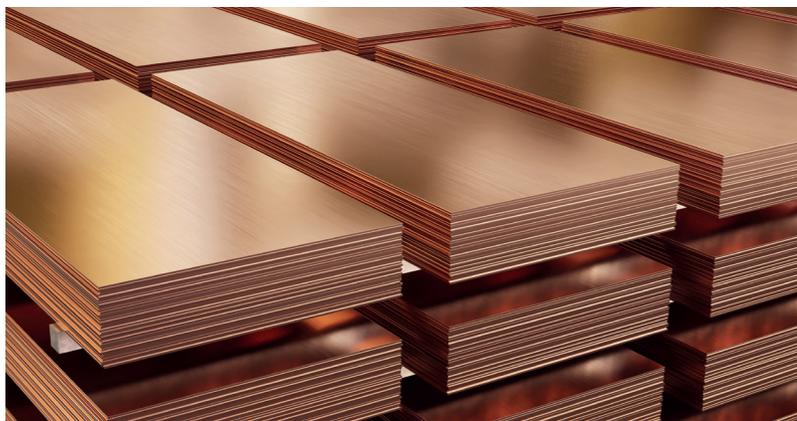
## Case study: Solvent Extraction Copper Mine Revamping Study, Peru\*

A customer revamped their copper solvent extraction mining site in 2016. They switched from a 5% aromatic diluent to ELIXORE in 2016 after carrying out a detailed analysis study with 5 potential market diluents. The study was presented in Hidrometalurgia 2019.

### 3 major findings from this study related to diluent change:

- No loss in performance** while changing from a 5% aromatic diluent to fully aliphatic diluent ELIXORE 205.
- ELIXORE displayed the **lowest rate of evaporation**.
- Lower crud formation** linked to better oxidative stability of ELIXORE as there are almost no aromatics (< 300 ppm).

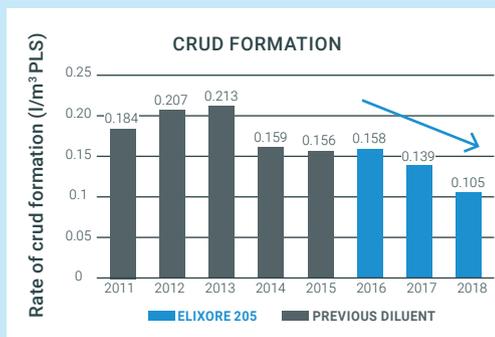
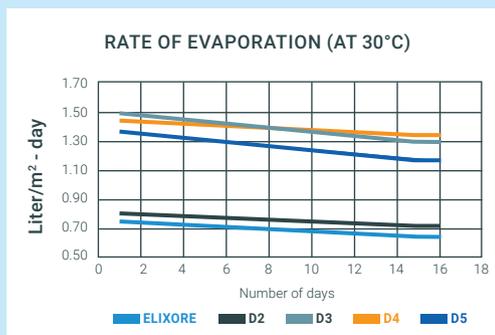
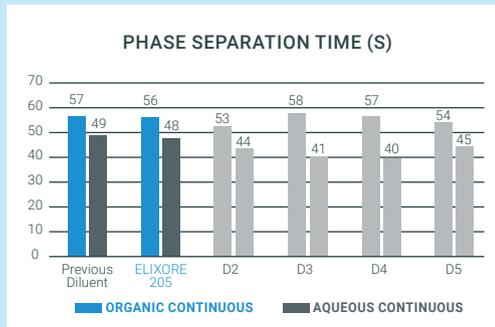
**Feedback after 5 years:** Diluent consumption fell by 8% per annum because of ELIXORE's lower rate of evaporation > Economic Benefits (TCO\*\*).



### \*\*Proven Economic Benefits through Total Cost of Ownership (TCO) Approach

TCO is an internal tool developed by ELIXORE's technical team with the objective: first, to understand the different elements of a SX mine that affect the cost of a diluent, and second, to translate these findings into potential cost savings for the customer.

