# IN-WATER DRY DOCKING SYSTEMS

# PILOT STUDY REPORT



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### PREPARED BY

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# 1 INTRODUCTION

Los Angeles County (County) continues to be an active participant in water quality improvement programs in Marina del Rey Harbor (MdRH). The County's implementation strategy to address dissolved copper in MdRH involves a multi-pronged approach to restore and maintain water quality for the designated beneficial uses. The strategy includes technical studies, pilot projects, and developing a site-specific objective for copper. Also important is building public awareness around the impacts of copper to marine life and gaining public support for use of alternatives to copper leaching antifouling paints and for hull cleaning best management practices (BMPs). The County has ongoing and planned voluntary programs to help meet its water quality goals. One such program is the In-Water Dry Docking System Pilot Study (In-Water Dry Dock Pilot) to assess the effectiveness and use of in-water dry docking systems as an alternative to copper antifouling paints for reducing fouling. This report summarizes the installation, maintenance, and removal of an in-water dry dock during a oneyear trial period. It also covers the purchase and installation of two in-water dry docks for a long-term pilot study, as well as cost analysis and lessons learned for moving forward with this BMP alternative.

### 1.1 BACKGROUND

MdRH is listed as impaired on the State's 303(d) list of impaired waterbodies due to several pollutants, including dissolved copper, which can exceed water quality limits specified by the California Toxics Rule by up to four times the chronic limit of 3.1 µg/L. The MdRH Toxic Pollutants Total Maximum Daily Load (TMDL)<sup>1</sup> was revised in 2014 to address dissolved copper exceedances in the water column. The revised TMDL became effective in 2015 and includes dissolved copper load allocations for the County, anchorages, and boat owners in MdRH. The revised Toxics TMDL requires a dissolved copper reduction of 85% from baseline by March 22, 2024. The TMDL also estimates that approximately 94% of the dissolved copper is coming from passive leaching of antifouling paints, with the other 6% coming from boat hull cleaning.

Compliance with the Toxics TMDL requires one of the following to be met:

- Meeting numeric targets in the water column, or
- Demonstrating that 85% of boats in the harbor are using copper-free hull paints, or
- Another acceptable means of demonstrating compliance as approved by the Executive Officer of the Regional Board that would result in attainment of copper numeric targets

<sup>&</sup>lt;sup>1</sup> A TMDL puts a limit on the amount of pollutant a receiving waterbody can accept in order to protect its beneficial uses.

in the water column (e.g. demonstrating that 100% of boats in the harbor are using hull paint that discharges 85% less copper than the baseline load).

Because the primary source of dissolved copper loading is antifouling hull paints, identifying BMPs that replace the need for antifouling paints, such as using in-water dry docking systems to separate the boat hull from contact with the water, is a key strategy to improve water quality in the harbor and help meet the requirements of the Toxics TMDL.

# 1.2 PROJECT SUMMARY

Los Angeles County Department of Beaches and Harbors (DBH) identified in-water dry docking systems as a potential alternative to antifouling paints in June 2018. The County then entered into an equipment loan agreement with an in-water dry docking system manufacturer, FAB Dock, to use one of their devices in MdRH for free on a temporary basis (originally 6 months, but later extended) as a trial to get a better understanding of its capabilities and maintenance requirements. The device was used by a local community group, the Sea Scouts, for a period of approximately one year. Following the end of the trial, the device was removed from the water and returned to the manufacturer. Toward the end of the initial trial period, the County purchased two new in-water dry docks for use by private boaters in the County-managed Anchorage 47 for ongoing assessment of the product.

# 2 IN-WATER DRY DOCKING SYSTEMS

In-water dry docking systems work by separating the hull of the boat from the water without lifting the boat out of the water. These systems consist of a bottom liner that envelops the submerged hull of a boat, and a floating frame along the edges of the liner that forms a bumper between the boat and dock. Unlike a typical 'wet' slip liner, which requires the input of chemicals such as chlorine to a wet barrier between the boat and liner, an in-water dry dock removes the water from between the boat and liner with a pump to keep the hull dry when docked at the slip. These devices also operate differently than boat lifts, as they do not physically lift the boat out of the water.

In-water dry docks are a promising new strategy to reduce copper pollution in marina waters and save boat owners money over the long term, since, according to the manufacturers, a boat docked in an in-water dry docking system does not need antifouling hull paint or regular hull cleaning.

The benefits of these devices, provided manufacturer claims prove to be accurate, include:

- **Reduced maintenance costs** Regular hull cleaning and antifouling paint are not needed when using an in-water dry dock. The device may also reduce damage to the boat caused by electrolysis.
- **Protection of the boat hull** The inflatable tubes help guide the boat into the slip and provide protection to both the boat and the dock.
- Improved water quality Use of in-water dry docks helps reduce copper and biocide pollution by preventing prolonged contact of biocidal paints with marine water and eliminating or reducing the need for in-water hull cleanings and antifouling paints in general.

DBH has identified two in-water dry docking systems (FAB Dock and SeaPen). Both manufacturers are based out of Australia.

# 2.1 FAB DOCK

FAB Dock is an in-water dry docking system company based out of Queensland, Australia. The company has been producing FAB Docks since 2011 and has recently started selling the product in the U.S. All details provided below were acquired from the manufacturer's website and printed materials, as well as correspondences and conversations with FAB Dock's president.

### TYPES AND SIZES

FAB Dock is available in a Universal Range that can fit outboard and stern drive vessels ranging in size from 17 feet to 44 feet in length. There is also a multi-hull option for multi-hull vessels,

including catamarans, trimarans and pontoon boats, between 17 feet and 100 feet long. For other vessels such as larger boats (45 feet to 100 feet), sailboats, or boats that have shaft drives, IPS drives or larger jet drives, there is a custom build option available.

#### COSTS

FAB Docks are marketed as an economical in-water dry docking system with standard models and sizes in the \$7,000 to \$21,000 range. The 2019 FAB Dock U.S. wholesale price list is included as **Appendix A**. This pricelist represents wholesale pricing for dealers and distributors; however, FAB Dock has offered to honor wholesale pricing for all Marina del Rey boat owners for the next two years in order to assist with the County's copper reduction program. FAB Dock costs are discussed in more detail in Section 6 of this report.

#### MATERIALS<sup>2</sup>

FAB Docks consist of a hand welded inflatable tube and liner made from UV-resistant polyurethane alloy and an automatic bilge pump system. All electrical fittings are gold-plated, and all wires are submersible and waterproof. The gate's perimeter weight beam is made up of PVC pressure pipes with enclosed galvanized steel weights.

