THE POWER OF KNOWLEDGE AND THE ENERGY OF TRANSFORMATION

Vander Tumiatti
President and Founder of Sea Marconi
(1968) Turin (Italy) – www.seamarconi.com

Sea Marconi, 58 years of experience

100+ employees

Italy

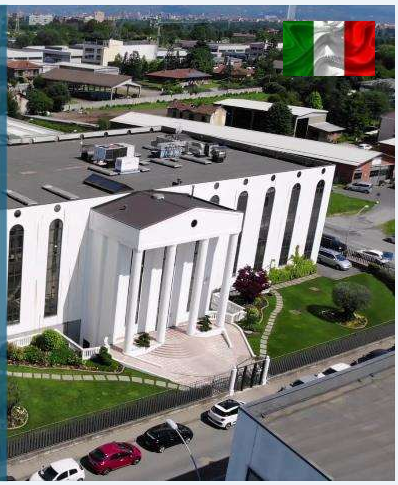
France

Spain

Argentina

More than 3000 customers in 50 countries and 40 patents

UN; UNEP; UNIDO; WORLD BANK ACCREDITATION

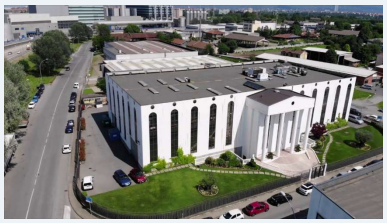


- Pioneers in excellence since 1968
- Independent from oil and transformers manufacturers
- Full range of Technical Services
- International Standards compliance (IEC; CENELEC; ISO; BAT/BEP, etc.)
- Accredited laboratory (ACCREDIA, IAF, EA, ILAC)
- UNI EN ISO Certified (9001, 14001, 45001, 17025, Pdr 125)

Sea Marconi Global Approach

A. Vision & Scenarios (Circular & Granular Economy on Energy & Environment);
B. Ideas & Opportunities (Innovations & Sustainable Solutions);
C. Mission & Projects (Targets: Modularity; Integrations; BAT; BEP; BVC; ROSI; Best CAPEX/OPEX; etc.);
D. Manufacturing & Applications (TRL5/6; TRL6/7; TRL8/9).

Sea Marconi – XyBuilding XXI - HQ



Sea Marconi Labs

Sea Marconi Fluid Treatments Units

i³APOLLO CARE IFTU

SEA MARCONI

Two Main Brands

SEA MARCONI since 1968
Sustainable Energy & Asset Management

Transfo Care
For Resilience and Life Extension of Fluids & Electrical Equipment

BIOENPRO bioenergy & products
Sustainable Solution for Circular & Granular Economy

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SCENARIO: ENERGY & ENVIRONMENT

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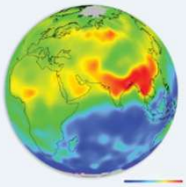
Targets: Minimize the Impact of Climate Changes

Unprecedented levels of greenhouse gases

https://climate.esa.int/



Levels of carbon dioxide and methane in the atmosphere – the **primary drivers of human-induced climate change** – are at record levels and continue to rise. **Methane concentrations are now around 150% above pre-industrial levels (Buchwitz, M. et al. 2018) – and continue to rise.**

Lake Urmia (IRAN) has changed drastically over the decades (Image: Imagery courtesy of USGS/NASA Landsat; Processing by Planet)

