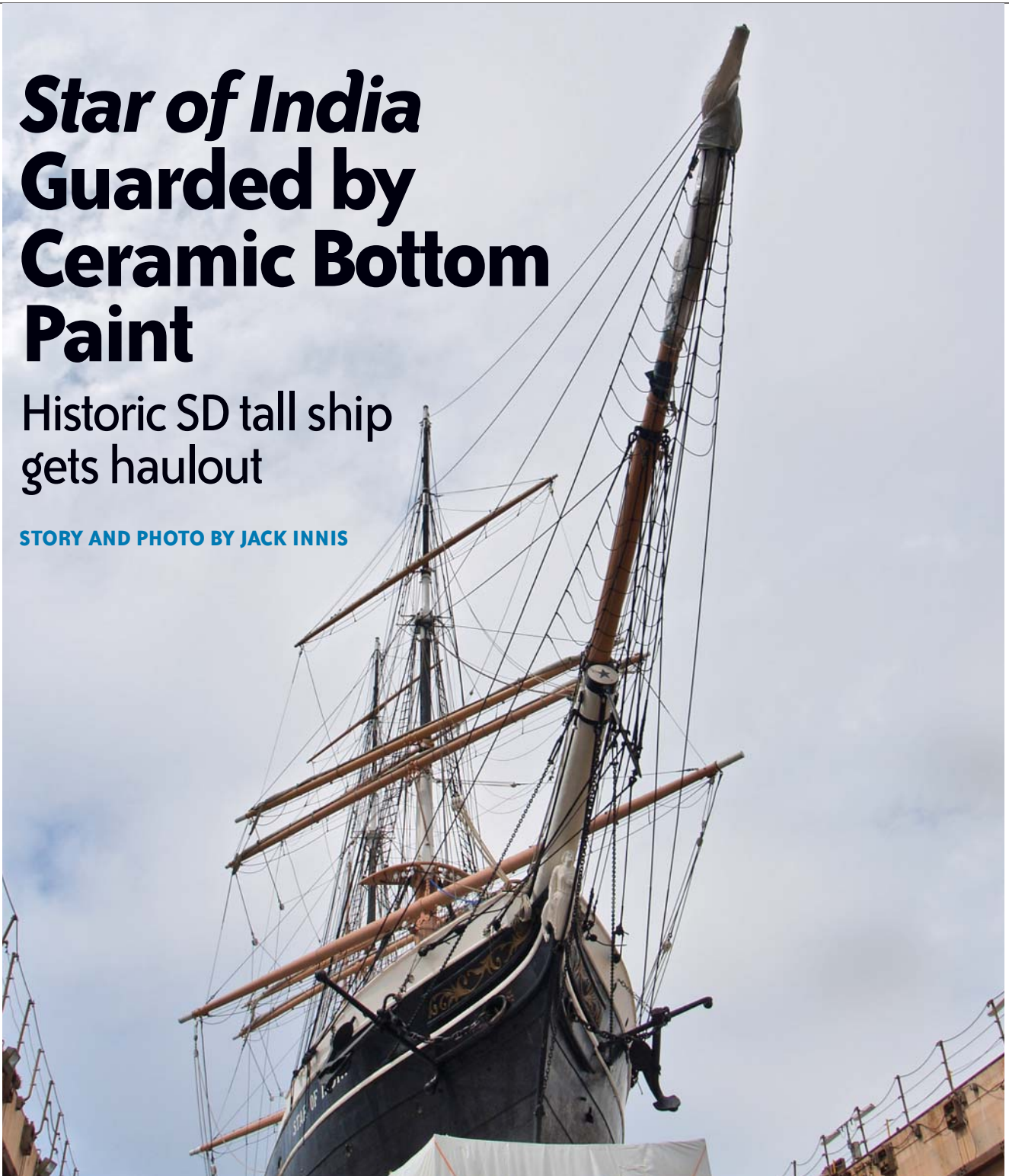


Star of India Guarded by Ceramic Bottom Paint

Historic SD tall ship gets haulout

STORY AND PHOTO BY JACK INNIS



SAN DIEGO'S STAR OF INDIA is possibly the most durable iron ship ever built. Constructed of machine-wrought iron plate at the Ramsey Shipyard on the Isle of Man in 1863, the 205-foot sailing cargo ship completed 21 circumnavigations over the course of 63 years before being purchased for the nonprofit San Diego Maritime Museum. The ship was fully restored to sail in time for our country's July 4, 1976 bicentennial celebration and instantly became an important icon for the city of 1.3 million.

The port's beloved tall ship, *Star of India*, is now protected by a 21st century bottom paint that will ensure its preservation for years to come.

Today, thanks to the recent application of high-tech 21st century ceramic bottom paint, the ship will likely remain watertight for another 146

years. But for maritime museum officials, getting the underwater armor onto the hull was no easy matter.