#### OPERATION

FAB Docks have inflatable air chambers that form a large floating tube around the boat (Figure 1). The main forward tube is divided into two separate air chambers to ensure buoyancy in the event of a puncture. Bulkheads on either side of the inflatable tube form a hinge for the drop-down rear gate, which is fitted with containing sleeves that hold the perimeter weight beam. When the rear tube is deflated, the weights pull it down to open the gate and flood the liner, allowing the boat to exit and enter the FAB Dock. After the boat enters the device and turns off and raises its engine, the boater attaches the inflator to the gate hose to raise the gate. The inflator turns off automatically when it reaches the preset pressure. Once the gate is fully inflated, the boater packs the inflator away in a dry part of the boat connects the electrical lead between the water pump connector on the FAB Dock and the boat's 12V outlet to activate the pumps. The FAB Dock system is operated by 12-volt power from the boat battery (or solar panels), eliminating the need for any 240/110 volt electrical lines connecting the system to a power source on the dock or the storage of an on-shore power source. The tube inflation/deflation process takes approximately 3-5 minutes, with additional time required to fully pump out all the water from between the boat hull and the dry dock liner<sup>3</sup>.

<sup>&</sup>lt;sup>2</sup> Based on information provided by FAB Dock.

<sup>&</sup>lt;sup>3</sup> The amount of time needed to pump all the water out depends on the size of the FAB Dock and the size of the boat using it. Since the pump is automatic, the operator does not need to be present while the water is being pumped out.

The Universal Range FAB Docks include two fully automatic water pumps (the number of water pumps in custom built FAB Docks varies by design). Each water pump is wired independently so that if for any reason there is a problem with one pump, the other pump will continue to function and keep the boat dry. The pumps are connected to a special water sensing controller that is connected to the boat's battery.

There are three pump stages: 1) When a user first plugs in the device, the pumps turn on, empty all the water out, and then turn off. 2) The device goes into dry-out mode for the first hour, during which time it will do 6 checks and pump out any residual water. 3) The device goes into rain mode after completing dry-out mode, checking every 2 hours for water and pumping out any new water that has collected.



Figure 1. FAB Dock In-Water Dry Docking System Illustration

#### MAINTENANCE

Antifouling paint should never be applied to a FAB Dock. Fouling is expected to occur on the bottom of FAB Docks and will not damage the device. The only time the bottom of the device needs to be cleaned is when moving it to a different location, in which case the growth can be wiped off by hand, with a soft cloth, or sprayed off with a hose. The weight of growth will not cause the device to sink and will not damage the material. The top of the tubes surrounding

the boat should be kept clean and free of debris. In most cases, if the device is punctured, the material can be patched, but fouling organisms should not be able to puncture the device. FAB Docks have no metal parts to service.

#### LIFESPAN

According to the manufacturer, FAB Docks last at least 10 years in Australia under warmer water conditions with higher ultraviolet radiation, therefore the manufacturer anticipates that these devices can last between 10 and 15 years in southern California.

#### SAFETY

Because the boat is kept at the water line, safety concerns typically associated with boat lifts, such as tipping, are not an issue. People can also board the boat while the device is inflated.

#### ADDITIONAL BENEFITS

There are additional benefits to using a FAB Dock besides its protection of the boat hull from fouling organisms. Because the boat hull is kept out of contact with the water, the device helps protect against electrolysis. It also provides a watertight environment that can prevent a leaking boat from sinking while inside the dry device. The bumper itself can protect the sides of the boat and can help guide the boat into the slip, reducing the risk of damage to the boat and dock. FAB Dock can also be used for mooring to help protect the boat when attached to a mooring buoy.

Additional information on FAB Dock can be found on their website at https://fabdock.com/.

### 2.2 SEAPEN

SeaPen is an in-water dry docking system produced by DOCKPRO, and sold in the US by Solstice Docking Solutions. SeaPen originated from Queensland, Australia and has been in fulltime production since 2004. DOCKPRO was established in 2007 as the exclusive sales and marketing agent for SeaPen, and it has now partnered with Solstice Docking Solutions as the exclusive distributor in the U.S. market. Details provided below were acquired from the DOCKPRO and Solstice Docking Solutions websites, as well as, correspondences and conversations with the director of Solstice Docking Solutions.

#### TYPES AND SIZES<sup>4</sup>

SeaPens are suitable for vessels ranging in size from 18 feet to 65 feet in length. The SeaPen Classic unit has been designed to suit all types of drive systems including shaft drive, IPS or keel boats, and can be designed to be multi-entry (i.e. reverse in or side berthing). It can be

<sup>&</sup>lt;sup>4</sup> Based on information provided by DOCKPRO and/or Solstice Docking Solutions.

used with sailboats if they have a retractable keel. A single unit size can fit a large range of boat sizes. It also suits locations which have stronger currents or high traffic areas. Other models include the new SeaPen SQ Gate, which is designed to suit outboards, stern drive, jet drive and some V drive boats and has a shallow liner which minimizes the water volume and pumps out quickly. The Ski/Wake Boat SeaPen has the same features as the SeaPen SQ; however, it has a deep liner and rope mat designed to suit wake boats.

#### COSTS

SeaPen in-water dry docking systems are on the higher end of the cost spectrum, as compared to FAB Dock. According to the US Distributor of SeaPen, the higher costs are attributed to their use of extremely high end materials and durability, lasting more than 15 years. A price list was not available at the time of this report.

#### MATERIALS

SeaPen includes a mesh layer of UV-stabilized breathable marine-grade rope (designed to protect the boat and allow the hull to completely dry), a growth resistant polymer liner, a walkable durable frame composed of high-density polyethylene with a hinge made of hard/durable plastic, and optional walkways that can be added on (Figure 2).



Figure 2. SeaPen In-Water Dry Docking System Illustration

#### OPERATION

A remote-controlled rear gate drops down to launch and dock the boat. The boat is guided into the frame on top of the growth resistant liner and marine-grade rope mesh that acts as a barrier between the boat and the water. The marine-grade rope mesh, which sits between the boat and the liner, is a patented system with integrated weights that maximize air flow and create a channel for water to funnel down, keeping the hull dry. The mesh layer is key for fiberglass boats without bottom paint because without the mesh, some moisture could remain between the liner and the boat. Without hull paint, this trapped moisture could cause blistering to the fiberglass hull.

It takes approximately 3 - 5 minutes for the gate to open/close and allow the boat to enter and exit the device. If the marina is equipped with Wi-Fi, the user can remotely lower the gate from a cellphone when within range so that the gate is down by the time the boater is at the boat.

Water is pumped out of the space between the liner and the boat using automatic pumps running off 110-volt power from the dock (not the boat battery). No electrical cords run through the water. Water may take 30-45 minutes to be completely pumped out of the lining. The pumps will shut off automatically when dry, so the operator does not need to be present while the water is being pumped out. The pumps will also automatically turn on any time water is detected to maintain a dry hull.

#### MAINTENANCE

Antifouling paint is not used on SeaPens, and the devices do not need to be cleaned. Growth can be cleaned off the device with a brush, but it is not required. Growth will not impair the functioning of the SeaPen, and since only soft growth attaches to the material, there is no concern for heavy hard growth weighing down or damaging the device. The gate hinge, the main moving part, is made of hard plastic and is completely out of the water so it does not corrode, oxidize, or become encumbered by growth. If any part of the SeaPen is damaged or malfunctioning, it can easily be replaced for much less than replacing the entire device. Temporary fixes can be completed by the boat owner to allow the boat in and out of the SeaPen if there is an issue, but full repairs should be completed by a local service representative.