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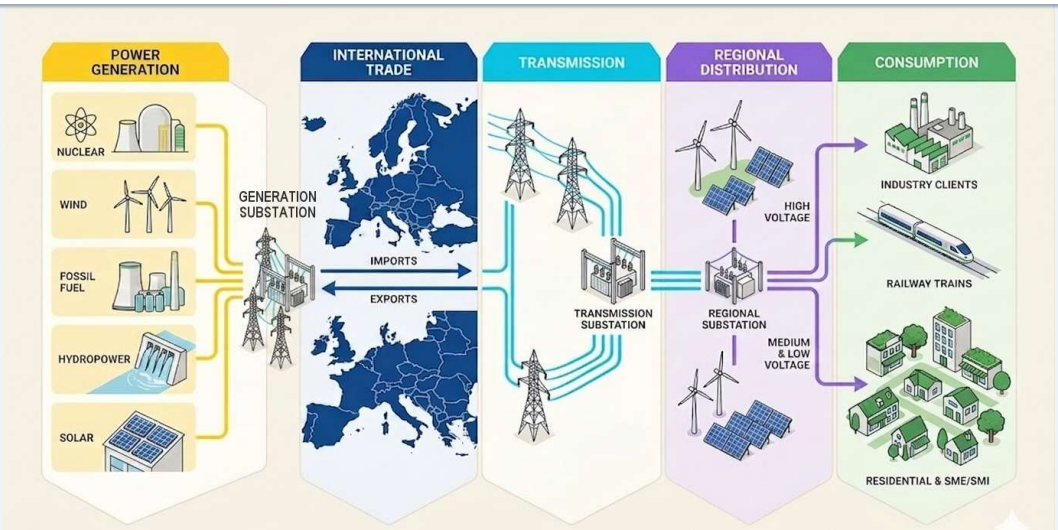
Energy Value Chain



