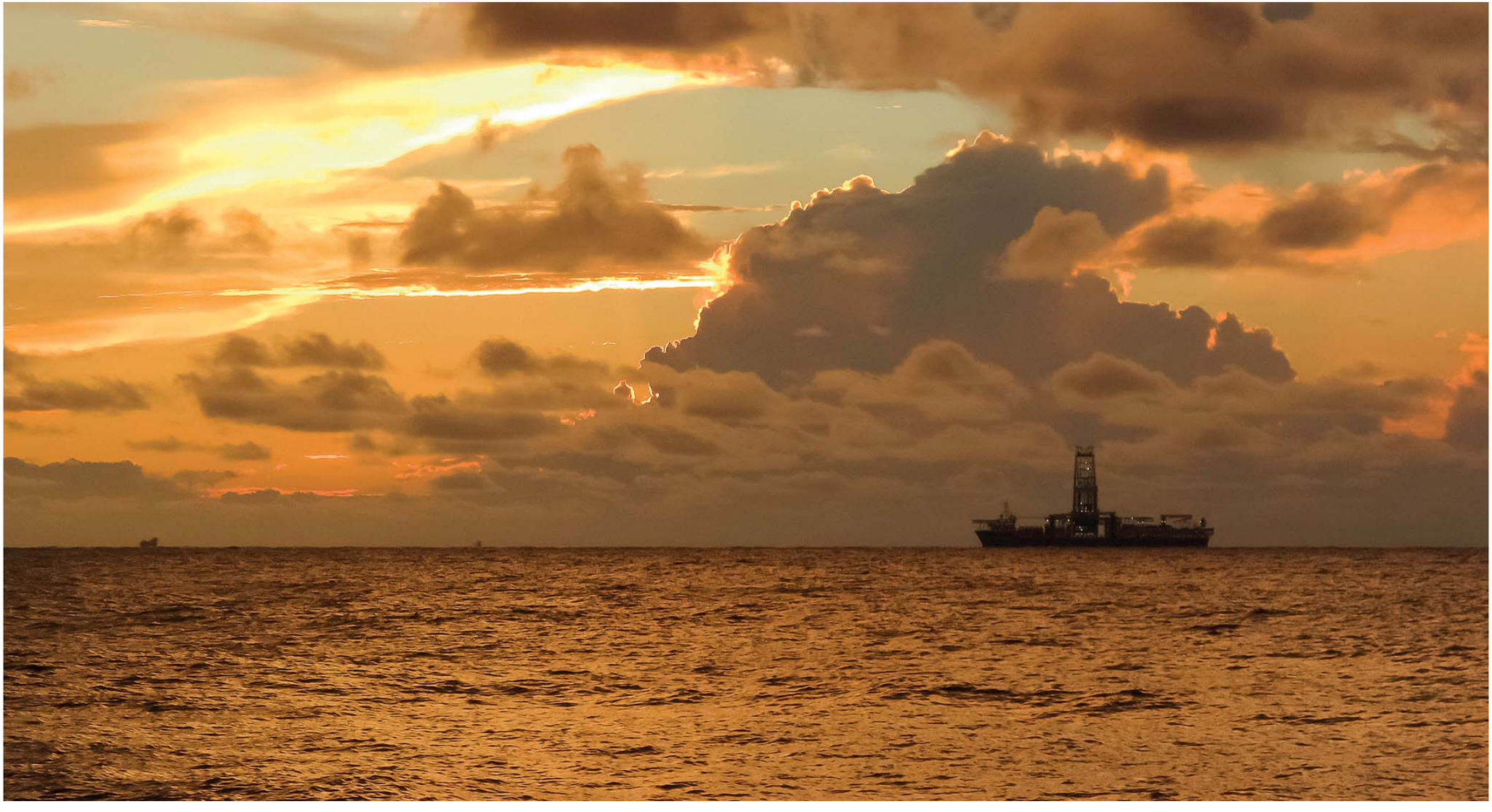
ECOLOCK®

LIFETIME CORROSION PROTECTION FOR OFFSHORE UNITS



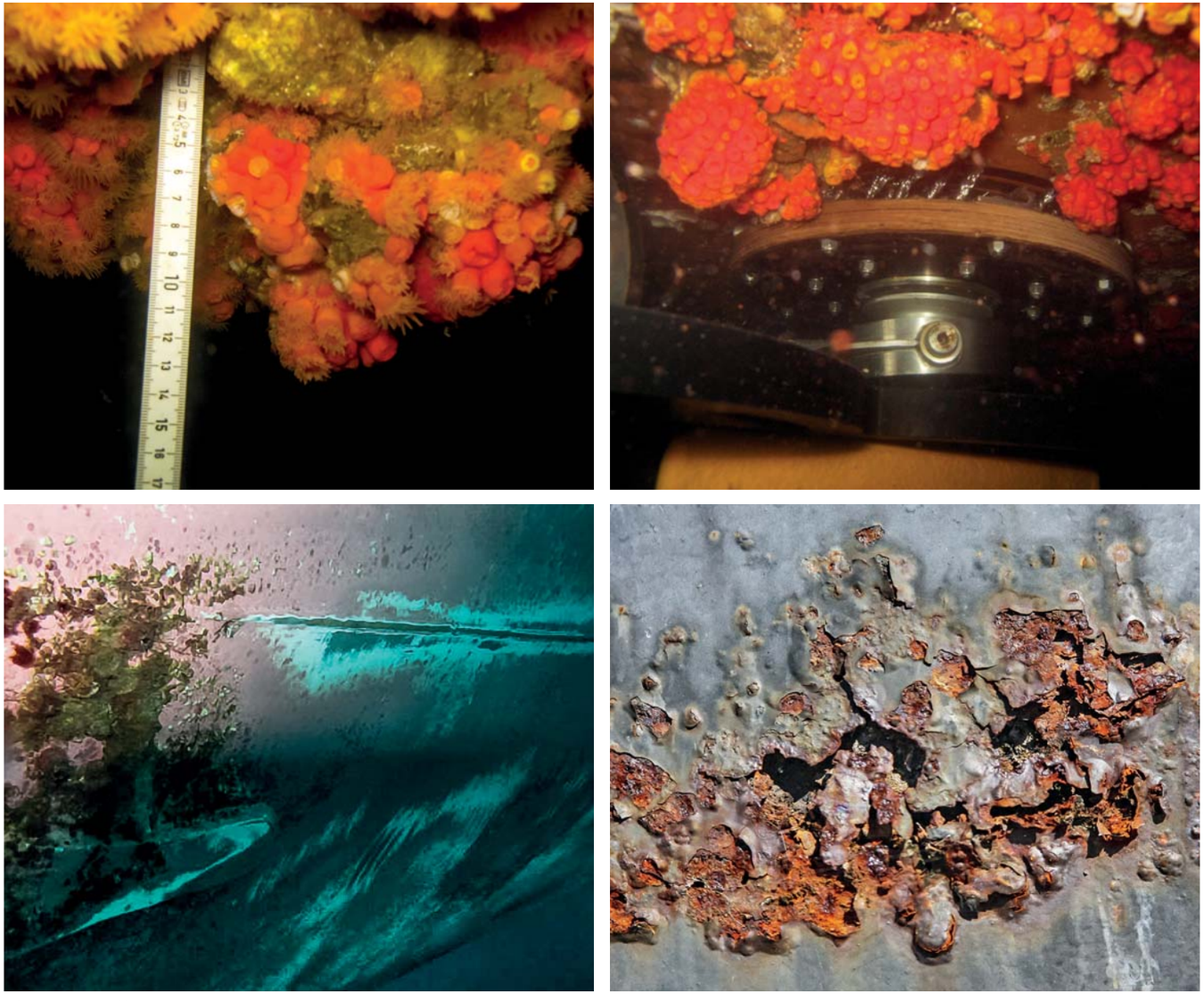
The offshore vessel challenge

Keeping a drillship, FPSO, FLNG or other offshore unit on location, in production and out of drydock for 20 or even 40 years is an economic necessity. Off-hire time, production losses and drydock expenses simply have too much impact on normal operations.

