AIRCOATING TECHNOLOGIES

Executive Summary

Aircoating® TECHNOLOGIES

PATENTPOOL GROUP

PROJECT HIGHLIGHTS

High Economic Efficiency
Rapid amortization thanks to massive energy savings, cost-effective mass production and a high degree of automation

Wide Range of Applications
In addition to the shipping industry, can also be used for pipelines, drinking water systems, pipelines and chemical reactors

Effective Problem Solving
Reduces friction, biofouling, corrosion and noise emissions

Inspired by Nature
Modeled on the floating fern Salvinia molesta with a water-repellent nano-surface

Unique Technology
Exclusive know-how and worldwide patent protection by leading KIT scientists

Market Dominance
No comparable solutions available worldwide

Sustainable & Environmentally friendly
Non-toxic, saves fuel, reduces CO2 emissions and exhaust fumes - with a direct impact on air quality and health

Flexible Application
Innovative Air-Tiles are visually customizable and retrofittable

Cost Savings
Less maintenance, lower fuel consumption and therefore reduced operating costs

Air Layers under Water

Aircoating Technology is a comprehensively patented surface coating process that was developed using nature as a model, or more precisely the water-repellent floating fern Salvinia Molesta.

This fern has tiny, dense hairs on the surface of its leaves, which **retain a permanent layer of air** and thus protect the leaf from direct contact with water. Even under water, this layer of air remains stable for years.

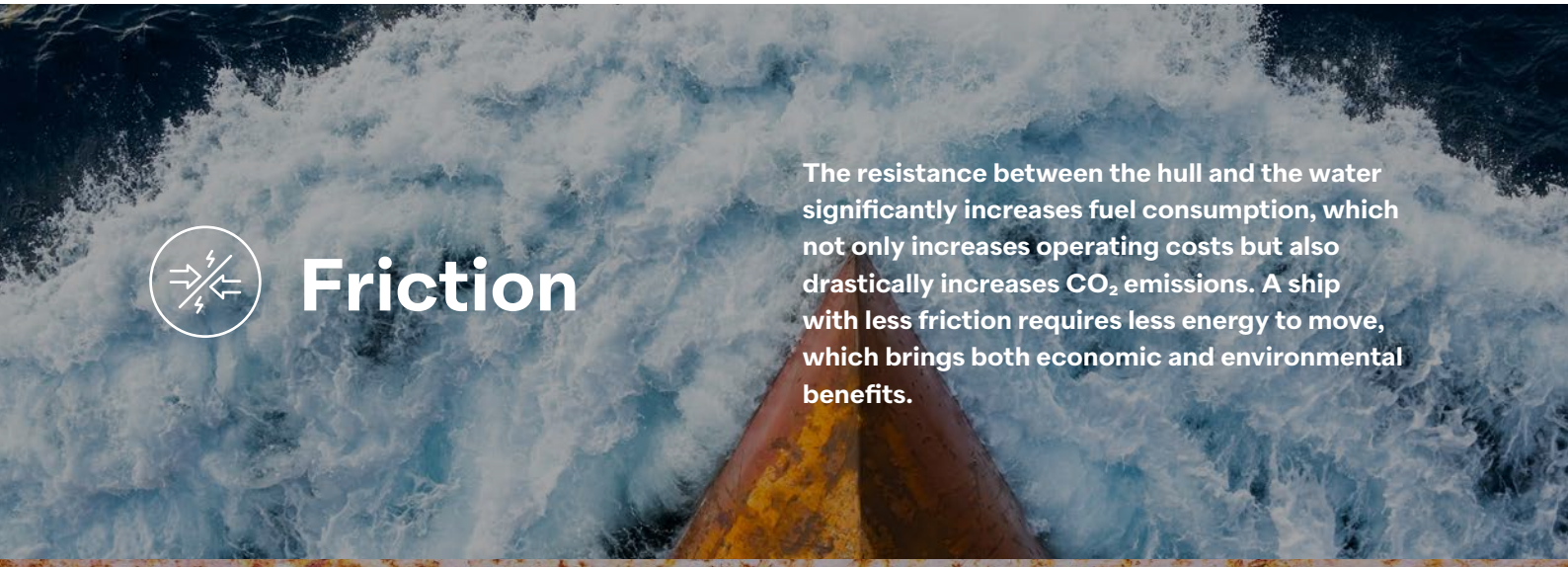
This mechanism was decoded at the **Karlsruhe Institute of Technology (KIT)** and transferred to artificial surfaces. A coated sample in Karlsruhe has been maintaining a stable layer of air under water for more than eight years. Since then, the technology has been optimized and further developed using nanotechnology.