#### LIFESPAN

Life expectancy of the liner portion of the SeaPen is approximately 8-10 years depending on how much movement is in the water. The mesh layer, polymer, and pumps can each be replaced individually and economically to extend the lifespan of the product. Original units in Australia have lasted 15-16 years (with liner replacement) and are still in use today.

#### SAFETY

Safety concerns typically associated with boat lifts, such as tipping, are not an issue because the boat is kept at the water line. People can board the boat while the device is in use and walk around the device along the rigid frame.

#### ADDITIONAL BENEFITS

Similar to FAB Docks, there are additional benefits to using a SeaPen besides its protection against biofouling. Because the boat is kept out of contact with the water, the device helps protect against electrolysis. It also provides a watertight environment that can prevent a leaking boat from sinking while inside the dry device. The frame can provide protection to the boat and help guide it into the slip, reducing the risk of damage to both the boat and dock. SeaPen can also be used for mooring, if desired, but the power source would need to be converted to solar. If a multi-unit docking system is desired, SeaPen units can be bolted together to extend a dock for multiple boats.

SeaPen is currently working on integrating a new sensor that will detect fuel and oil. The sensor will shut off the pumps and send a text message to the boater that the SeaPen has detected fuel and oil and the pumps have been disabled. This will give the boater an opportunity to check the boat for leaks, repair the problem, and properly dispose of the contaminated water prior to removing the boat from the security of the in-water dry dock.

Additional information on SeaPen can be found on the U.S. distributer webpage at <u>https://www.solsticedockingsolutions.com/seapen-dry-docking-system</u>.

# 3 PHASE I: IN-WATER DRY DOCK TRIAL

In-water dry docks surfaced as an alternative to antifouling paints in MdRH during the County's solicitation process for the Boat Lift Program<sup>5</sup> in June 2018. Because the product did not align with the definition of a boat lift, the product was not eligible for that specific project. Following the solicitation, DBH was contacted by FAB Dock, and was offered a free equipment loan for an in-water dry dock for demonstration purposes, on a temporary basis, so that the County could trial the device.

# 3.1 INSTALLATION

DBH entered into an equipment loan agreement with Fab Dock on August 9, 2018. The Sea Scouts, a local community group and tenant of the County's DBH-operated anchorage, volunteered their 21' power boat for the Pilot Study (Figure 3). A small Universal Model (Model FD19) FAB Dock was selected for the boat type and size. This model could fit vessels 17 feet to 22 feet. The FAB Dock manufacturer delivered the device and performed the installation at the Sea Scouts' slip on September 6, 2018. See **Appendix B** for images of the installation. FAB Dock's installation manual is included as **Appendix C**.



Figure 3. Sea Scout's 21-ft powerboat in a Model FD19 FAB Dock.

One issue that occurred during installation was that the Sea Scouts' boat battery was old and unable to provide enough power for the pump. The issue was resolved by replacing the battery during installation.

<sup>&</sup>lt;sup>5</sup> The Boat Lift Program was a proposed program to provide a subsidy to marina operators in MdRH that purchased a boat lift through the program. The program was being funded by a 319(h) nonpoint source pollution prevention grant from the State Water Resources Control Board. The Program was cancelled after the funding agreement was terminated.

### 3.2 FEEDBACK DURING IN-WATER DRY DOCK TRIAL

The Sea Scouts used the Fab Dock between the period of September 6, 2018, and September 23, 2019. During the trial period, they reported that the FAB Dock worked well, kept the boat bottom clean, and was easy to use. The device made it easy for new, young Sea Scout members to dock the boat at the slip without damaging the boat or dock because it protected and guided the boat into the slip. The computer-controlled dewatering pump was reported to be their favorite feature, and it kept the rain water out of the in-water dry dock during storms. During the year that the FAB Dock was in use by the Sea Scouts, the bottom of the device was never cleaned, and there was no need to clean the boat bottom while it was kept in the device.

During the trial, the FAB Dock manufacturer notified DBH that there was an issue with the material used for the device.<sup>6</sup> This FAB Dock had been made with a new material, which was expected to be more resilient and tougher in the marine environment. Unfortunately, the material instead was found to degrade more quickly, and the company decided to revert to their previously used material (UV resistant polyurethane alloy), adding additional UV inhibitors and increased thickness. The FAB Dock manufacturer offered to replace the trial FAB Dock with a new unit made with the improved material for long-term use by the County. Since the County had only agreed to a short-term equipment loan, and did not have a mechanism by which to extend the trial indefinitely, the offer was declined. The trial continued for a few more months with the older version, and FAB Dock was removed during the vendor's next visit.

In August 2018 the Sea Scouts reported that the FAB Dock had been damaged, but did not disclose what had specifically caused the damage. The bottom of the liner had been punctured, possibly by the boat's motor. Since the trial was at its close and the vendor indicated that he would not be reusing the device, there was no attempt at repairing the puncture.

On September 9, 2019, DBH staff used an underwater camera to video the fouling on the bottom of the trial FAB Dock to document the type and scale of marine fouling that had grown on the bottom over the course of the year. Screen shots from the videos are shown in **Appendix D**.

# 3.3 REMOVAL

The trial FAB Dock was removed from the slip on September 23, 2019 by the manufacturer, marking the end of the in-water dry dock trial at the Sea Scouts' slip. The device was pulled out

<sup>&</sup>lt;sup>6</sup> According to the manufacturer, the Sea Scout's trial FAB Dock was one of 52 FAB Docks built using a new, experimental material that had tested well in short term applications. Upon finding that the experimental material was not performing as well in the marine environmental over longer periods of time, FAB Dock returned to the original polyurethane alloy material. All FAB Docks produced prior to and after the experimental batch have been made with polyurethane alloy with UV inhibitors.

of the water by two men, without additional support, and without moving the boat out of the slip. They started by removing the weights from the back end of the FAB Dock, deflating the back, and pushing it down until the liner filled with enough water to slide it easily under the boat. Then they pulled it forward onto the dock. Once out of the water, the larger fouling growth (e.g. tunicates and mollusks) on the bottom of the FAB Dock was removed by hand. After removing the larger growth from each section by hand, the rest (e.g. algae) was sprayed off with a hose. Since they were disposing of this FAB Dock unit instead of reusing it (due to the damage and discontinued material), they cleaned it in sections, cutting it into easily disposable pieces as they went. The manual growth removal and hose rinse was effective, removing about 95% of the fouling. Organisms came off easily and did not leave any marks on the material. Photos of the FAB Dock removal are included in Appendix E.

Additional power washing was not performed because the device was being discarded, but power washing could effectively remove the remaining marine growth. According to the manufacturer, a dry dock in Sydney was removed from the water, pressure washed and resold at half price after being used for 4 years. Growth on the material had no impact on the material consistency or its function.

