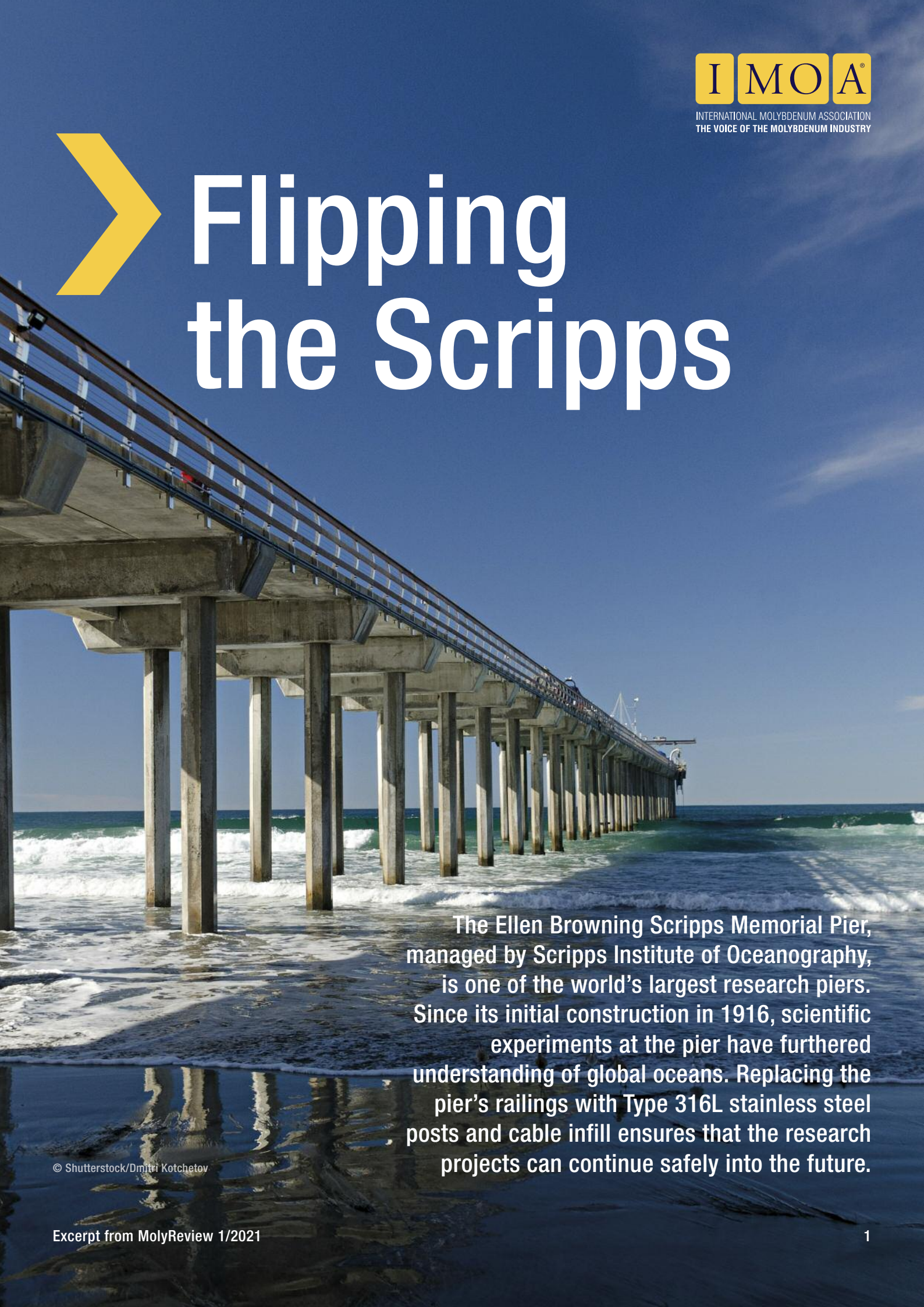
INTERNATIONAL MOLYBDENUM ASSOCIATION
THE VOICE OF THE MOLYBDENUM INDUSTRY

Flipping the Scripps



The Ellen Browning Scripps Memorial Pier, managed by Scripps Institute of Oceanography, is one of the world's largest research piers. Since its initial construction in 1916, scientific experiments at the pier have furthered understanding of global oceans. Replacing the pier's railings with Type 316L stainless steel posts and cable infill ensures that the research projects can continue safely into the future.