Now we have reached the next step with **Air-Tiles**. This new level of technology enables an **even more efficient, modular solution** that can be used specifically in shipping and beyond. Air-Tiles offer maximum adaptability and scalability - a decisive step forward for the sustainable and economical use of air-layer technology.

Large container ships consume around 14.4 tons of heavy fuel oil in just one hour. 70% of the energy consumed is used for friction between the ship and the water. Hull coating with aircoating technology creates a layer of air, drastically reducing friction in the water and the associated energy loss. In the laboratory, friction is reduced by around 50%. A further improvement in the results is to be expected.

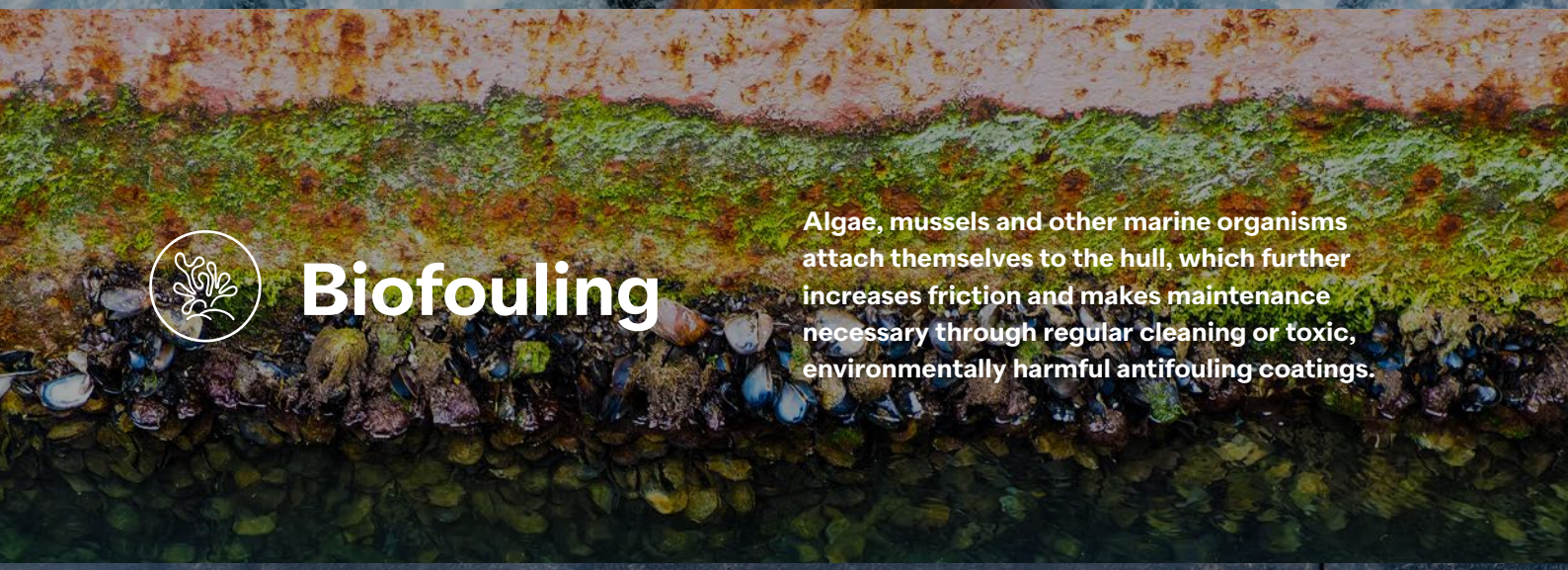
PROBLEMS

Three Challenges facing Shipyards and Shipping Companies



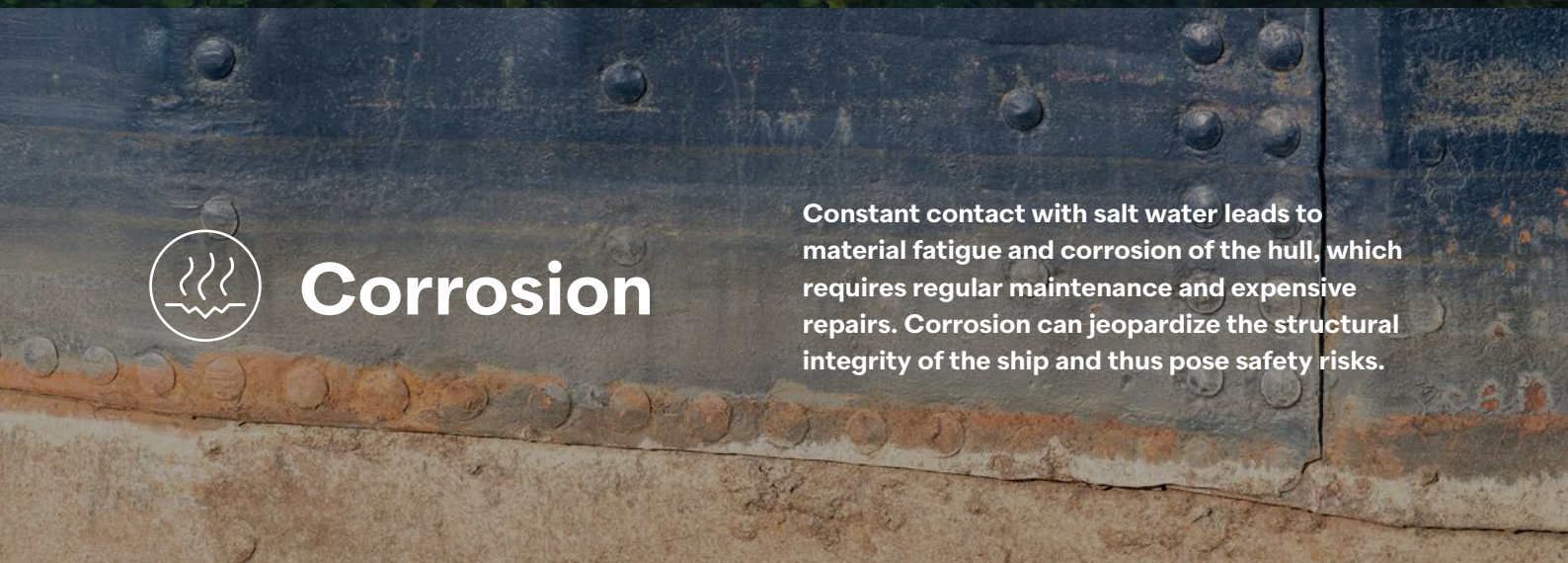
Friction

The resistance between the hull and the water significantly increases fuel consumption, which not only increases operating costs but also drastically increases CO_2 emissions. A ship with less friction requires less energy to move, which brings both economic and environmental benefits.



Biofouling

Algae, mussels and other marine organisms attach themselves to the hull, which further increases friction and makes maintenance necessary through regular cleaning or toxic, environmentally harmful antifouling coatings.



Corrosion

Constant contact with salt water leads to material fatigue and corrosion of the hull, which requires regular maintenance and expensive repairs. Corrosion can jeopardize the structural integrity of the ship and thus pose safety risks.

SOLUTION

The Ship no longer comes into Contact with Water at all

The Aircoating 2.0 concept is based on modular air tiles and films that hold or build up a gas layer under water. These innovative surface solutions are easy to apply to existing surfaces, including curved structures, and enable reversible coating without the need for special ship constructions or substrates. The modular design allows for quick installation, easy replacement of damaged segments and flexible adaptation to environmental conditions such as fresh or salt water.

Thanks to the small pressure differences within a tile, edge effects are resolved and the entire surface can be coated without gaps thanks to a periodic arrangement. The technology is suitable for both new ships and the retrofit market and can be applied partially or over the entire surface. The simple scalability allows individual tiles to be tested before large-scale application. The films and tiles are visually customizable, non-flammable and can be combined with other friction-reducing technologies. Their installation does not require any special equipment or expertise, which enables cost-efficient implementation in mass production. Aircoating 2.0 thus offers an innovative, flexible and economical solution for reducing friction and increasing efficiency in the maritime sector.