# 4 PHASE II: IN-WATER DRY DOCK EXTENDED PILOT

Based on the success of the in-water dry dock trial, DBH purchased two in-water dry docks for an extended assessment of the device's effectiveness, cost (as compared to antifouling paints and alternative hull paints and coatings), maintenance needs, and understanding of userelated issues that might arise. The devices will be used for a period of at least three years on two privately-owned boats at County-operated Anchorage 47, where they can be closely monitored by the DBH Marina Manager. There will be no charge to the private boater for using these in-water dry docks. The Department drew potential pilot participants from a 2018 list of slip tenants that had expressed an interest in trialing copper paint alternatives.

### 4.1 FIRST PURCHASE

The first extended pilot participant was selected in early 2019. The boat was a 1991 Beneteau powerboat with 28' length, 10' beam, and I/O propulsion (twin stern drives). A request for bids (RFB) for an in-water dry docking system that matched the participant's boat specifications was released February 27, 2019, and closed on March 13, 2019. The solicitation was publicly posted and sent to known in-water dry dock manufacturers (including FAB Dock and DockPro). The winning bid was received from FAB Dock for a FAB Dock Model FD25XDD at a cost of \$12,990 plus tax<sup>7</sup> (the lowest cost bid). Following the purchase, the extended pilot participant's Anchorage 47 Slip Rental Permit was amended to include terms of use for the FAB Dock. An example of the Slip Rental Permit Amendment is included as **Appendix F**.

The FAB Dock was installed on June 25, 2019 by the FAB Dock vendor. The boat owner moved their boat into the in-water dry dock on the same day and was provided training from the vendor regarding the proper use of the device.

Issues encountered during installation included:

 The boater's slip was too narrow to accommodate the extra width of the FAB Dock model needed for this boat, so it had to be installed in a wider slip next to the sea wall instead. The new slip was ideal from a visibility perspective (e.g. for monitoring); however, the boater was concerned about potential damage to his boat from increased electrolysis caused by closer proximity to the sea wall, which has a cathodic protection system. The manufacturer countered that the in-water dry docking system would protect the boat from electrolysis since it removes it from direct contact with the water. If this proves to be true, this could be an important added benefit to using an in-water dry docking system.

<sup>&</sup>lt;sup>7</sup> Offered at wholesale price.

The boat's stern drives were broken and could not be raised before inflating the rear bumper of the FAB Dock and pumping out the water. While this model was designed with pockets deep enough to accommodate the I/O motor in the down position should it be necessary, it is not intended to be used this way for long periods of time. Therefore, the boater was permitted to use the FAB Dock initially with the stern drives down, but with the stipulation that they needed to be fixed as soon as possible. The boater was instructed to not raise or lower his stern drives with the dry, inflated FAB Dock wrapped around them. The stern drives should only be moved once the rear section of the FAB Dock is deflated and the bottom has cleared both stern drives.

### 4.2 SECOND PURCHASE

A second extended pilot participant was identified in April 2019. The boater volunteered to participate in the In-Water Dry Dock Pilot with a 2006 Safe Boat Defender, 26' length, 8' beam, approximately 8,000 lbs. dry weight with a twin outboard. This is an ex-coast guard interceptor fast boat, similar to several of the boats in the County's own fleet. An RFB for an in-water dry docking system for this boat was released in August 2019, closing August 26, 2019. Only one bid was received, which was from FAB Dock for a FAB Dock Model FD 25, at a cost of \$10,735 before tax<sup>8</sup>. The FAB Dock was installed by the vendor on October 28, 2019. The boat owner moved his boat into the in-water dry dock on the same day and was provided training from the vendor regarding the proper use of the device.

<sup>&</sup>lt;sup>8</sup> Offered at wholesale price.

# 5 IN-WATER DRY DOCK DEMONSTRATION

On September 23, 2019, FAB Dock representatives came to MdR for an In-Water Dry Dock Demonstration Event. The original plan was to have the team install the second DBH purchased FAB Dock at Anchorage 47 and demonstrate the new FAB Dock to stakeholders at the event. Because of some delays in processing the necessary paperwork to purchase the second device, the second FAB Dock was not installed, and the team instead used the first FAB Dock purchased as a demonstration for the public. Attendees included: marina managers, hull cleaners, boat yards, newspaper reporters, two police officers from Redondo Beach, the County Sheriff's boat manager, and other interested stakeholders. Following the demonstration, the FAB Dock representatives removed the Sea Scouts' FAB Dock, officially ending the original trial and equipment loan (see Section 3.3). Photos from the Demonstration Event are included as **Appendix G**. Newspaper articles from the Argonaut and the Log covering the event are included in **Appendix H**.

The FAB Dock manufacturer answered stakeholder questions throughout the event. Some of the main stakeholder concerns revolved around how fouling on the FAB Dock material would impact its function. The manufacturer restated that fouling is expected and a natural part of a healthy marine ecosystem. No antifouling paint should be used on the bottom of a FAB Dock. Cleaning the growth off the bottom of the FAB Dock is not needed while in the water. The fouling will not cause the device to sink and will not puncture/damage the material. Additional stakeholder questions and responses provided by the manufacturer are summarized in **Appendix I**.

# 6 COST ANALYSIS

While in-water dry docking systems may require a higher initial capital investment when purchasing the device, there are cost savings provided over the lifespan of the product that ultimately may offset these costs. Only FAB Dock costs were available at the time of this report. A US price list for SeaPen was requested but could not be provided by the distributor at this time. Therefore, the following cost analysis discussion is based solely on the 2019 US Wholesale Price List provided by FAB Dock (see **Appendix A**), and should be used only for comparison of the cost of FAB Dock units. The upfront cost of purchasing a SeaPen is expected to be substantially higher, although a full analysis would be required to compare the full lifecycle costs of similar sized units of the two products.

The upfront cost of purchasing a FAB Dock can range from approximately \$7,000 to \$21,000 for the basic Universal Model, depending on boat size, with Custom Build models costing in the range of \$13,000 to \$55,000. Because the in-water dry dock protects the boat from fouling, antifouling paint is not required on the hull<sup>9</sup>, nor is regular hull cleaning. Cost savings from not needing to paint and clean the bottom of the boat can save the boat owner money over the lifespan of the FAB Dock. Table 1 below summarizes the potential costs associated with painting and cleaning a boat painted with either copper or non-biocide hull paint (such as Intersleek) for a 20ft, 30ft, and 40ft boat. These costs would not be incurred if the boat uses an in-water dry dock. Table 1 below also summarizes the cost to purchase a 20ft, 30ft, and 40ft Universal Model FAB Dock for comparison.

There are other potential cost savings that require additional research to better quantify. For example, an in-water dry dock may help the boat owner save money on maintenance by keeping the boat's stern drives, shafts and propellers dry. FAB Dock also keeps water out of inlet pipes, preventing sea growth and other build up in these channels. In addition, the boat may go faster without the added friction of a hull paint coating or fouling, providing better fuel efficiency. These savings combined may help the in-water dry docking system be received as more cost effective to boaters and could improve the resale value of the boat.

<sup>&</sup>lt;sup>9</sup> For fiberglass vessels without hull paint, consult with an experienced professional to determine if a protective gel coat should be applied to the hull to guard against osmosis and blistering.