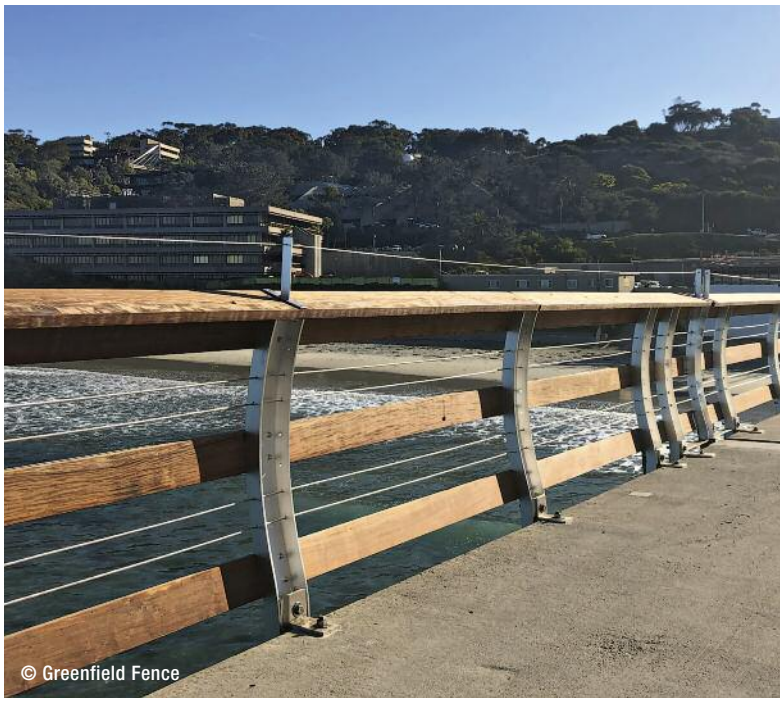
In San Diego, California, there is a classroom where sunglasses and swimwear are encouraged. La Jolla beach might seem like the domain of surfers rather than scholars, but its iconic pier is home to world-class academic research. The University of California at San Diego's Scripps Institute provides around-the-clock data on oceanic conditions, including temperature, salinity, plastic degradation and plankton levels. It also provides over 3.7 million liters of filtered seawater per day to nearby laboratories, aquaria, and other marine institutions. Researchers diligently sample air and water off the pier, sustaining the longest continuous ocean monitoring program in the Pacific Rim. Many of these daily samples are taken by hand, so the pier must remain operational 365 days a year. The pier was upgraded in 2018 with molybdenum-alloyed stainless steel to minimize future maintenance in the highly corrosive seaside environment.

The corrosion of the ocean

Decades of exposure to punishing wind and waves took their toll on the pier. By 1988, it needed a major renovation. That year, the pier's wood planks and railings were replaced with concrete and steel. But after 30 years, the upgrades were beginning to fail, battered day in and day out by the unrelenting Pacific. Several members of the Scripps family donated more than $2.6 million to replace the railing yet again. This time a more resilient construction material, Type 316L stainless steel, was chosen to withstand the constant exposure to wind, waves and aggressive chlorides. The 2% molybdenum in this grade provides added resistance to atmospheric corrosion in marine environments. The pier remained fully operational during the renovation, allowing the researchers to continue their sampling without interruption.

The stainless steel channels that serve as the pier's new railing posts are laser fused, a process that creates crisp architectural corners. Each of the sleek, slightly curved channels is about 15 centimeters wide and weighs 5.4 kilograms. Stainless Structurals supplied over 900 meters of these sharp-cornered channels, weighing more than 17 metric tonnes altogether. The cable infill strung parallel to the horizontal hardwood rails is also Type 316L stainless steel.

The fabricators bent the channels in their shop to the required geometry. The channels, cables and fittings were all electropolished to provide optimal corrosion resistance. Electropolishing removes micro imperfections, that can lead to corrosion, by removing a microscopic surface-layer from the material. Eventually, the posts were installed by bolting them into the pier's existing bolt sleeves. These railings exemplify a growing trend of using structural stainless steel in both renovation and new construction. Not only do the railings look attractive, but they are also built to last in a taxing environment.



Curved stainless steel posts combine with hardwood rails for a nostalgic yet modern look.

Beyond basic science

Some of the research conducted at Scripps underscores the need for more molybdenum-alloyed stainless steels in coastal environments: sea levels, temperatures and humidity are rising, storms are intensifying and oceans are becoming more acidic, all contributing to a more corrosive environment for building materials. The Scripps Institute has collected data on climate change for over 60 years, when researchers there first identified increasing levels of carbon dioxide in the atmosphere over time. While up to one-third of the CO_2 produced by human activity is absorbed by the world's oceans, which is slowing down climate change, this is not without consequence. The changes in water chemistry cause its pH to drop. A more acidic ocean is bad news: it impedes the growth of shells and corals in marine life and may accelerate corrosion of human structures near the coast. Scripps' rigorous sampling contributes to one of the most comprehensive data sets on Pacific Ocean acidification and carbon levels anywhere.

Though the subject of Scripps' research itself was eating away at the pier with a growing fervor, thanks to a significant assist by molybdenum, the structure is now better protected. This type of structural stainless steel application foretells exciting possibilities in durable coastal construction, allowing human activity to continue beside the ocean with improved safety and lessened impact on the environment. (Karlee Williston)