POTENTIAL USERS & CUSTOMERS

- Container ships and tankers
- Passenger ships
- River shipping
- Yachts, sailing and motor boats

Both ship newbuilding and ongoing maintenance represent markets for the new products and processes.

IMPORTANT BENEFITS

- Non-toxic / environmentally friendly
- Flexible surfaces
- Visually customizable
- Retrofittable
- Saves maintenance costs, fuel and emissions

AirCoat 2.0 – Breakthrough for Sustainable Surface Coating

AirCoat 2.0 takes air coating technology to a new level. Thanks to groundbreaking advances, the air coating can now regenerate itself (self-recharging) and remains stable even under extreme conditions. In addition, the oil-release function prevents oil and contaminants from settling - a decisive advantage for maritime applications.

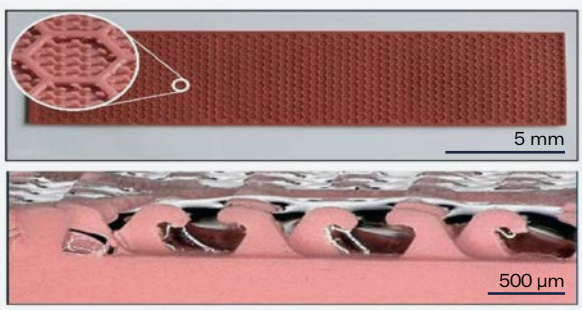
AirCoat 2.0 achieves an unprecedented reduction in friction, drastically reduces water resistance and thus minimizes fuel consumption, emissions and operating costs. The technology is based on hydrophobic and texturizable materials with maximum long-term stability, UV resistance and environmental compatibility, making it particularly resistant and sustainable.

Thanks to a new roll-to-roll production technique, large-scale, efficient production is now possible. Already 530 meters of microstructured surface have been successfully produced on polyethylene (PE). The speed of 0.6 m² per minute allows a daily output of 850 meters. This means that a container ship could be fully coated in just six months with just one production line - and in less than three weeks with ten parallel lines. With new research facilities, test laboratories and production sites, an innovative ecosystem is being created for AirCoat 2.0. The close integration of science and industrial production maximizes efficiency and scalability. AirCoat 2.0 - Air-Tiles: The future of friction reduction, now industrially feasible.

GEOMETRIE HOOK TAPE FROM ARES PROJECT

4 mm

Height of the structure: 0.5mm

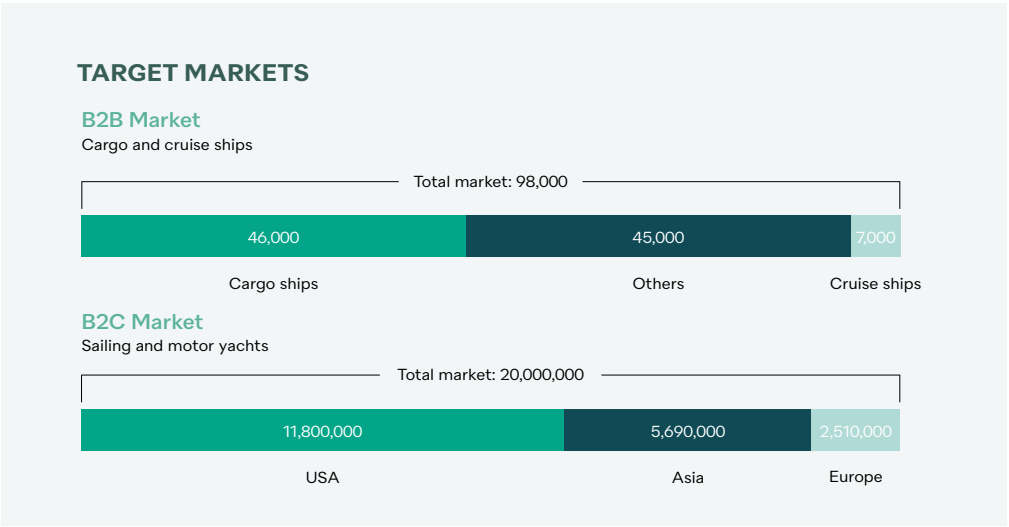


Efficiency, Savings and Sustainability for Global Shipping

With AirCoat 2.0, ACT Aircoating Technologies offers an innovative coating technology that significantly reduces the water resistance of ship hulls and thus lowers energy consumption. The technology is suitable for a wide range of ship types - from yachts and riverboats to ocean-going and special ships - and improves both maneuverability and energy efficiency. Particularly in the inland shipping sector, advantages such as a shallower draught at low water and reduced maintenance cycles can lead to considerable savings in operating costs.