Boat Length	One-Time Painting Cost <sup>1</sup>	Number of Paint Events over 10 years	Cost to Strip Old Paint <sup>2</sup>	Total Painting Cost	Cost per Hull Cleaning <sup>3</sup>	Cleaning Frequency (per year) <sup>4</sup>	Total Hull Cleaning Cost	Total 10- year Cost
Copper Pa	aint							
20	\$976	3	\$3,000	\$5,928	\$29	18	\$5,220	\$11,148
30	\$1,730	3	\$4,650	\$9,840	\$44	18	\$7,830	\$17,670
40	\$2,770	3	\$6,400	\$14,710	\$58	18	\$10,440	\$25,150
Soft Non-	Soft Non-Biocide Paint (Intersleek)							
20	\$1,290	2	\$3,000	\$8,580	\$29	12	\$3,480	\$12,060
30	\$2,290	2	\$4,650	\$13,880	\$44	12	\$5,220	\$19,100
40	\$3,660	2	\$6,400	\$20,120	\$58	12	\$6,960	\$27,080
In-Water	er Dry Docking System (FAB Dock) <sup>5</sup>							
20	\$6						\$6,990	
30	No Painting, Stripping, or Hull Cleaning Required							\$10.990
40								\$16,990

#### Table 1: Hull Painting and Cleaning Costs Avoided Over 10-year Lifespan of a FAB Dock\*

#### Notes:

1) Source: Boat Yard estimates

2) Copper paint must be stripped from the hull as it builds up (approx. once every 10 yrs.) and before applying a different type of paint. Intersleek requires the hull be stripped prior to initial application of the product and repainting.

3) Based on S & K Dive estimate of \$1.45 per foot for a power boat.

4) Typically boats in MdRH are cleaned once every two weeks in the summer and once every four weeks in the winter. Soft non-biocide paints are designed to self-clean when the boat is in motion; however, boats that remain in-slip for long periods of time may benefit from gentle manual hull cleaning to remove fouling growth. For the purposes of this comparison, monthly cleanings are included for soft non-biocide paint.

5) Wholesale base price for Universal Range Model from 2019 FAB Dock USA Pricelist.

\*Total hull protection costs over 10 year period excludes other maintenance and repair expenses. All prices exclude taxes.

# 7 NEXT STEPS

DBH plans to continue monitoring the two FAB Docks at Anchorage 47 to assess use, maintenance, and cost savings over a three-year pilot period. If additional in-water dry docking options or other copper reduction strategies become available, DBH may decide to explore those alternatives as well. It is the County's hope that through implementing pilots of these options, other marinas in MdRH might be inspired to follow similar models of offering a dry docking system as an add-on service for slip rentals.

# APPENDIX A – FAB DOCK U.S. PRICE LIST

\*The following pricelist represents wholesale pricing for dealers and distributors; however, FAB Dock has stated that they will honor wholesale pricing for <u>all Marina del Rey boat owners</u> purchasing directly through FAB Dock for the next two years.

Los Angeles County Department of Beaches and Harbors

APPENDIX A

# fab dock

# USA PRICELIST

# Universal (Outboard & Single Stern Drive)

FAB Dock Model	Boat Size (guide only)	Price \$US	
FD 19	< 21ft / 6.4m	\$6,990	This Universal Range is designed to
FD 19X	extra width	\$7,490	cater for monohull boats with single,
FD 21	21 > 24ft / 6.4 > 7.3m	\$7,490	double and triple outboards and single
FD 21X	extra width	\$8,490	and double stern drives and jet drives.
FD 23	24 > 27ft / 7.3 > 8.2m	\$8,990	
FD 23X	extra width	\$9,990	If your boat is outside of those
FD 25	27 > 30ft / 8.2 > 9.1m	\$9,490	parameters, please contact us to discuss
FD 25X	extra width	\$10,490	a custom solution for your boat.
FD 27	30 > 33ft / 9.1 > 10m	\$10,990	and the second
FD 27X	extra width	\$11,990	
FD 29	33 > 36ft / 10 > 10.9m	\$12,990	Delivery – Major Airport
FD 29X	extra width	\$13,990	Universal FAB Dock up to FD 27X - \$750
FD 32	36 > 39ft / 10.9 > 11m	\$14,990	Larger Universal from FD 29 - \$950
FD 32X	extra width	\$15,990	Installation and Training motro \$405
FD 35	39 > 42ft / 11 > 11.9m	\$16,990	Installation and Training metro - 3495
FD 35X	extra width	\$17,990	
FD 38	42 > 45ft / 11.9 > 12.8m	\$19,990	
FD 38X	extra width	\$20,990	

Stern Drives add "D" to above codes e.g. FD 19D Dual Stern Drives available from FD 23 and above. Add "DD" to above codes e.g. FD 23DD Dual Stern Drive FAB Docks add \$950

# Custom

FAB Dock Model	Air Freight Cost	Sea Freight Cost	Price \$US	Prices valid as at 1 December 2018.
8.53 metres / 28 feet	1000		\$12,990	Check with your local distributor for the most up to date prices.
9.75 metres / 32 feet	1000		\$14,990	Based on mono hull vessels.
10.79 metres / 36 feet	1500		\$17,990	Power Catamaran vessels attract an
12.19 metres / 40 feet	1500	-1-	\$20,990	additional 25% surcharge.
13.41 metres / 44 feet	2000	AN AN	\$23,990	Extra wide sailing catamarans attract an additional 50% surcharge.
14.63 metres / 48 feet	2000		\$29,990	For larger or non-uniform hulls, please
15.85 metres / 52 feet	3000		\$36,990	contact your local distributor.
17.07 metres / 56 feet	3500		\$44,990	For solid jetty applications, FAB Dock Berthing bars are required at
18.29 metres / 60 feet	4000		\$54,990	\$250 each (minimum of 2).

