It is widely understood that antifouling coatings play a crucial role in maintaining a smooth hull, as they help reduce frictional resistance and can improve optimized fuel performance by 5 percent on average, compared with traditional tin-based polishing systems. There is more to be gained, however, by further reducing the forces between a ship’s hull and the water surrounding it.

Increasing demands to reduce the carbon footprint of commercial shipping have caused leaders in the marine industry — marine paint producers, in particular — to look at new technologies and seek improvements to current hull coatings. Reduced hull fouling can also lessen the transfer of aquatic species between regions where they can damage the local marine life — the so-called transfer of nonindigenous species that, for example, caused the zebra mussel infestation of the Great Lakes in North America and has now spread to many of the inland waterways.

Before examining recent developments, though, it would be prudent to recall what happens on a ship’s hull when immersed in seawater.

**Development of Fouling**

A clean surface immersed in seawater will have an adsorbed molecular (conditioning) film within minutes, or even seconds, and within an hour, a biofilm will develop. The biofilm is initially formed of bacteria and then of diatoms and protozoa — or slime, as it is more commonly known.

Approximately a week later, macrofouling — algal spores and animal larvae — will begin to appear and will then develop over months and years into adult organisms known as weed and shell fouling.

**Hull Coatings**

Current premium hull coatings, which are available from all the major suppliers, can be divided into two major groups.

1) Biocidal polishing systems based on acrylate technology: either metal (copper or zinc) acrylate or silyl acrylate, with copper as the main biocide, often supplemented by organic co-biocides; and

By Brian Goldie & Dan Mobbs

**JPCL Europe**

By Brian Goldie & Dan Mobbs

**JPCL Europe**
RECENT DEVELOPMENTS

Ecofleet 690
Photo courtesy of PPG
2) Biocide-free, foul-release coatings, split into two technologies: (a) “soft” products based on silicone elastomers, and (b) fluoropolymers and “hard” products based on different resin technologies such as glass-flake vinyl ester and solvent-free epoxy.

There is no one-for-all coating, and this is reflected in the varied products offered. Also, the correct choice of underwater coating for any given vessel depends on a number of parameters, including, but not limited to; ship type, service speed, trading pattern, cost, and whether it is newbuild or maintenance painting.

Over the past five years, advances in hull-coating technology, and hence improvements to fuel efficiency, have been restricted to incremental advances. The current premium products are all very effective at preventing macrofouling (i.e., weed and shell), which has the largest effect on hull roughness and, as a result, fuel efficiency.

For this reason, research has been, and still is being, directed at solving the problem of slime buildup, which can account for about a 5 percent fuel penalty. During the past year, there have been further developments by coatings producers in their premium products.

**Coating Developments**

The latest foul-release technology from coatings supplier Hempel features a hydrogel surface modification which the company says improves resistance to slime fouling. The company has also recently launched Hempaguard, a new hull-coating concept that is said to offer both outstanding resistance to fouling during idle periods and significant fuel savings. The technology, dubbed ActiGuard, has been five years in development and is based on silicone-hydrogel and biocide science.

This technology integrates silicone hydrogel and full diffusion control of biocides in a single coating. Surface retention of the biocide activates the hydrogel, which effectively holds fouling organisms at bay, cutting friction to a minimum while utilizing a minimal amount of biocide.

Since the biocide is retained on the surface, there is no need for polishing. Thus, the product is said to release 95 percent less biocide than a standard self-polishing co-polymer type antifouling. The surface also has the same smoothness as conventional biocide-free, silicone-based foul-release coatings.

Hempel’s tests have shown excellent fouling resistance of up to 120 days during idle periods as well as fuel savings of 6 percent on average. Control of fouling during loading and unloading, or at other times when the vessel is stationary, has traditionally been difficult, because the surface self-polishing that exposes fresh biocide, or water movement across foul-release systems, is greatly reduced.

There are two separate products available: Hempaguard X5, offering sustained fouling defense for up to 36 months, and Hempaguard X7, at up to 90 months of fouling defense. Both products are suitable for any type of vessel with any trading pattern as well as for extended idle time.