HAULOUT WOES

As a passenger-carrying vessel, *Star of India* must be hauled out and inspected below the waterline every 10 years to comply with Coast Guard regulations. The vessel's last inspection was 1999, so Maritime Museum President Ray Ashley slated the tall ship for haulout at BAE Systems shipyard in South San Diego Bay. *Star of India* is an important revenue earner for the museum so Ashley opted for a fall haulout — well past the summer tourist season. At \$12 per adult visitor, it costs the museum plenty to have its star attraction sidelined.

But in early August, Ashley received a call from BAE Systems notifying him that Diligence, the floating drydock assigned to lift *Star of India*, was suddenly being placed into mandatory early retirement. If they acted immediately, the floating drydock could accommodate one last ship: *Star of India*.

With a Coast Guard deadline looming, Ashley reluctantly moved the haulout forward to August 18, 2009 at the height of tourist season, right before Labor Day weekend.

"We had no other choice," Ashley said. "We obviously had to drydock it and didn't know what else might be available in the future."

DON'T ERASE THE HULL!

Star of India was towed to the shipyard and eased onto the semi-submerged floating drydock. After divers ensured the 1,300-ton-displacement vessel was well supported, the floating drydock lifted the tall ship out of the water.

Workers from R.W. Little Co. prepared for painting by blasting *Star of India's* hull with 6,000 psi of water. The plan was to remove all marine growth and peel back several layers of old bottom paint until just a single layer of old primer coat remained. But the hydroblast crew could not remove all the stubborn marine growth from below the waterline. Normally if water blasting

doesn't work, shipyard workers start sandblasting. But the thought gave Ashley a case of the shivers. Wrought iron is fairly soft and sandblasting might be too aggressive.

"Even losing 1/32nd of an inch of wrought iron is completely unacceptable for a ship that old," Ashley said. "Lose that much time and again over decades to come and you'll eventually erase *Star of India's* hull."

The problem was solved by switching to a copper-based adhesive that is softer than the wrought iron. The yard workers blasted — with a delicate touch — and the tall ship passed Coast Guard and Maritime Museum paint preparation inspections with flying colors. It looked like it was time to apply the ceramic coating system.

OLD SHIP WEEPS

More than a dozen maritime museum volunteers used putty knives to fill numerous small voids in *Star of India's* hull with waterproof filler. But the paint crew took one look at the hull and shook their heads. Saltwater was weeping from the tall ship's seams.

"*Star of India's* wrought iron plates overlap one another," Ashley explained. "In nautical terms it's called joggle plating. The ship was built from the bottom up, each successive plate placed inside the plate below and riveted. After construction, the outside edges of the plates were hammered down against the hull to create a smooth surface."

With water seeping from the seams, it looked as though the ship might have to sit for weeks in drydock to dry out. Several days had already been lost due to the abrasive blasting change order; further delays were simply unacceptable. Luckily, the coating supplier had an answer.

Bill Kraus, La Jolla-based owner of Ram Protective Coatings Co., Inc., showed Maritime Museum officials a product called CeRam-Kote 54 SST, an epoxy that can be sprayed over moist surfaces. The coating is used in undersea oil pipeline applications so there was no doubt it would work.

R.W. Little Co. sprayed the entire hull with an ultra-thin coating of the product. The weeping ceased, and the new ceramic coat had a good surface to cling to. With all obstacles out of the way, *Star of India* finally received its spray-applied below-the-waterline ceramic shell. The credit card-thick hardened coating is so slick, dense and hard that it wards off marine growth. In fact, the Maritime Museum's retired ferry *Berkeley* has enjoyed the same ceramic hull protection since 2003.

SPACE SHUTTLE TOUGH

Ceramic-laden tiles work to protect NASA's space shuttles from the heat of re-entry. While *Star of India's* hull will never get that hot, ceramics help protect the tall ship from rust, the number one enemy of iron and steel vessels.

The coating system works to combat corrosion in two important ways, Kraus said: Ceramic particles create a tortuous path to keep water molecules away from the iron hull, which prevents corrosion. In addition, the ultra-dense coating system inhibits the flow of stray electrical current, a small current that trickles from onboard or nearby power sources that aggressively corrode metallic hulls or metal fittings in wood or fiberglass hulls.

Protecting the integrity of *Star of India's* iron hull is important — perhaps even more so than on historic wooden ships.

"*Star of India* is completely original below the waterline," Ashley said. "Most historic wooden ships have had nearly every piece of timber replaced at one point or another. If you look at *HMS Victory*, you're really not looking at much of the ship that Admiral Lord Nelson stood upon at Trafalgar. But when you look at *Star of India*, you see rivets that were driven in when Abraham Lincoln was president."

Today with a high-tech 21st century ceramic coating protecting its hull, *Star of India* is poised to endure another 146 years of saltwater immersion. 🍷