# www.fabdock.com

fab dock

# UNIVERSAL SIZING CHART



# **Universal Sizing Chart**

	Max Boat Measurements to Fit into FAB Dock							FAB Doo	ck Overall Measu	irements
	Model	Length @ 200 above W/L	Beam @ 200 above W/L	Draft	Side Straight	Propulsion	Swim Platform	Length	Beam	Gate Draft
F	D 19	19'	7' 7"	1' 7"	11' 9"	3′ 11″	2′ 9″	25′ 6″	9' 9"	6′ 8″
F	D 19X	19'	8' 8"	1' 7"	12' 5"	3′ 11″	2′ 9″	25' 6"	10′ 11″	6′ 8″
F	D 21	21'	7' 7"	1′ 7″	15′ 9″	3′ 11″	2′ 9″	27′ 6″	9' 9"	6' 8"
F	D 21X	21'	8' 8"	1' 7"	12′ 5″	3′ 11″	2′ 9″	27′ 6″	10' 11"	6' 8"
F	D 23	23'	8' 8"	1′7″	14' 5"	3′ 11″	2′ 9″	29' 6"	10' 11"	6' 8"
F	D 23X	23'	10' 2"	1' 11"	13′ 9″	4' 7"	3' 7"	30′ 5″	12' 7"	7′ 5″
F	D 25	25'	9'	1′ 7″	16' 5"	3′ 11″	2′ 9″	31' 6"	11' 3"	6′ 8″
F	D 25X	25′	10' 2"	1' 11"	15' 9"	4' 7"	3′ 7″	32′ 5″	12' 7"	7′ 5″
F	D 27	27'	9'	1' 7"	18′ 4″	3′ 11″	2′ 9″	33' 6"	11′ 3″	6' 8"
F	D 27X	27'	10' 2"	1' 11"	17' 8"	4' 7"	3' 7"	34' 5"	12' 7"	7′ 5″
F	D 29	29'	9'	1' 7"	20' 4"	3′ 11″	2′ 9″	<u>35′ 6″</u>	11' 3"	6' 8"
F	D 29X	29'	10' 2"	1' 11"	19' 7"	4' 7"	3' 7"	36' 5"	12' 7"	7′ 5″
F	D 32	32'	9'	1' 7"	23' 4"	3' 11"	2' 9"	38' 6"	11' 3"	6' 8"
F	D32X	32'	10' 2"	1' 11"	22' 7"	4' 7"	3' 7"	39' 4"	12' 7"	7' 4"
F	D35	35'	10' 2"	2' 3"	24' 2	4' 7"	3′ 11″	42' 10"	12' 7"	8'
F	D35X	35'	11' 10"	2' 3"	22' 7"	4' 7"	3' 11"	43'	14' 3"	8' 2"
F	D38	38'	10' 2"	2' 3"	28' 6"	4' 7"	3′ 11″	45′ 9″	12' 7"	8'
F	D38X	38'	11' 10"	2' 3"	25' 7"	4' 7"	3′ 11″	45′ 11″	14' 3"	8′ 2″

# www.fabdock.com

# APPENDIX B – FAB DOCK INSTALLATION PHOTOS

# Appendix B: FAB Dock Installation Photos

September 6, 2018



# Appendix B: FAB Dock Installation Photos

September 6, 2018



# APPENDIX C – FAB DOCK INSTALLATION MANUAL



# INFLATABLE DRY DOCKS FOR BOATS WITH OUTBOARD OR STERN DRIVE(S) FOR BOATS 16' to 32' LENGTH

# **INSTALLATION MANUAL**



# **MEASUREMENTS** (IMPORTANT)

<b>STOCK #</b>	MODEL	VESSELS	VERSION	LENGTH o/a	BEAM o/a	WEIGHT
FD19	Orange 19	16' - 22'	WIDE, O/BOARD(s)	<b>7.8 m</b>	<b>3.0 m</b>	<b>115 kg</b>
FD19X	-, D, X, XD		STERN DRIVE(s)	w 7.8 m	w 3.3 m	w 120 kg
FD21	Orange 21	18' - 24'	WIDE, O/BOARD(s)	<b>8.4 m</b>	<b>3.0 m</b>	<b>120 kg</b>
FD21X	-, D, X, XD		STERN DRIVE(s)	w 8.4 m	w 3.3 m	w 125 kg
FD23	Orange 23	20' - 26'	WIDE, O/BOARD(s)	<b>9.0 m</b>	<b>3.3 m</b>	<b>125 kg</b>
FD23X	-, D, X, XD, XDD		STERN DRIVE(s)	w 9.3 m	w 3.8 m	w 135 kg
FD25	Orange 25	22' - 28'	WIDE, O/BOARD(s)	<b>9.6 m</b>	3.4 m	<b>130 kg</b>
FD25X	-, D, DD, X, XD, XDD		STERN DRIVE(s)	w 9.9 m	w 3.8 m	w 145 kg
FD27	Orange 27	24' - 30'	WIDE, O/BOARD(s)	<b>10.2 m</b>	<b>3.4 m</b>	<b>135 kg</b>
FD27X	-, D, DD, X, XD, XDD		STERN DRIVE(s)	w 10.5 m	w 3.8 m	w 150 kg
FD29	Orange 29	26' - 32'	WIDE, O/BOARD(s)	<b>10.8 m</b>	<b>3.4 m</b>	<b>145 kg</b>
FD29X	-, D, DD, X, XD, XDD		STERN DRIVE(s)	w 11.1 m	w 3.8 m	w 160 kg

NOTE: If this is a stern-drive (stern leg) model, your FABDock will have a floor pocket with weight and sleeve for each drive. For total weight (of 2 packets) add 7 kg per stern drive pocket. Outboard models do not have pockets.

VESSEL LENGTHS FROM TRANSOM (DRIVE-MOUNT) TO BOW ACCOMODATED BY MODEL DATUM: measured at 200mm (8") above water line				
	BOAT LENGTH at WL	BOAT BEAM at WL		
FAB Dock 19	5.8m (19' 0")	2.30m (7' 7") w. 2.65m (8' 8")		
FAB Dock 21	6.4m (21'0")	2.30m(7' 7") w. 2.65m(8' 8")		
FAB Dock 23	7.0m (23' 0")	2.65m (8' 8") w. 3.10m (10' 2")		
FAB Dock 25	7.6m (25' 0")	2.75m (9' 0") w. 3.10m (10' 2")		
FAB Dock 27	8.2m (27' 0")	2.75m (9' 0") w. 3.10m (10' 2")		
FAB Dock 29	8.8m (29' 0")	2.75m (9' 0") w. 3.10m (10' 2")		

**Note**: Boat manufacturer's lengths are measured over-all including swim platforms and bow overhangs. The fundamental sizing of a FAB-Dock relates to the boat length from *transom* to bow, and the beam, *each measured just off the water* (200mm or 8"). It can happen that a boat rated at 24' easily fits into a Orange 21.

INCEPT MARINE LIMITED 126 Hautapu Street, Taihape 4720, (Postal) PO Box 26, Taihape 4742, New Zealand Phone: +64 (0)6 388 0729 Fax: +64 (0)6 388 0747 www.incept.co.nz

INCEP

FAB Dock

# Orange - inflatable dry dock

Model No's FD19\*\* to FD29\*\*\*

# Supplied with

- 12v Dual Bilge Pump 4000 gph system
- Pump Controller
- Genovo battery-powered inflator 12v 500L/m dual pressure
- Bravo 1 manual foot bellows pump for installation
- Repair kit

# Specification:

- Length
- See chart
- Beam See chart
- Dock tube 31cm diameter
- Gate swing 2.0 m
- Material:
  - o Tube Polyurethane alloy, 950 gsm, polyester reinforced
  - Floor PU alloy, 950 and 1400 gsm, p/ester reinforced
- Dock weight (dry) See chart
- Colour Blue



# INSTALLATION

# 1. Handling Out of the Box

The FAB Dock inflatable dry-dock materials are extremely robust when lubricated by water. <u>However</u>

- **Never** drag any inflatable when bundled. Dragging results in holes. The bundled dock may be lifted or rolled only, and carefully.
- Be careful in dragging draped material across sharp objects or snags e.g bollards or weathered jetties during deployment or recovery.
- Never haul a rope across the dock at any time, neither inflated nor bundled (results in friction burns).
- *Always* keep valves closed and caps fitted when not actively inflating or deflating.