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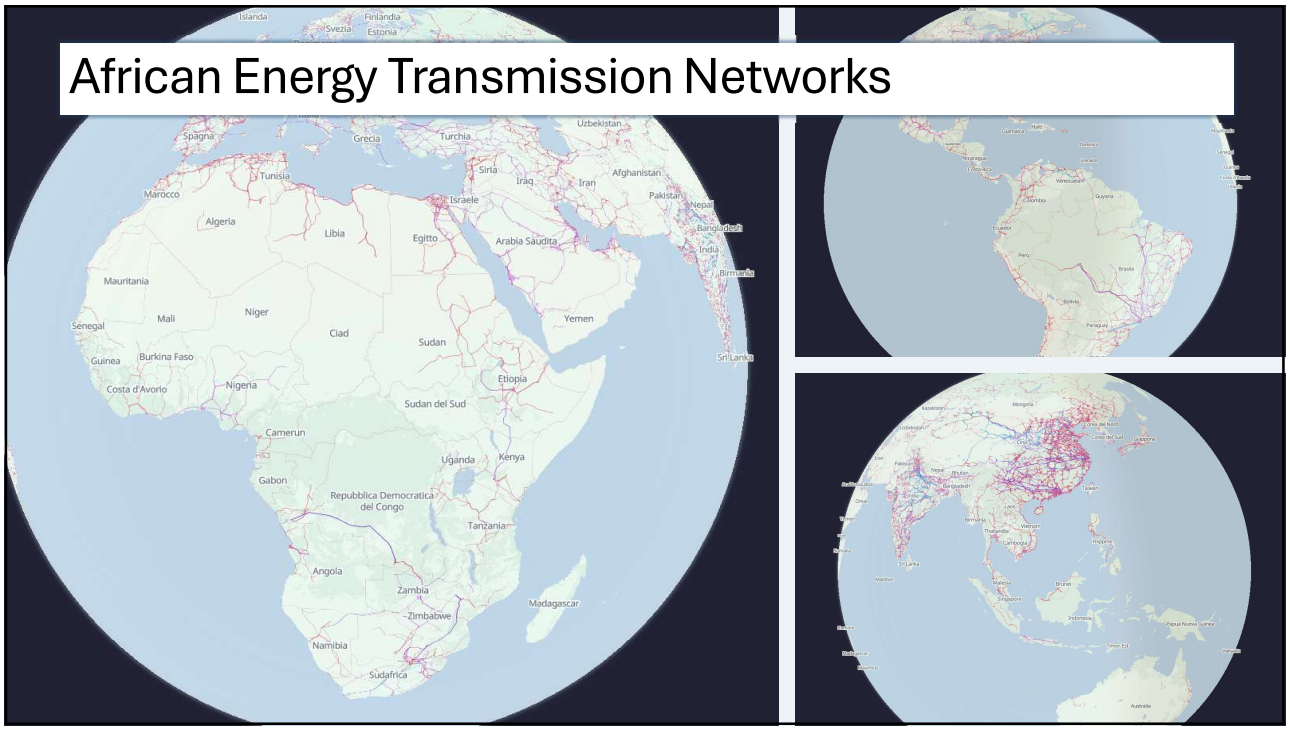
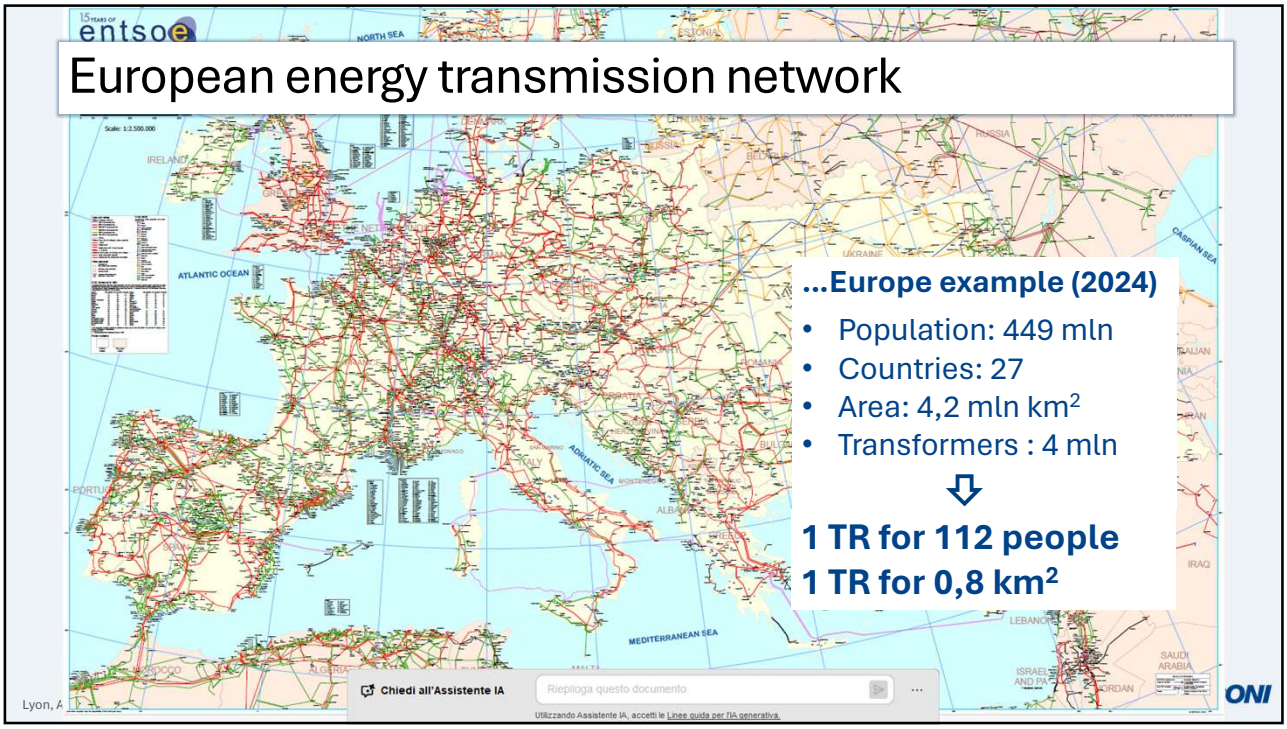
African Energy Transmission Networks



European energy transmission network



...Europe example (2024)

- Population: 449 mln
- Countries: 27
- Area: 4,2 mln km^2
- Transformers : 4 mln

⇩

1 TR for 112 people
1 TR for 0,8 km^2

ONI

Mission: Sustainable ESG Solutions (BAT; BEP; BVC) for Asset & Risk Management

ASSET PROFILE
- Type
- Power (MVA)
- Voltage (KV max)
- Age (year)
- Fluid (type)
- Manufacturer
- Serial number
- Asset Value (€/$)
- Consumed thermal life
- OLTC (type, fluid)
- Bushing (Oil, SF6, etc.)