The use on large passenger and cargo ships also offers a very high savings potential: for a one-week cruise, fuel costs can be between 525,000 and 1.3 million euros, depending on the ship. A savings potential of 100,000 euros per ship and week would - conservatively calculated - mean annual savings of around 5 million euros per ship. In times of high oil prices, these costs not only have an impact on the balance sheet, but are often also passed on directly to passengers as a fuel surcharge.

The global market volume for ship coatings is over 10 billion euros a year, with the area of friction reduction alone offering potential savings worth billions. A fuel saving of just 5% on a typical container ship can amount to several million euros a year - with several thousand ships in service worldwide, the potential savings add up to billions. AirCoat 2.0 therefore not only offers operators a low-maintenance and resource-saving solution, but also an effective tool for cost optimization and CO_2 reduction - and is thus positioning itself as a key technology for a more efficient, regulatory-compliant and competitive future of shipping.



Progress through Continuous Development

2008-2012
BIONA project: Air-retaining ship coatings based on a biological model

2010
Discovery and first publication of the salvinia effect

2013-2016
ARES project: Air-retaining Surfaces - Permanent air-retaining ship coatings based on biological models

2015
Test setup: First trip of an air-coated boat in the indoor swimming pool of the KIT Karlsruhe

2016-2019
Salvinia-BW: Air-coated surfaces; a concept for environmentally friendly antifouling

2016
Further tests: Successful tests of the salvinia effect in salt water and surfactant-containing water

RESEARCH

The research work is initially focusing on the further development of the air coating. Improving the performance and durability of the surface plays a central role here. Other fields of research include the development of production technologies, corresponding application techniques and various tests of different prototypes.

PRODUCTION

The production of aircoating surfaces will preferably take place in the company‘s own plants or in cooperation with a small number of specifically selected partners, with the technology itself remaining unchanged.

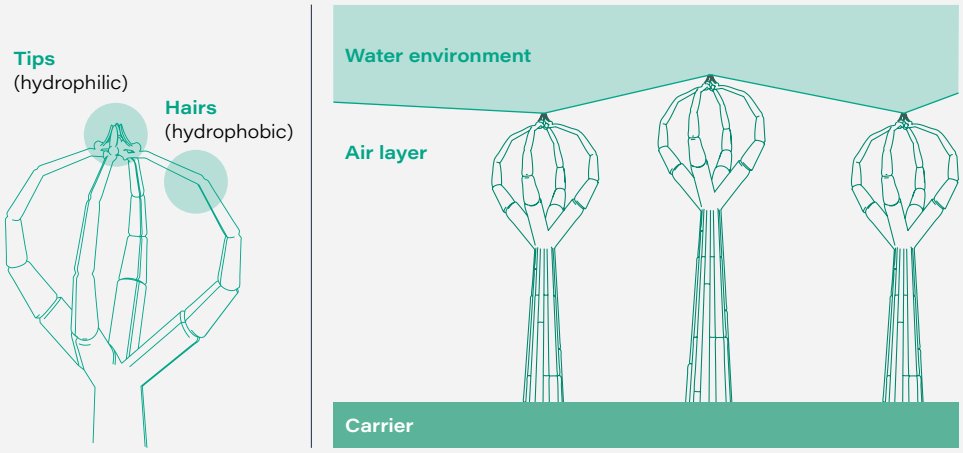


Illustration: Salvinia Effect
The tiny hairs (hydrophobic) and the tips (hydrophilic) form a stable layer of air between the carrier and the water environment.