# 2. Description

This FAB Dock inflatable dry docks are designed to fit a range of boats from length 16' to 32' but fit depends on actual waterline size of the boat.

The FABdock has three inflatable air chambers forming a large ring tube. There is a bulkhead at the bow, and two bulkheads in the orange panels forming a hinge for the drop-down gate.

The gate is fitted with a perimeter weight beam made up of PVC pressure pipes which run through containing sleeves on the gate sponson (= the inflatable tube). When the dock is installed, four steel weights are enclosed in the perimeter pipe and then sealed with entrapped water.

When the gate is deflated, the weights pull it down to open the dock and flood it, and a vessel can then enter or exit.

When the gate is re-inflated it rises against the weights and the vessel is enclosed. A 12V electrical connection is made from the client boat to the dock bilge pumps and the dock is pumped dry and kept dry.

# 3. Preparation for Installation

# Site

For the purposes of this manual it is assumed that the FAB Dock will be installed at a marina berth alongside a floating concrete jetty wing pontoon which is about 0.5 m above water level. If your situation is different please modify the procedure accordingly, but DO observe the handling precautions so your dock is not holed before it gets in the water.

The FAB Dock takes a good couple of hours to install so choose a time which presents a minimum of inconvenience to other marina users.

# **Gate considerations**

This FABdock requires a water depth of 2.0m to fully open the gate.

Tidal currents greater than 1/4 knot will affect the opening and closing of the gate.

# 3.1. Supplied

- A main dock package delivered in a cardboard box
- 5 sections of plastic weight pipe
- 4 steel weights
- 1 12v dual Johnson bilge pump unit
- 1 12v electrical controller kit
- 1 Genovo-80D 12v inflator
- 1 Bravo-1 foot bellows inflator
- Repair kit
- User Manual

# 3.2. Inflatable Tube Arrangement

The main forward tube is permanently inflated and is divided by a bulkhead into two separate air chambers so there will always be buoyancy in the event of a puncture. The two valves for these are situated in the main tubes near the orange hinge panels.

After initial installation, the forward air-chambers will be checked and the pressure self-maintained every time the gate is raised.

# 3.3. Operation of 12v Inflator

Used to inflate the dock at installation, and to operate the dock gate on an as-required daily basis, the Genovo 80D inflator has two motors which operate automatically depending on back pressure.



- On initial inflation, the Genovo primary motor runs a turbo blower up to 3 kPa (0.5 psi) and 500 L/min. This enables fast inflation for the initial filling of the targeted air chamber.
  - When 3 kPa pressure is reached, the first motor shuts down
- When 3 kPa pressure is reached, the first motor shuts down and the second motor cuts in, driving a 2-piston positive displacement pump. Note the change of tone.
- The cut-out pressure for the inflator is user-selectable and should be **preset to 24 kPa** on the digital face panel. The preset is retained even when powered off.
- The inflator is fitted with miniature ball bearings and thermal overload protection and is robust and reliable. It should be good for at least 15 minutes on a hot day. However if the pump does stop working because of overheating, allow to cool and then re-start.

# 3.4. Valves

To lock the valves open for deflation, press the internal stem down with a fingertip and twist 1/4 turn clockwise.

To close the valves for inflation, *press stem down, twist 1/4 turn anti-clockwise, and release*.

*Always* keep valves closed and caps fitted when not actively inflating or deflating.

# 4. Installation

# 4.1. Out-Of-The-Box

- Park your boat away to vacate the berth.
- Remove your FABdock from its box (actually, lift the box off the FABdock). Port is marked on the box so it can be oriented on the jetty before unpacking. *Caution: take care in handling.*
- Roll the FABdock out along the jetty with the orange gate hinge panels in line with the berth.

#### • Initial inflation

Since the on-board boat electrics are not yet available, use the included foot bellows pump for the initial installation. Connect the hose to the pump **outlet** port which is the LH side with your foot on the pump - the rubber flap of that port is uppermost.



The Bravo-1 foot pump is good and robust. When the dock is installed, it can be kept on board your boat as a backup.

Check the three inflation valves are **closed** (yellow poppet stem is up). See section 3.4

Attach the foot pump to the forward valve (nearest the nose) in each orange panel in turn and *half* inflate the two forward air chambers.



- Launch the forward section of the FABdock into the marina berth taking care to lift rather than drag the dock in the process and especially over hooks or rough edges. Leave the orange panels (and gate) up on the jetty.
- Fully inflate the two forward air chambers which are now on the water. Keep the gate section up on the jetty for fitting of the weight pipe and the bilge pumps.

Note the dock at this stage is oriented in reverse.

# 4.2. Weight Pipes

There are 6 or 7 weight pipes which are assembled in sequence. **Four of the pipes** will contain each a 4kg steel weight with hose spacers to keep them temporarily in position. These are installed into the sleeves fitted on the outside perimeter of the gate. The pipe is then filled with fresh water and sealed. In operation, the gate is deflated and the weights drag it down.

If your boat has a stern drive unit there will additionally be a small weight pipe which belongs in the corresponding FABDock floor pocket.

• Thread Tape. Before screwing the corner connections together, pre-wrap the threads with 8 layers of ptfe thread tape (supplied). If you wrap tightly in a clockwise direction

the tape won't unravel when screwing the joints together.







- **Semi-inflate** the gate. A small amount of inflation will aid in giving shape and support while fitting the weight pipes. Too much inflation will make the last pipe difficult.
- Insert **pipe #1** into the <u>starboard</u> gate sleeve, plugged end first.
- Remove the black shipping plug from pipe #2, fold back the cover flap and feed pipe through the second sleeve. Align the pipes carefully so the threads of the joint engage and gently screw together 1 2 turns. If the threads bind, back up and re-align.
- Once the threads are properly engaged, support the weight of the joint and screw it almost fully home from the remote end. The sleeve may grab during rotation of the pipe supporting the weight and lifting upwards during rotation will help release it. Such grabbing is worst when the day is hot. Pre-spraying with plenty of water/ detergent solution will help. If you need a tool for tightening, use a large pair of slip-joint pliers.









- Repeat for all the pipes in sequence. **Pipe #6 (or #7)** will be pushed up hard into the **port** sleeve, plugged end first.
- **Corner covers.** Once all the weights and pipes are fitted, pull the covers over the joints and snap the black *Durable* fasteners together.



• Stern-Drive Pocket Option. Remove the large plug from the small remaining weight pipe containing steel chain and fill it with fresh water.

Wrap the plug with seal-tape before replacing it. It does not need to be wound down hard.

Insert the weight pipe into the leg pocket sleeve and secure it in place with a cable tie, pulled up snug and trimmed.

Flood the main weight pipes with fresh water. To be assured that all air is displaced from the perimeter weight pipe there needs to be a steady incline from the end remaining plugged up to the filling point. Place a 150mm block (or box or whatever) under the second port joint and a 300mm block under the third joint. Remove the small plug from the starboard cap and holding it 500mm off the deck, fill it with fresh water until all air bubbles cease. Wrap the small plug with 6 layers of seal tape and screw it back in place. This plug needs to be screwed in not much more than hand-tight to get a seal.