Key role in the networks:
- Generation,
- Transmission,
- Distribution,
- Use of Energy

Sea Marconi Independent Protocols for Oils and Transformers:
Diagnosis, Prognosis and Treatments of Pathologies in Insulating Liquids (Mineral Oil; Natural and Synthetic Esters; etc.)

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A Bit of History

Nikola Tesla, inventor (10/07/1856 – 7/01/1943)

- "Electrical Transformer" U.S. Patent n. 493, 138, November 2, 1887
- "Electrical Transformer or induction device", U.S. Patent n. 433, 702, August 15, 1890

"Method of Insulating Electric Conductors" U.S. Patent n. 655,838, August 14, 1900 *"my invention any kind of **fluid** capable of meeting the requirements (75…) as **oil,** may be used (130…)"*

A grateful tribute to an innovative scientist (over 200 patents)!

Vander Tumiatti

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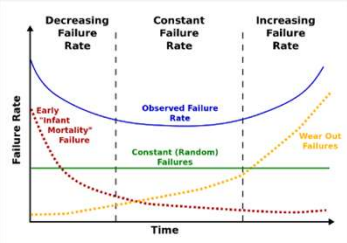
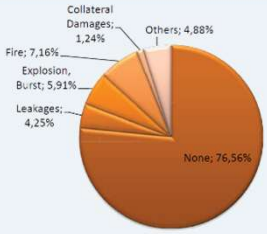
Transformer Failures

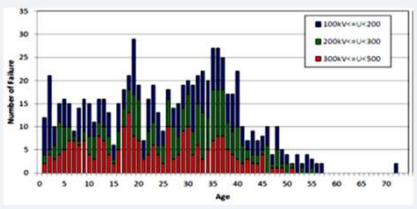


The 'bathtub curve' hazard function (Source: Cigré. December 2015. Pag. 33)

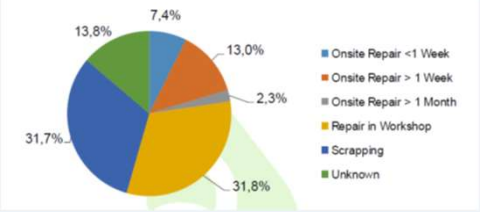


External Effects of Major Failure (Source: Cigré. 2015. Pag. 97)

…Fire (7,16%), Explosion, Burst (5,91%), Leakages (4,25%)…



Number of Failure Dependent on Transformer Age (Source: Cigré. December 2015. Pag. 82)



(Source: Cigré. 2015. Pag. 99)

Analysis of actions taken after a major failure

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Knowledge Value from Top Accidents (Explosion & Fire)

Russia, 2009

GSU Transformer Explosion at RusHydro power plant (6500 MW)

(72 dead)...

Turkey, 2014

Transformer Explosion in a coal mine

(301 dead)...

Europe, 2011

GSU Transformer Explosion in a nuclear power plant

No victims...

AFP . @New Vision

England, 2025

Heathrow Airport Transformer Fire

_No victims...
_70000 users in blackout
_1350 cancelled flights
_Loss of €50 million only for British Airways

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PATHOLOGIES, DIAGNOSIS AND PROGNOSIS

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Target: Sustainable Resilience Impact (SRI)

intelligence, integrable, inferences

i3XFluidsCare

Win & Win Strategies for Asset & Risk Management

Actions

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Sustainable Solutions Based on Circular & Granular Economy

Prevention and Protection on 4 Key Areas

Corrosions, thermal faults, electrical faults, water, degradation, etc.

« Failure Prevention»

Impact due to purchase, losses, etc.

«Protection»

Transformer Value (about) **15-30 €/Kwe**

PCBs, PCA, POPs, biodegradability, etc.