Another manufacturer using hydrogel technology with a biocidal polishing antifouling is Nippon Paints. The company recently launched what it calls an improved version of its low-friction LF-Sea product, which has been on the market for more than seven years and applied to more than
Safespan is a leader in access solutions and provides safe & secure methods for accessing virtually any structure.

**SIMPLE INSTALLATION**

The components are all designed with fast installation in mind and our research and development team is always working on system improvements to save contractors time.

The dimensions and weight of the Safespan panels have been designed and manufactured specifically for platform use, are easy to handle, and support more weight than any other panel.

Our fastening devices are easily installed from above and provide a seal.

**DEBRIS SHIELD**

The strength of the work platform makes Safespan the system of choice for deck demolition and rehabilitation. It is built to handle the heavy abuse of falling debris and protects roadways and waterways below as nothing can fall through.

**A STABLE WORK PLATFORM**

Our platforms provide a cost effective solution utilizing a safe solid floor. The stability of the system allows for work to be performed faster along with increased safety and comfort for workers.

**CONTAINMENT**

For projects with containment needs the system easily converts to a completely enclosed environment with the addition of tarps. Safespan is the best system for projects with Class A containment requirements. It protects the environment and dramatically simplifies waste disposal.

**RELIABLE**

Superior engineering has made our approval rate second to none.

All components are backed by exhaustive load test data to ensure safety and load handling.
850 ships. According to Nippon, this technology gave ship owners about 4 percent propulsion improvement — a significant figure — but the company believed there was potential for higher gains. After working on the technology for three years, with support from shipping company Mitsui O.S.K. Lines (MOL), the Japanese government, and the classification society Class NK, Nippon now claims that ship owners can see up to a 10 percent reduction in fuel expense. Compared to the first generation product, this next version employs an enhanced water-trapping function, improved biomimetic technology, and a rheological, anticorrosive control additive.

The use of hydrogel technology in the antifouling makes the surface of the hull behave like a liquid on a microscopic level. This behavior not only deters the fouling from settling in the first place, but also significantly reduces hull friction. The new system is included within a copper-silyl-acrylate, self-polishing antifouling paint in which the hydrogel’s effect is said to be both renewed and maintained throughout the ship’s service life. The company maintains that the system does not need to be applied over a fully-blasted surface and can therefore be used over existing antifouling paints quickly and with minimal cost.

As of this article’s original publication in JPCL Europe, in January of this year, owners were being given the opportunity to try the system for themselves. Each owner was permitted by the company to apply the material to two vessels — including cruise ships, large tankers, car carriers, or bulkers — to verify the fuel-savings claims. The 3 to 4 percent fuel savings attributed to earlier antifouling systems were difficult to verify; however, this new material has the potential to produce significantly higher fuel savings, which should be easy to see in even a simple analysis.

European owners and majors have been at the forefront of demand for this new technology, and their initial results will be released soon. This year Nippon Paint expects to have at least 100 ships using the technology.

The latest premium hull coatings from International Paint include an advanced Intersleek coating and a new Intercept system. Intersleek 1100SR is based on an enhancement of the fluoropolymer used in previous generations and features a unique, patented slime-release technology. The coating is said to have improved static foul-
NO FLASH RUST = A CLEAN SURFACE

HoldTight® 102 is the standard of performance for preventing flash rust:

- **NO SALT.**
  Removes all contaminants

- **NO RUST.**
  Leaves a rust-free surface for 48 hours or more - often 3 to 5 days

- **NO DETECTABLE RESIDUE.**
  There is nothing left on the surface that might interfere with your coating.

Among rust preventers and salt removers, HoldTight® 102 is the most widely used, reliable, time-proven, lab-tested, field-tested, recommended and approved by coating companies.

Call, email or visit our website today to see why HoldTight® 102 is the best option for low-cost, easy-to-achieve, and easy-to-measure contaminant-free surface preparation.

