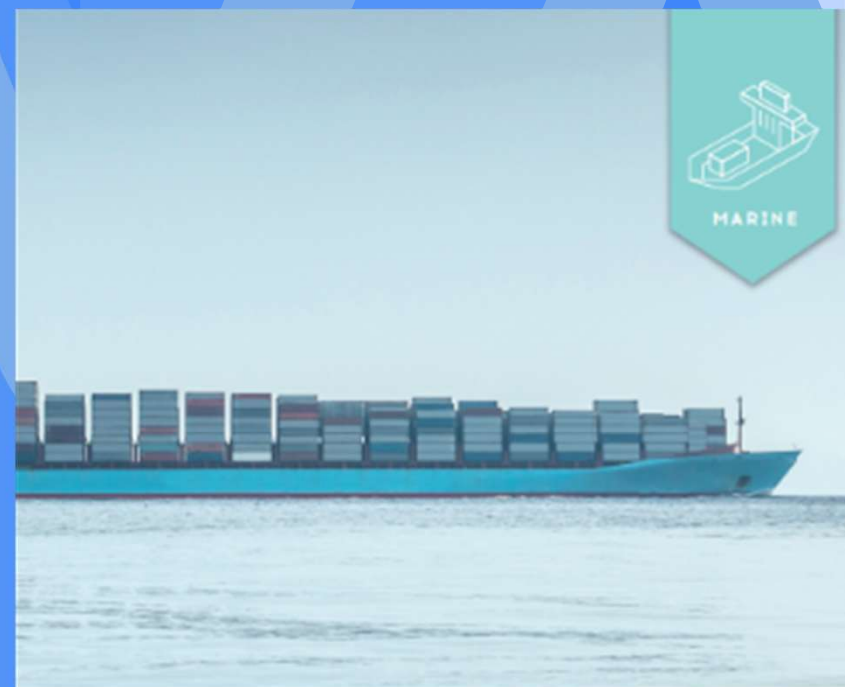


SOLVAir®

Marine Solutions

Rethinking Exhaust Gas Treatment in a Tightening Regulatory World



SOLVAir®
— Refractor in Global Marine Industry —
SodaFlexx

SOLVAY

Solvay at a glance

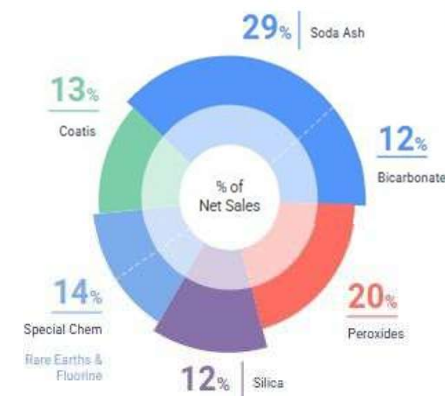
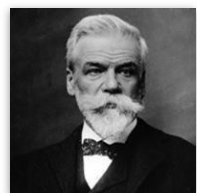
Solvay is a 165-year old, family-owned, pioneering chemical company headquartered in Brussels.

Our products are **essential to people's daily lives**:

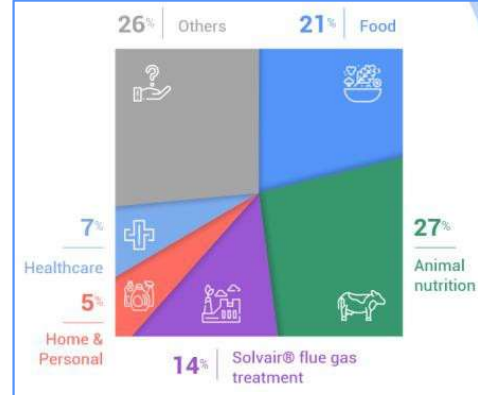
- Improve air quality
- Preserve food resources
- Protect health and well-being
- Support sustainable mobility
- Enable battery recycling