«Environmental Protection»

Major Accidents

«Loss Prevention»

Circular and Granular Solutions for Asset & Risk Management

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Innovative Approach: ElectroChemistry vs BioChemistry

Transfo & Oil as for body & blood	Sampling of transfo' oil as for humans' blood	Sea Marconi laboratory as for hospital lab	Technical Diagnostic as for Human Diagnostics	Transfo & Oil treatment as for blood dialysis
				
				

...like liquid biopsy of human blood for detection and classification of early treatments of Tech-pathologies

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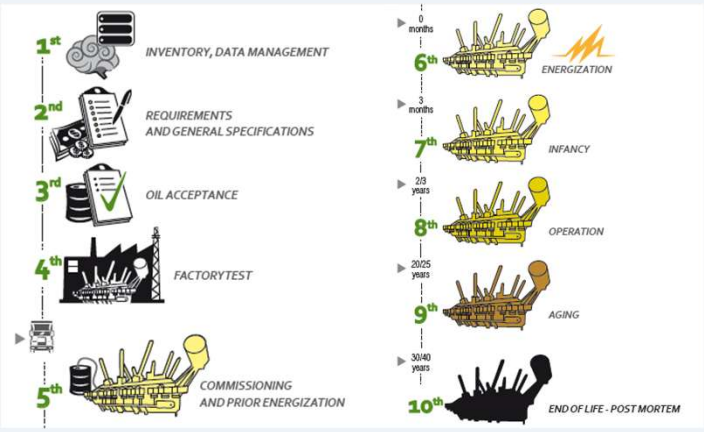
10 Steps of Life Cycle Management (LCM)



Life Cycle Management (LCM) is a continuous process that maximises a transformer's service life, safety and economic value from commissioning to decommissioning

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Visual Inspection, Representative Sampling, Audit of Transformers and Traceability

ISA KIT
Inspection Sampling Audit

Patent by Sea Marconi

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Sea Marconi's Independent Database — Overview

CHARACTERISTICS IN DB	VALUE
Items recorded in the DB	125,764
Items recorded as “TRANSFORMERS”	89,937
Number of Nations of installation of Transformers	80
Number of Clients/Sites owning Transformers	15,959
Manufacturers present in DB	2,832
Type of matrix (Fluids)	More than 10
Number of Fluid’s Brands	More than 150

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Sea Marconi's Independent Database — Details

CHARACTERISTICS IN DB	VALUE
Items recorded as “TRANSFORMERS”	89,937
• Range of Rated Power (MVA)	Up to 1,080 MVA
• Range of Voltage (kV)	Up to 750 kV
• Range of year of manufacturing	Since 1,922 to now
• Range of oil weight	Up to 146,000 kg
• Range of Equipment weight	Up to 460,000 kg
• Number of samples Analysed	≈320,000
• Number of tests performed	≈1,230,000

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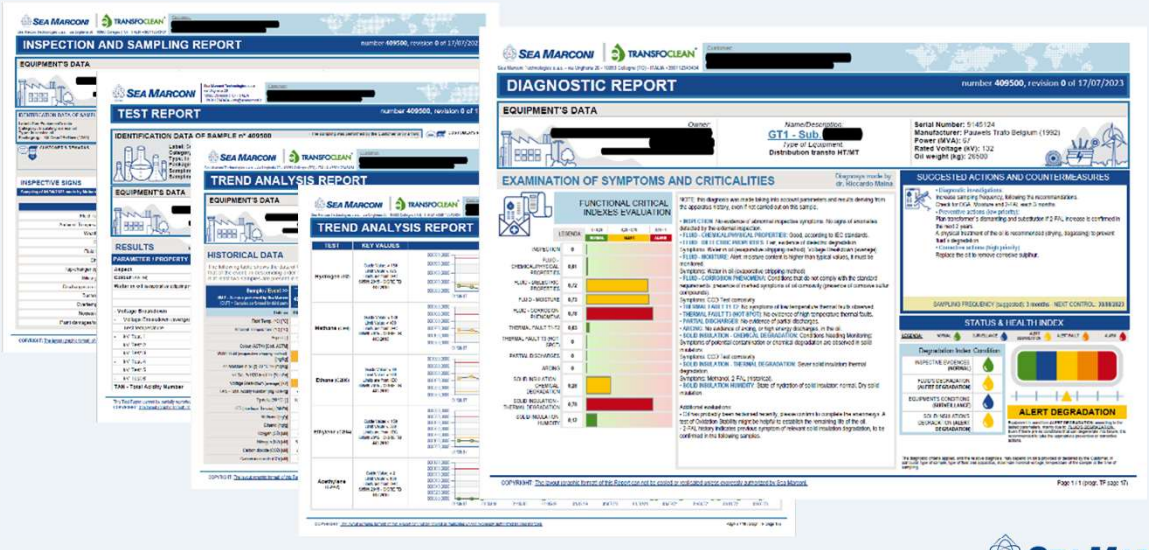
Analysis, Diagnostic and Prognostic Report