The challenge is how to keep the asset out of dry-dock for such long periods, keep the hull and tanks free from corrosion and stay in class.

The hull and tank coatings have to remain intact over time without failure. Hull coatings must be cleanable in the water. Biofouling needs to be removed safely without damage to the coating and without hazard to the environment.

A zero failure coating protects your asset. A clean hull allows for reliable UWILD inspections when needed.



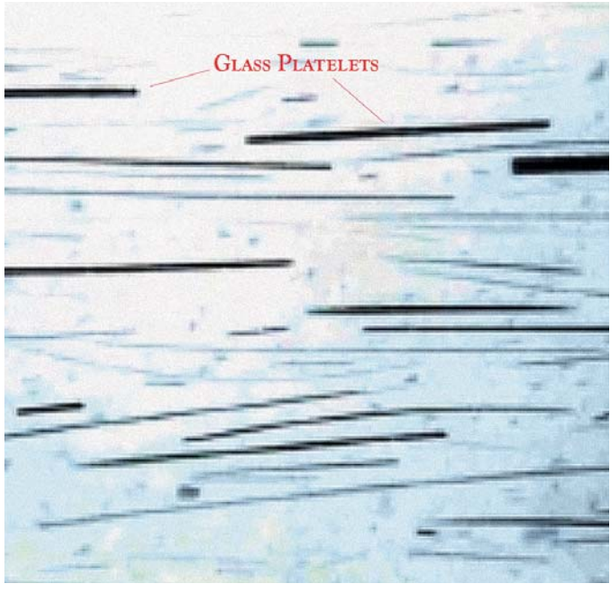
Because offshore vessels tend to be stationary for extended periods, large quantities of fouling accumulate, even where biocidal AFcoatings are used (top left). This can be cleaned off (top right) but with conventional coatings, the cleaning will damage and deplete the coating (under left) exposing the hull to corrosion (under right).

What is Ecolock?

Ecolock is an extremely tough and durable, glass platelets reinforced coating designed to protect your asset for 20 years without dry-docking, repair or replacement.

Ecolock's main features are:

- Hard, impermeable and even the toughest barnacles will not penetrate it.
- Non-toxic and harmless to the environment when cleaned underwater.
- Can be cleaned as often as needed to meet the UWILD and weight requirements of FPSOs, drill ships and other offshore units without risk of damage.
- No undercreep, even in case of minor mechanical damages.



Cross section of Ecolock coating showing the large aspect ratio glass flakes in resin. Freshly applied Ecolock.

The 2014 Maritime Innovation Award – given jointly by the Royal Institution of Naval Architects(RINA) and QinetiQ – has been presented to Subsea Industries for the product Ecolock.

Applying Ecolock

Ecolock is easy, economical and fast to apply. Surface preparation is similar to that required of any good quality coating application.

Application features are:

- Roughness profile of at least 75µm.
- Surface cleanliness of SA 2.5.
- Requires no primer, mid-coat, tie-coat, top-coat, corrosion protection scheme or any other complications.
- Applied directly to the prepared steel surface in two or more coats, of 500µm DFT each.
- Overcoating time is about 3 hours depending on temperature and humidity.
- No special equipment is needed.
- No special temperature or humidity conditions required.
- The unit can be launched 24 hours after the final coat has been applied.

Applying Ecolock is a fast, economical and easy job. Subsea Industries ensures that a qualified paint inspector is present for and monitors the entire application process to ensure it is standard.

Cleaning Ecolock

Ecolock is applied once and can be cleaned as often as needed without restrictions and without damage to the coating. Even long stationary period offer no problem. Ecolock is designed to be cleaned.