Suncor Energy uses HoldTight® 102 to remove salts from its FPSO Terranova and other similar vessels in the North Atlantic every time it re-coats decks, structural steel, piping and other surfaces exposed to the sea.
ing resistance, even in warm waters, and any slime that does settle during these periods is removed as the vessel moves through the water. The company claims that this product offers proven fuel savings — and thus, emission savings — of up to 10 percent, compared to the cost associated with controlled-depletion polymer antifoulings. This coating is said to be suitable for all ship types and appropriate for slow-steaming vessels. Since its launch last year, the product has been applied to 102 vessels, with 30 contracted and 24 under negotiation across all main classes, including container, cruise, LNG, Ro-Ro, and tanker vessels.

Intercept 8000 LPP is a biocidal antifouling coating featuring Lubyon polymer technology. This hull coating is said to replicate the linear polishing behavior of tributyltin-based materials, unlike the silyl or metal acrylate biocidal systems. The Lubyon polymer produces what the company refers to as a “superhydrophilic” surface, which has a lubricating effect. It also swells in water, helping to smooth out the surface and further reduce drag. In addition, the polymer reacts with seawater through the surface-active zone, releasing only the optimum amount of biocide, the release of which is largely independent of seawater temperature.
We create chemistry that makes coatings love complex shapes.

Versamid® and Versamine® epoxy curing agents by BASF create very tough, high solids epoxy coatings that speed up through-cure and tack-free times without sacrificing pot-life.

- Applies easily
- Cures quickly – even at low temperatures
- Adheres to a variety of substrates
- Maintains excellent chemical resistance

At BASF, we create chemistry. basf.us/industrialcoatings
This coating is, therefore, suited for global routes during all seasons and for all ship types, but it is specifically designed for deep-sea vessels. The company claims that the product, compared with controlled-depletion technology, achieves fuel and emission savings of 5 percent and has been applied to 51 vessels, with 15 contracted and 41 more in the pipeline.

Slime control is a feature of coatings manufacturer Jotun’s latest innovation, the newly developed SeaQuantum X200-S range. The company says the product offers superior resistance to slime and fouling in addition to controlled and linear polishing, a low-leached layer, resistance against mechanical damage, a smoother coating surface over time, and low water ingress into the coating. Within the range, there are products for high-speed/high-activity vessels, low-activity vessels, static or laid-up vessels, and a universal product. The company asserts fuel savings of 10 percent above market average and 90 months of effective performance.

A few years ago, Jotun launched its Hull Performance Solutions (HPS), which combined its premium antifouling, SeaQuantum X200, with priority technical service, tools to measure hull performance over time, and a money-back guarantee. Relying on data generated from vessel trials, the company says that its HPS offers a clean hull and, compared with a vessel after dry docking, less than 1.5 percent speed loss or a maximum of 4.5 percent increase in fuel consumption over 60 months. The company has also released its HPS Newbuilding Solution, aimed at yards delivering vessels with eco-design.

PPG’s premium products include the third-generation SIGMAGLIDE 990 silicone-based foul-release coating with improved slime-resistance and release properties and SYLADVANCE 800, a silyl acrylate antifouling coating with controlled polishing rates, and enhanced self-smoothing
EAGLE UNDERSTANDS YOU NEED OPTIONS !!

BUY OR RENT
EAGLE INDUSTRIES & EAGLE LEASING

Decon Trailers

Dust Collectors

EAGLE LEASING
ASK ABOUT OUR LEASING OPTIONS

EAGLE INDUSTRIES is the nation’s premier supplier of containment materials and equipment. Whether you’re applying protective coatings, removing hazardous wastes or protecting your jobsite from unwanted weather........we have a containment solution to fit your needs.

800-266-8246 www.eagleind.com

Click our Reader e-Card at paintsquare.com/ric
capabilities to optimize hull roughness reduction. The latter is said to control shell and weed fouling for prolonged periods, depending on sailing pattern and routes.

The company has also recently launched its Sigma EcoFleet 690 coating, which is said to provide high-performance, predictable antifouling protection for short-sea and coastal shipping at variable operating speeds, in aggressive fouling environments. The company asserts that this coating contains an ultra-high-volume solids content of 70 percent, thus reducing potential volatile organic compound (VOC) emissions.