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Pathologies and Solutions for Transformers & Insulating Fluids

Sea Marconi provides an Independent Support for Diagnostic, Prognostic and Treatments for each Pathology during each Life step of the Fluids & Transformer (LCM)

Top 10 Pathologies

1. **Major accident: Explosion and Fire with potential PCBs & POPs/PFAS Contaminations**
2. **Corrosive Sulfur** and Corrosion Phenomena (Type: C_1, C_2, C_3, C_4, C_5, C_6)
3. Electrical, Thermal and Mechanical failure
4. Electrical, Thermal and Mechanical fault
5. PCBs/POPs/PFAS & Environment
6. Fluid Chemical Degradation
7. Paper and Solid insulation Aging
8. Moisture in Paper and Fluid
9. Sludge, Solid deposits (degradation byproducts)
10. SF_6 in Fluid – Seal defects

Top 10 Solutions

1. Analysis, Diagnosis and Prognosis (trend evolution)
2. Focused analysis and supplementary Diagnosis
3. Post Failure & Post Mortem Diagnosis
4. Depolarization of corrosive compounds
5. **Dehalogenation of PCBs in Fluid**
6. Depolarization for Fluid acidity
7. Transformer desludging
8. Transformer and insulating paper dehydration
9. Physical decontamination treatment
10. **Transformer Fluid refilling/retrofilling (Fluid change)**

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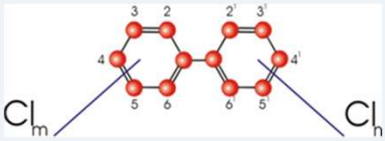
High Priority Environmental Pathology: PCBs / POPs / PAHs / PFAS

- **PCBs is a POPs - belongs to the "dirty dozen"**

Stockholm Convention on persistent organic pollutants (POPs)

- **PCBs is carcinogenic to Humans GROUP I (IARC April, 10th 2013)**

International Agency for Research on Cancer
World Health Organization



According to IEC 61619, EN 12766, IEC 60296, IEC 60422, CENELEC 50503

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INTEGRATED TREATMENTS
RESILIENCE & LIFE EXTENSION

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i³ Apollo Fluid Care, Multi-Treatment Insulating Fluid Unit

The New Patented Technologies by Sea Marconi (2026)

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Apollo Future Applications:
Integrated Fluid Treatments for Data Centers & AeroSpace

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Case History: On-Load Integrated Treatments of Giant Transformers in the Middle East

Issue 4, October 2022

TREATMENT OF CORROSIVE SULFUR PATHOLOGIES

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Integrated Treatments vs Fuller's Earth Treatments