Classification demands an underwater inspection twice every five years to check if the hull is in good shape. So the hull must be cleaned to allow these inspections. If the hull is cleaned on a frequent basis, say every two years, this offers no problems at all.

In the case of Ecolock the barnacles, coral and other fouling organisms can be removed completely by divers using special equipment, leaving no trace and restoring the coating to its original condition. And because it is non-toxic, it is safe to clean the Ecolock coated hull when needed for UWILD or simply to reduce the weight when too much fouling has accumulated. This can be done even in sensitive waters.

Biofouling accumulation on an offshore hull, stationary for long periods (left). Ecolock after the fouling has been removed, restored to original, pristine condition with no damage (right).

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NORSOK approved coating system

Ecolock is a pre-qualified coating system in accordance with NORSOK standard M-501, Rev.5, June 2004.

The NORSOK standards are a series of standards relevant to offshore installations developed by Norwegian petroleum industry. NORSOK M-501 specifically deals with anticorrosive coating systems and the processes related to their application. It covers the selection of coating materials and defines the requirements of surface preparation, application procedures and inspection for protective coatings to be applied during the construction and installation of offshore structures and associated facilities.

The complete test program typically takes about 9 months and only the best coating systems manage to pass through.

The standard also stipulates that all personnel involved in the application and inspections have to prove their qualification. Painters shall present craft certificates or pass tests on-site, whereas paint inspectors must be certified according to FROSIO or NACE.

NORSOK M-501 has become a universally recognized standard that meets the most stringent requirements for corrosion protection. The standard is relevant for offshore use or other specific areas where pre-qualification is required. A pre-qualified coating system assures customers of longterm reliable protection.

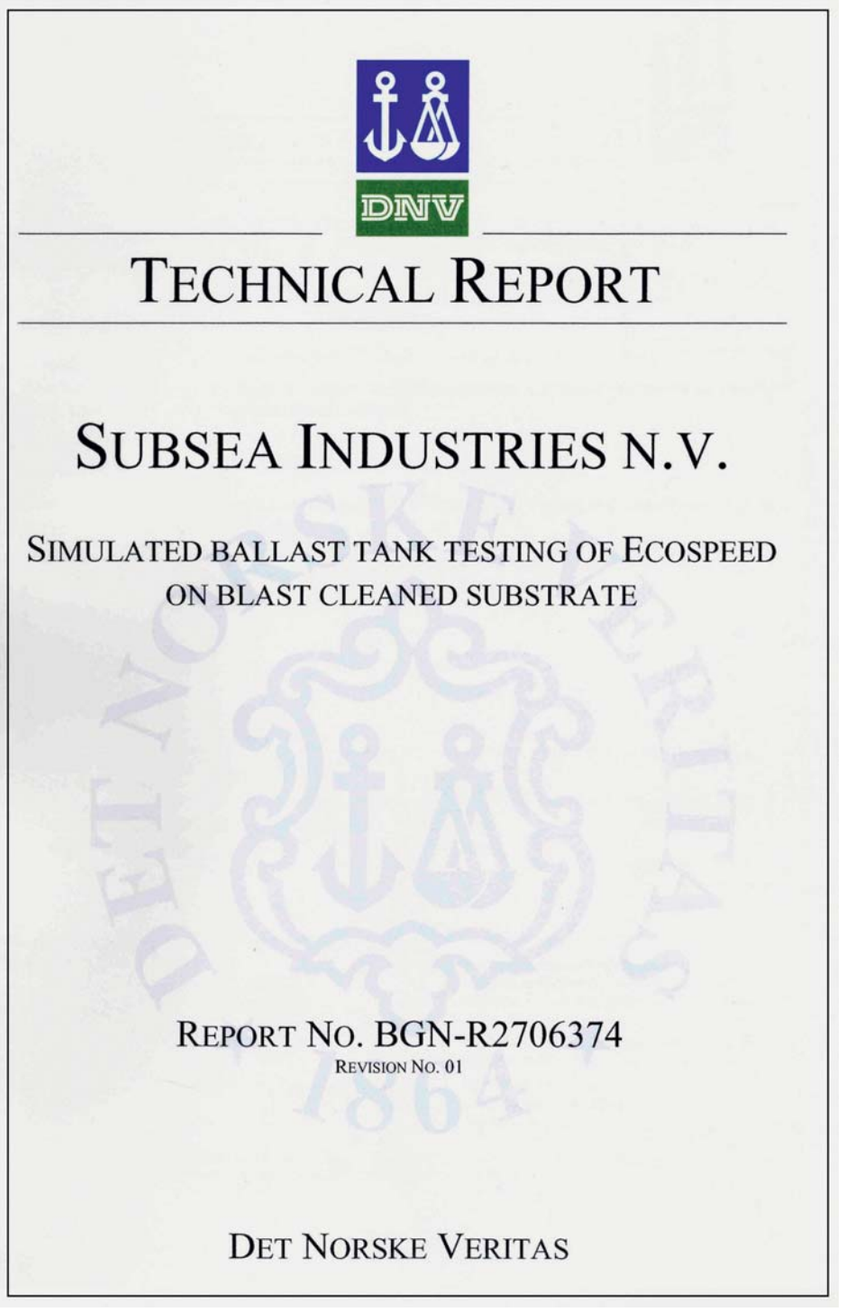
Ecolock protects your asset for 20 years without drydocking, repair or replacement.