1863

Ernest Solvay invents a new process for producing soda ash



A market maker in Bicarbonate



~9,000
Employees



€4.3bn
Underlying net sales



43
Production sites



41
Countries

>80% regional sales from local production

We are **ESSENTIAL CHEMISTRY**, making progress possible **FOR GENERATIONS**

SOLVAY

Air Quality and future environmental regulations driving SOLVAir® growth with clear milestones for maritime transport



ECOSYSTEM AT RISK

Pollution (air, water, and soil) will raise more and more concern triggering the research for new solutions

- Growing demand for air treatment with a special focus on fossil fuel
- Upgrade of large municipal waste management systems in response to lower limits and more pollutants to be treated

01

SECA/ECA

- Mediterranean SECA in **May 2025**, with a NECA planned for the future.
 - U.S./Canada, Baltic & North Sea are already SECA (SO_x) and NECA (NO_x & PM).
 - Norwegian Sea, Canadian Arctic, and NE Atlantic are expected to become ECAs soon.
- **All European seas are anticipated to be ECAs in the coming years.**

02

Washwater ban

- Wash water release banned in Danish, Swedish and Finnish territorial waters (12 nm) from **July 2025**.

03

Port pollution

- California : Expanded regulations for particulate matter (PM) removal, effective **January 2025**.
- Other regions and countries are expected to follow suit soon.

SOLVAY

Solvair® Marine Dry Cyclone DeSOx/PM System

1 Bicarbonate Storage & Handling

Marine-grade sodium bicarbonate is stored in a **deck-mounted silo** and pneumatically conveyed to the **dosing tank**.

2 SO₂ neutralisation

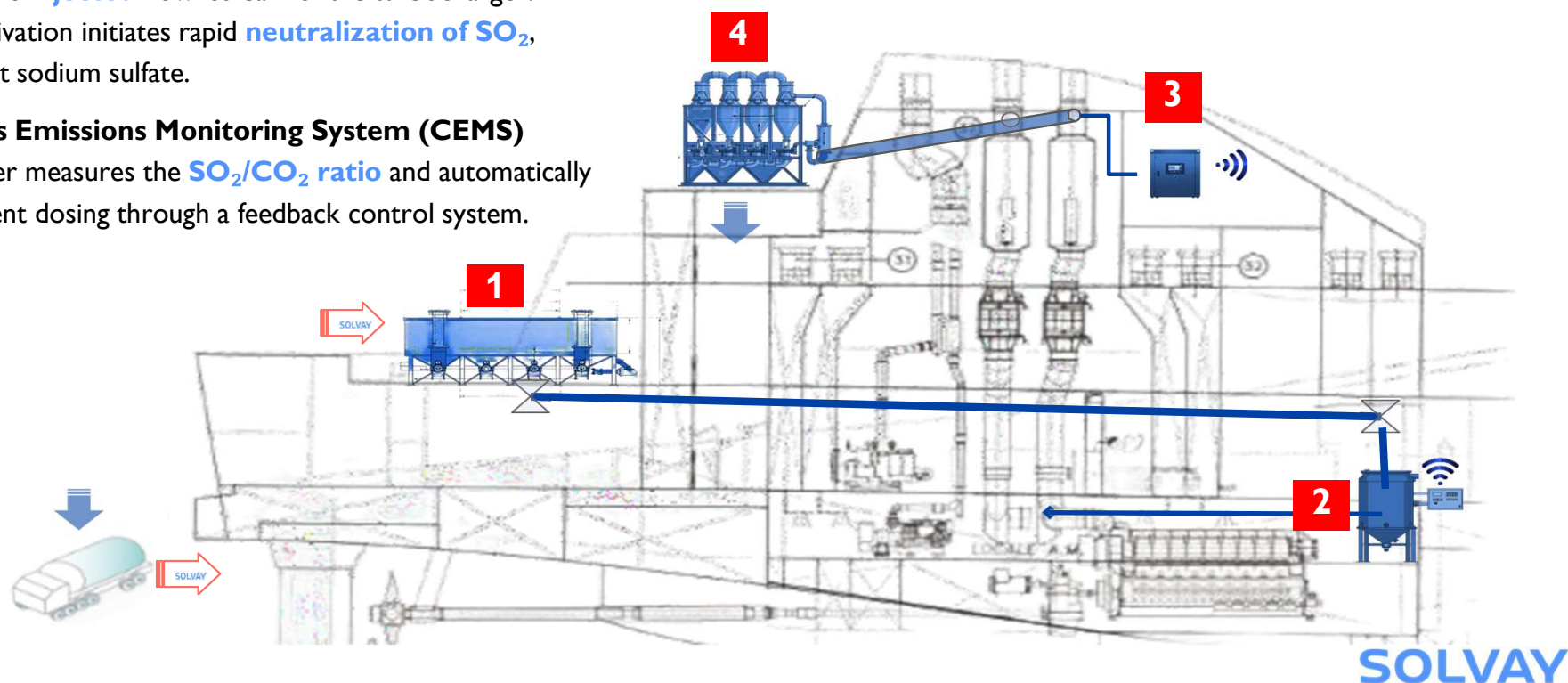
Bicarbonate is **injected** downstream of the turbocharger. Thermal activation initiates rapid **neutralization of SO₂**, forming inert sodium sulfate.