**Get in touch to find out more:** How switching to ELIXORE can result into cost savings at your site?



They trust us

### Kazakhstan - Mining Company

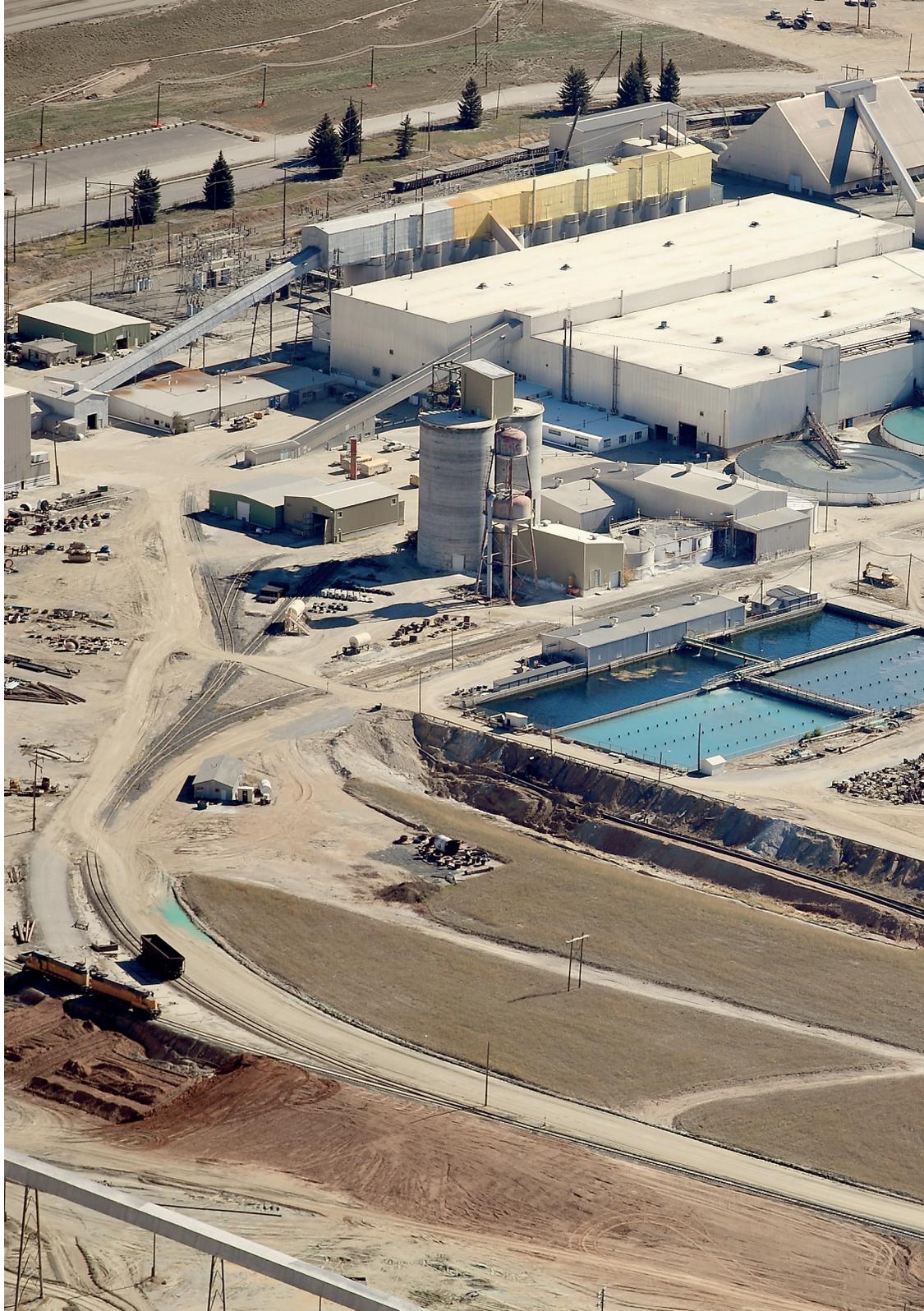
“ ELIXORE diluent meets all technical requirements of operation and has proved to work well in our operations. ”

### Mexico, Peru & US - Mining Company

“ TotalEnergies Special Fluids is one of the main suppliers of diluents for our SX-EW operations in various mining sites in Mexico, Peru & US. We are satisfied with the performance of the ELIXORE diluent. TotalEnergies Special Fluids proved its capacity to manage regular supply with the high safety standards, satisfactory leadtime and delivery conditions compliant with our expectations. ”

### Zambia - Mining Company

“ According to our engineer, the aromatic content is only 300 ppm which is very low and good for solvent extraction... thanks to ELIXORE we have much less evaporation losses compared to the previous product. ”



**TotalEnergies**