Certified ballast tank coating

Ballast tanks are generally known to be susceptible to coating degradation and corrosion attacks. Relevant tests have therefore been developed for classification of ballast tank coatings by DNV.

Ecolock's sister coating, Ecospeed was subjected to DNV's lengthy testing procedure. At the end of the testing, Ecospeed was given the highest level of effective protection against degradation and corrosion possible under the DNV classification system.

By combining Ecolock and Ecospeed, we can offer our customers protection for the inside as well as the outside of their offshore unit.



Ecospeed has received the highest rating in the DNV ballast tank test.

Ecolock in action

Exmar Caribbean FLNG Barge

EXMAR NV, headquartered in Antwerp, Belgium, introduced the world's first floating LNG liquefaction barge, the Caribbean FLNG, in 2013.

The main reason for choosing Ecolock (at the time an Ecospeed application) according to the Caribbean FLNG Project Manager , was to protect the underwater hull from corrosion for at least 15 years without having to drydock or repair or replace the hull coating. Another key factor in choosing the hull coating system was the need for a clean hull to facilitate the 5-yearly class inspections (UWILD).

Operating in tropical waters means that the rate of fouling growth is likely to be very high. Ecolock has proved impenetrable by marine organisms. After the success of the Ecolock application on the Caribbean FLNG, Exmar decided to use Ecolock on their next project, a considerably larger unit.

The Caribbean FLNG (left). A hull section being coated with Ecolock (right) at Wison shipyard in Shanghai.

Launch Platform *Odyssey*

The Sea Launch Launch Platform (LP) Odyssey is a unique vessel, a semi-submersible converted to a sea-based platform dedicated to launching rockets to carry satellites to their intended orbit.

Drydocking the platform is extremely costly Therefore Sea Launch evolved a plan for extending the drydocking interval to 15 years. This plan included switching hull coatings.

The reasons for the switch from a copper-based SPC to what is now Ecolock were:

1. Anticorrosive properties over at least a 15 year period

2. Ease of cleaning and the fact that it can be cleaned in the vessel's home port of Long Beach since cleaning this coating presents no hazard to the environment