3 Continuous Emissions Monitoring System (CEMS)

A gas analyser measures the **SO₂/CO₂ ratio** and automatically adjusts reagent dosing through a feedback control system.

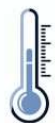
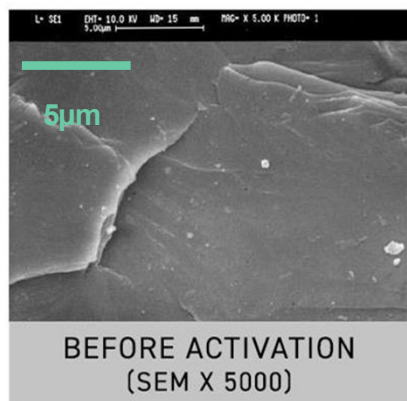
4

Sodium sulfate crystals adsorb black soot and fine particles, enabling the removal of > 90% of particle emissions through a **cyclone separation system**. The collected solids can then be safely treated onshore.



The Science behind Solvair®

Dry Sodium Sorbent Injection (DSI) of bicarbonate to neutralize acidic SO_x in flue gas



STEP 1 thermal activation to porous carbonate structure

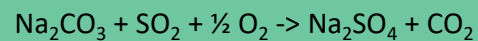
First reaction at 80°C (during injection):

- $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$
- (2**Sodium bicarbonate* -> *Sodium carbonate* + *CO₂* + *H₂O*)



STEP 2 neutralization to inert sulfate salt particles

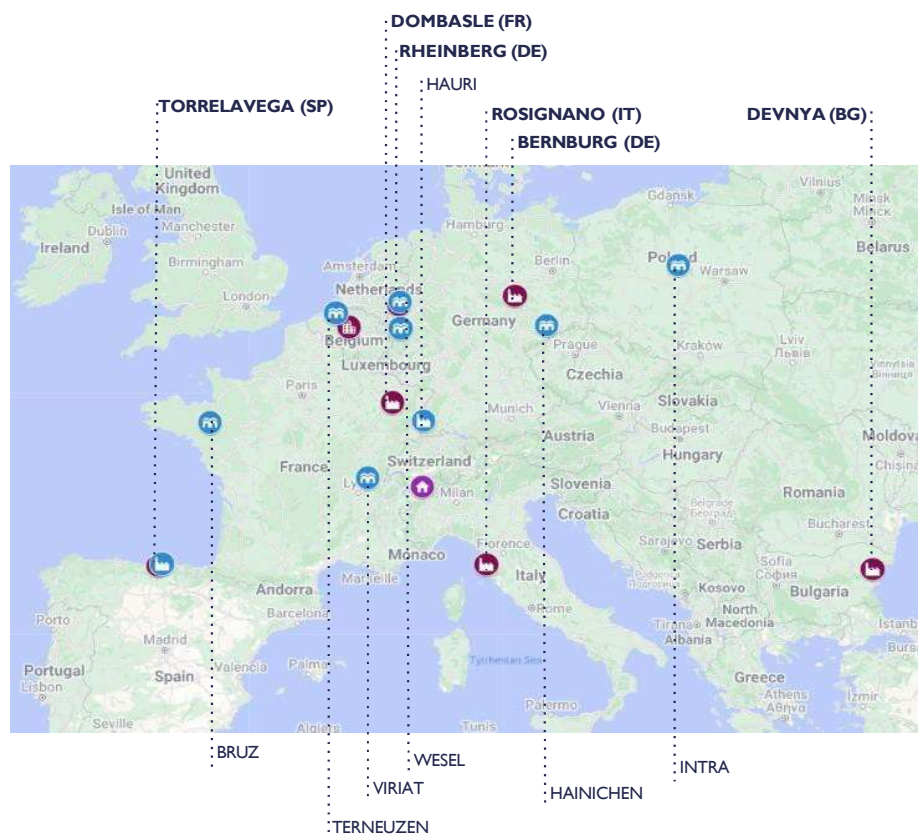
Second reaction:



Sodium carbonate + sulfur dioxide -> Sodium sulfate + CO₂

SOLVAY

Optimized logistics to serve European ports



PRODUCTION



WAREHOUSE



MARINE

SOLVAIR®
Marine Solutions

- ✓ Solvay produces more than **1 Mio. T** of bicarbonate from **6 plants** in Europe
- ✓ Solvay supplies more than **300 Solvair on-land customer sites**
- ✓ A unique logistic network to serve the **North Sea, Baltic and Mediterranean SECA ports**
- ✓ Adapted to **RoPax, container feeder and local bulk cargo** vessels with regular port calls

SOLVAY

Benefits of Solvair® Marine : cost savings and sustainability

01

Economical & Efficiency

Investment **payback < 12 months** for a 20,000 GT RoPax sailing in SECA area on HFO vs. ULSFO/MGO

Proven, reliable technology for flue gas treatment on land

02

Easy to Install, Adapt, and Handle

No dry dock necessary

Minimal additional on-board **power/electricity** needed

Non-hazardous powder and residues

03

No Air or Waste Water Release

Possible to retrofit **wet scrubber** to a “Solvair-hybrid” system

Anticipation of **future regulation on particle emissions**

04

Residues handling offering

Solvair on-land valorization business model



SOLVAY

Economics & Payback of a typical RoPax Ferry case (12.000 t/y) 1USD= 0,86 €

	Rotterdam Bunker Prices YTD 2026 [USD/T]			Annual Fuel Costs [EUR/T]*	S content (%)	Exhaust Gas Treatment needed in SECA	SOLVAIR N-FLEXX		TOTAL COST
	High	Low	Average				Soda Powder consumption	Annual OPEX	
IFO380	613.00	580.0	600.50	6.2 M€	2.5	YES	3000 T/year	2.3 M€/year	8.5 M€/year
VLSFO	722.00	685,00	702.50	7.3 M€	0.5	YES	500 T/year	0.4 M€/year	7.7 M€/year
MGO	1453.00	1388.0	1408.00	14.5 M€	<0.1	NO	-	-	14.5 M€/year

*1 USD = 0,86 EUR

- Based on **2026 average bunker prices**, this sample vessel saves nearly **50% on fuel costs**
- For vessels with **similar fuel consumption** sailing **100% in SECA zones**, the **payback** of the installation is **within 6 months**.

SOLVAY

A growing fleet of references

Currently supplying a fleet of 2 bulkers and 2 RoPax ferries – supplied from Rheinberg (DE)



2026: 2 new vessels equipped to sail in the Med. SECA - supplied from Rosignano (IT)



+ 6 new vessels
(container & heavy lifting/project cargo)
sailing in the new NE Atlantic SECA

SOLVAY

Thank you

SOLVAY
ESSENTIAL FOR GENERATIONS