2017
New company: Foundation of ACT Air Coating Technologies GmbH

2018
The long-term goals are divided into four areas: Research, production, application and implementation

2019
Award for the ARES (Air-Retaining-Surfaces) project with 1st place in the BMBF validation prize

2024
At the beginning of 2024, Prof. Dr. Thomas Schimmel developed strictly confidential innovations for air coating technology

2017
Application concept: Novel concept for large-area lithography of air-holding samples

2018
New benchmark: In endurance test: 8.5 years of permanent air retention under water

2018
Cooperation agreement concluded with global player in the coating industry

2020 - 2023
ACT patents: China, Japan, South Korea, USA, Canada and Europe; Also stable air holding at 80 km/h

APPLICATION

In addition to shipping, the results of the research will lead to further fields of application, which will be spun off by subsidiaries at a later date. Further application examples are Hygienic drinking water storage tanks and pipelines, chemical plant engineering, reactors, offshore platforms, drilling platforms and underwater structures.

IMPLEMENTATION

Implementation includes the sale of coatings to shipping companies and ship operators. This also includes transportation, installation of the surfaces on the ship‘s hull, as well as service and maintenance work. Continuous service is to be ensured by the company‘s own employees and with the help of strategic partnerships.

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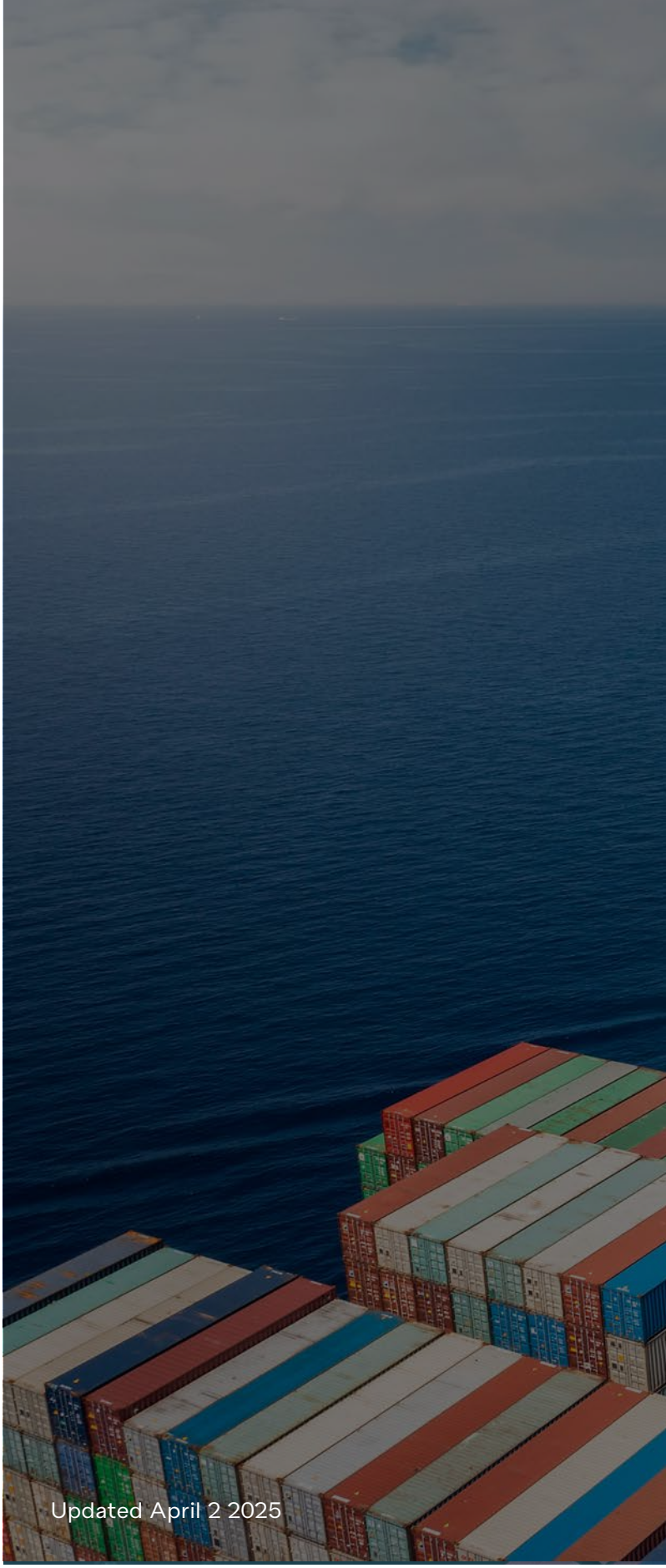

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