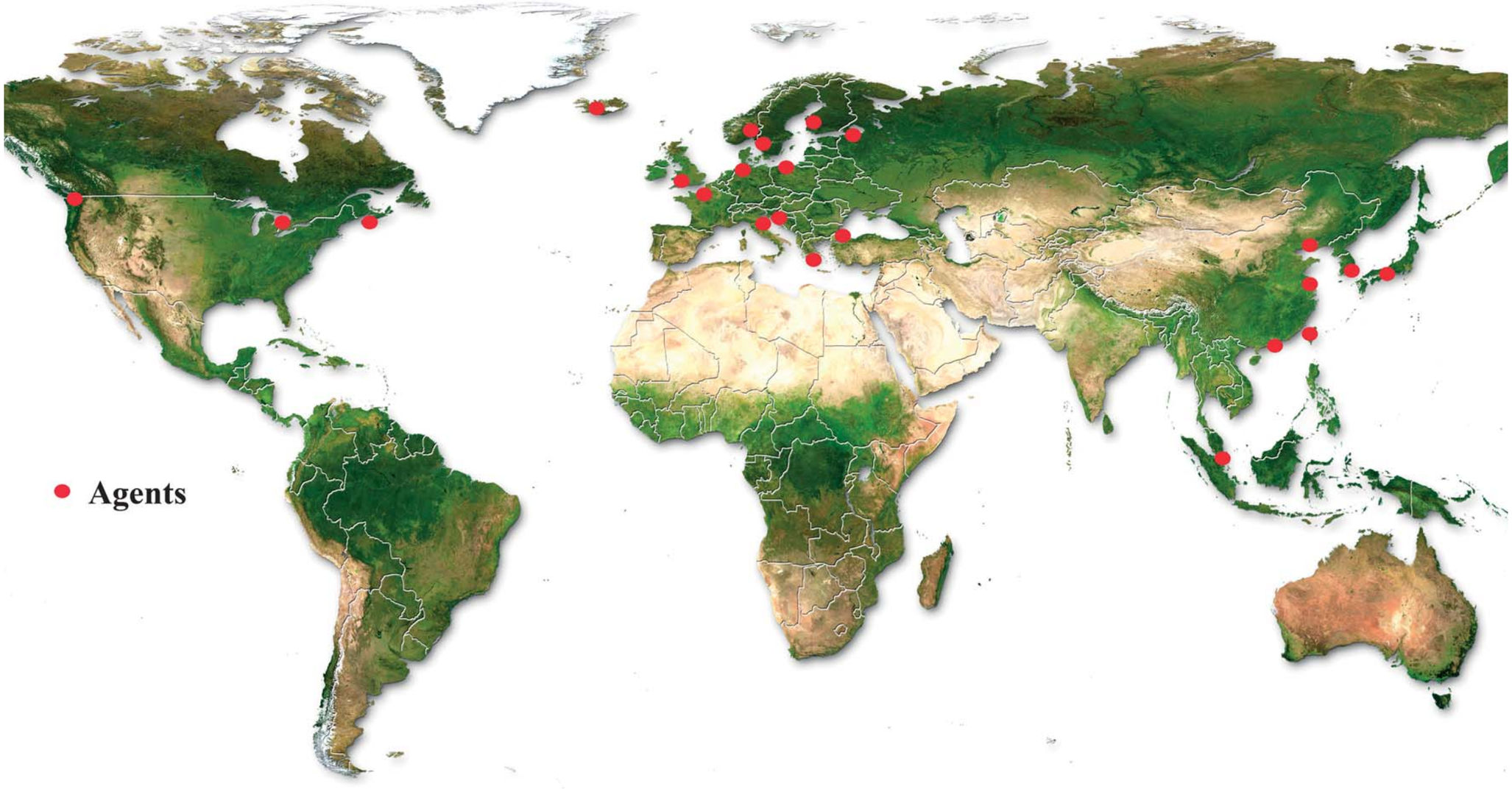
3. The fact that it is environmentally benign.

Expectations have been met. The coating has remained intact despite aggressive cleaning to remove all accumulated fouling and restore the hull to a clean, smooth condition.

The hull of the Sea Launch converted semisubmersible rocket launch platform was coated with Ecospeed. After heavy fouling was removed with underwater cleaning, the hull coating was in pristine condition.

Launch Platform Odyssey during operation.

Worldwide network of agents



Click here for contact details

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