Key Factors	DMU & Integrated Treatments* Sea Marconi Patented	Treatment with typical Fuller Earth	Treatment with typical Fuller Earth and regeneration > 600-700 °C
Recovery: Physical Properties KV, DGA, H_2O	Yes	Yes	Yes
Recovery: Chemical Properties TAN, DF, IFT	Yes	Yes	Yes
Removal: DBDS & Corrosive Sulfur	Yes	No	No
Decontamination: Dissolved Metals	Yes	No	No
Dehalogenation: PCBs/POPs in Oils	Yes	No	No
Classification: BAT/BEP - Best Available Techniques/Best Environmental Practices (PCBs/POPs)	Yes	No	No
Self-cleaning unit from: DBDS, PCBs/POPs	Yes	No	No
Cross contamination by DBDS, PCBs/POPs	Safety	Danger	Danger
Corrosion by Sulfur Degradation byProducts (SDBP) as H_2S, Mercaptans, etc. due to high temperature (> 370 °C – typical 600-700 °C)	Safety	Safety	Danger
Dioxins Emissions (PCDDs, PCDFs) due to high temperature degradation byproducts from PCBs/POPs and halogenated contaminants in Oils	Safety	Safety	Danger

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Technology Transfer to Customers and Local Partners

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BIOTRAFO EU Project

Raising knowledge and developing technology for the design and deployment of high-performance power transformers immersed in biodegradable fluids “BIOTRAFO”

https://www.biotrafo.unican.es/

Project Coordinator:

Beneficiaries

Partner Organisation

RETROTRAFO EU Project

- *Development of knowledge and technology to implement retrofilling in power transformers using biodegradable or recycled fluids and fostering circular economy.*
- **Call / Funding Scheme:** The project is funded under the European Union's **Horizon Europe**, call **HORIZON-MSCA-2023-SE-01**.
- **Duration:** 48 months
- **Coordinated by Universidad de Cantabria (UC)**, Spain

https://retrotrafo.unican.es/

Consortium

28 partners from 17 countries

Universidad de Cantabria (UC)
Universidad Carlos III de Madrid (UC3M)
University of Manchester (UM)
University of Zilina (UNIZA)
University of West Bohemia (UWB)
Basque Centre on Materials (BCM)
Institute of Experimental Physics (IEP)
Technical University of Košice (TUKE)
Balikesir Elektromekanik Sanayi Tesisleri (BEST)
Sea Marconi (SM)
E.ON Group Innovation (EON)
RWE / Stoen Operator (STOEN)
CELSIA
DIVEG
Universidad Nacional de San Juan (IEE)
Kyushu Institute of Technology (KIT)
New York University (NYU)
Universidad Bernardo O´Higgins (UBO)
University of Queensland (UQ)
Universidad de Santiago de Chile (USACH)
Universidad Nacional del Litoral (UNL)
Universidad Técnica Federico Santa María (UTFSM)
Universiti Putra Malaysia (UPM)
Universidad del Valle (UV)
University of Waterloo (UW)
Western Michigan University (WMU)
Tanta University (TU)

Lyon, April 27 – GEOFUTURE 2026, International Conference on Scientific Partnerships & Sustainable Investment

Partnership Opportunities: Joint Value Creation

Vision to Mission of **Sea Marconi**

from Decisions to Actions

Target 2026-2050

WIN&WIN Strategy

Implementation of Sustainable Solutions for Energy and Environment

«Today's Commitment for Future Generations»

Vander Tumiatti, entrepreneur since 1968

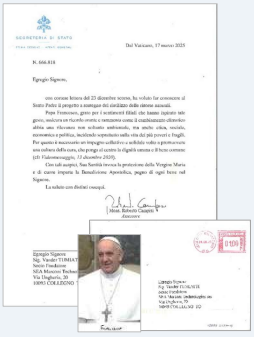
SEA MARCONI

A Voice of Encouragement for Our Sustainable Solutions

October 1, 2024
Communication in response to the Holy Father's invitation

January 22, Jubilee Year 2025
Meeting with the Holy Father in the Paul VI Hall, Vatican City

March 17, 2025
Response of the Vatican Secretariat of State



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THANKS FOR YOUR KIND ATTENTION

VANDER.TUMIATTI@SEAMARCONI.IT

ASK FOR CASE HISTORIES

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WWW.MYTRANSFO.COM