PPG also released its Sigma NEXEON range — a complete copper-free antifouling solution — developed based on research and testing at the company’s own facilities and in third-party studies. Within that range, Nexeon 710 is the company’s antifouling solution for operational vessels and can be applied during construction and dry docking. For newbuilds where outfitting takes longer than six months, the company offers its Nexeon 750 high-activity, copper-free topcoat antifouling. Both products are said to employ self-polishing, zinc-acrylate binder technology.

Because of the absence of copper, the leveling and smoothness straight after application are said to be significantly improved, thereby delivering better fuel efficiency. A further benefit claim is the cosmetic appearance — elimination of the so-called “whitening effect” that can occur with copper in the coating.

Surface smoothness is also said to be a major advantage of the latest addition to Chugoku’s antifouling range. SEAFLO NEO is a high-performance, TBT-free hydrolysis antifouling that, according to the Japanese company, utilizes a unique polymer that delivers an ultra-smooth surface and self-polishing performance. This enables the coating to provide long-term antifouling protection and low friction resistance. The company maintains that this coating reduces fuel consumption by as much as 5 percent and has the lowest VOC in the industry’s hydrolyzed ship-bottom paint.

Biocide-free, foul-release coating, Bioclean, forms the basis of Chugoku’s environmentally-friendly range. The product has a low VOC and is said to be 25 percent smoother than existing silicone coatings, resulting in further reduction of fouling, fuel consumption, and carbon dioxide emissions, according to the company.

The premium hull coating from Sherwin-Williams is its two-coat Sher-Release System. This silicone-based, foul-release system is made up of the SeaGuard Tie Coat and the...
COATING PROBLEMS?
KTA Can Help!

Log on to www.kta.com/solutions/ for this case study.

Log on monthly to read case studies from KTA

www.KTA.com/Solutions/

KTA - Tator, Inc. Pittsburgh, PA - 412.788.1300
Click our Reader e-Card at paintsquare.com/ric
SeaGuard Surface Coat. It is said to be suitable for use in a wide range of operating environments for vessels trading at greater than 10 knots and is claimed to have superior cleanability compared to traditional silicone foul-release systems. Fuel savings of 6–10 percent are claimed.

Kansai’s leading antifouling is its Takata Quantum Series of silyl polymer hydrolysis coatings, which the company claims will dramatically improve a ship’s fuel efficiency through wear characteristics that remain stable over the long term.

Conclusion
As stated earlier in this article, hull fouling is a major contributor to the transfer of invasive species. Research indicates that biofouling is a significant mechanism for the transfer of species by vessels. A single fertile fouling organism has the potential to release many thousands of eggs, spores, or larvae into the water, with the capacity to found new populations of invasive species such as crabs, fish, sea stars, mollusks, and plankton. Minimizing biofouling will significantly reduce the risk of transfer.

The International Maritime Organization (IMO) is addressing this, which could result in further mandatory regulations, but that will take time. For now, guidelines are outlined in the “2011 Guidelines for the Control and Management of Ships’ Biofouling to Minimize the Transfer of Invasive Aquatic Species,” adopted in 2011 by the Maritime Environment Protection Committee (MEPC) in Resolution MEPC. 207(62) and published in 2012.

These are only guidelines and, hence, not mandatory, but IMO member countries have been requested to take urgent action in applying these guidelines and in reporting back to the MEPC on any experience gained. The guidelines call for a biofouling management plan and record book to be maintained for every ship. It also recommends the application of an antifouling system appropriate for the type of vessel and its operating speed and trading pattern, as well as compliance with the AFS Convention (IMO International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001).

There is still a long way to go to keep ships’ hulls clean of fouling for fuel efficiency and preventing transfer of aquatic species, as well as having a universal basis for evaluating fuel savings. Will this result in new coating or hull-cleaning systems? We will have to wait and see.
Drips in your paint?

Dry compressed air prevents drips, fish eyes, and other imperfections.

Let us help you dry your compressed air lines.

Because Dry Air Matters.

1-800-840-9906
www.vanairsystems.com