# 4.3. Bilge Pumps Enclosure

• Draw the dock up onto the jetty so the gate and the bilge pump housing base are supported (there is a black reinforced area under the box with 4 webbing cleats holding it).

LIFT (avoid dragging)

- Cable clamp gland Unscrew the gland back-nut and press the cable into the keyhole slot. Fit the clamp into position and tighten up the back nut firmly.
- Tuck the cabling neatly into the pump box behind and around the pumps.
- the ind
- Fit the hose clamps loosely onto the pump outlets.
- Pressing hard down on the top of the pump to support it against the load, push the hoses onto the pump spigots. Use a little dish detergent smeared around the inside of the hose end to lubricate it in the process.
- Using a screwdriver, tighten the hose clamps onto the ends of the hoses.



• Screw down the box lid.

Note the plastic screws fit through keyed keeper slots in the lid and you will need to hold the lid up slightly to get the screws started.

**Do not overtighten** the box screws (they jam).



• Inflate the gate sponson (semi firm) and tie off the two bilge hoses through the webbing hose loops on the rear corner of the gate. Make sure the ends of the hoses do not touch the water. They should extend down just past the weight sleeves. Use the black plastic snap clamps provided and pass around both hose and webbing. Snap together with slip-joint pliers.

FAB Dock

# 4.4. Launching your FAB Dock

Caution: The <u>pump enclosure</u> is hard and heavy. To prevent cutting the FABDock bottom underneath the enclosure, do not allow it to drag across the jetty while launching.

 Lift the pump box over the edge of the jetty and into the water.



• Lift the rear section (the gate) with its weight pipes and launch the dock fully into the water.

While the gate pressure needs only be firm enough to give shape for getting the dock into the water and into position in the berth, it will subsequently need be firm enough to support someone moving around inside the dock to expel under-floor air. See section below. It does not necessarily need to be run fully up to service pressure at this stage. That can wait until your boat is in it's FAB Dock and the electrics are installed so you can use the electric inflator.

- At this stage the dock has no water in it and is easy to maneuver.
  - Secure a couple of lines to the FAB Dock rope beckets, push it out into the boat lane



and turn it round so it can be brought back into the berth oriented **bow first.** Watch for wind effects when you are doing this.

 Position the dock in the berth and tie off temporarily with the supplied lashings.

> These will need adjustment fore and aft when you bring the boat in, depending on the bow over-reach of your boat and the causeway clearances required.



**Rope:** There is a length of 3/8" (10mm) mooring line supplied and a roll of electrical tape. If you bind the rope with the tape before you cut it, on both sides of the cut, it will not fray or unravel. There will not necessarily be sufficient rope depending on your judgement.



Entrained Air

Now that your FAB Dock is floating in the water and tied up roughly in position, it is time to drop the rear gate and drive your boat into its new home. As you can imagine, the FAB Dock acts like a giant parachute as you lift it up and then drop it into the water.

To be able to drive your boat in to the FAB Dock, all this air trapped under the floor must be expelled. For this purpose you will need a long handled broom - ideally a swimming pool broom with an extendable handle.

If it is a nice day you can walk bare-foot or roll around inside the FAB Dock, pushing all the air out as you go. But be aware -

- > Your legs can be encased in the loose floor membrane
- There should be enough air pressure in the sponsons to hold the floor tight
- Be sure there is someone nearby who can assist if needed.

Pay particular attention to the deep propeller pocket(s) if your model FAB Dock has one. These have a habit of popping up like a balloon and it is necessary that water be got into these when you first lower the gate so they will stay down. This can be done by using the broom to push the (deflated) gate tube under water long enough to get water into those pockets.

This task is a perfect opportunity for any kids who have been wanting to help!

Lifting the inflated tube just off the water at bow or at the gate hinge will allow air trapped under the floor in that area to escape.

#### • Opening the Gate

Once you think that you have most of the air out from under your FAB Dock, it is time to release the rear sponson air valve. This is the one on the end of the air hose in the foam casing. Remove the cap, push down on the yellow spring loaded poppet and twist it clockwise to lock open.

The first time a FAB Dock gate drops it takes a very long time as there is still residual air under the floor and in the sleeves. You can give it a helping hand. Once the water gets over the top of the rear tube it will start to sink quickly. Use your broom to help push any remaining air out from under the floor. It is easiest to push that air forward and when you see the air bubble at the front, lift up the front of the FAB Dock briefly to let that last bit of air out.

#### • Entering the Dock

You are now ready to drive your boat in. At this point, your FAB Dock is still not tied properly, or in its correct position, so take it very quietly on first entry.

Once you have berthed your boat in the FAB Dock, straighten your stern drives (legs) or outboards and raise them up. You are then

ready to raise the rear gate on your FAB Dock and enclose your boat.

- Secure independent mooring lines to the contained boat.
- **Tie your boat** lightly in the position that you wish your boat remain relative to the jetty.
- Secure your FAB Dock into optimum position around your boat using the mooring ropes to your berth. Tie off to as many of the blue webbing beckets forward of the orange panel as you have bollards for. The dock needs to be secured so that it can not move either forward or backwards.
- Fit and adjust the Bow Catcher (see next section). Once this is done, you know that your boat will always stop in the exact same spot every time, barring some catastrophic berthing mishap.
- Close, cap and clip the valve in place when the gate is down and before walking away. Water inside the air chambers can be a disaster.
- Read the owner's "Operating Manual".

# 4.5. Bow Catcher

The Bow-Catcher is there to position your boat so that the **transom** (or more accurately **the drive unit mounting** - usually the same point - is in line with the <u>rear / aft edge</u> of the orange hinge panel of the gate.

It is important the transom is not located ahead of / beyond the  $\underline{\textit{rear}}$  of the orange panel so

- the bilge pump box remains functionally in its optimum position and
- to prevent possible damage caused by the pump box catching behind the transom.

If your boat is a good fit in the dock then the bow catcher will not be needed. That applies if there is not more than 300 mm (12") clearance ahead of the boat bow to the forward tube of the FAB Dock when the transom is level with the rear of the orange panels.



The hooped part of the Bow-Catcher is designed to prevent it from sliding beneath the boat by hooking the usual winching eye mounted in the bow on trailered boats.

- Park the boat and tie it off in the FAB Dock in the correct position (first paragraph above).
- Choose the D-ring fixings which are 900 1200 mm aft of the bow catching point at water level.

- Follow the buckle fixing shown in the photos and adjust so the two side legs are taut.
- There are marker threads sewn into the webbing on the side legs to help you get the hoop centred.
- Attach the forward leg of the Bow-Catcher harness to the D-ring on the front of the FAB Dock . Adjust up tight so the stretch is taken up on the elasticized section.



# 4.6. Bilge Pump Controller

FAB Dock 's Bilge Pump Controller is a proprietary development solving the inevitable failures of immersed switch gear. It is an intelligent device which works by testing the load condition of the pumps when they are operating and switches them off when they have gained air, and it lives on board your boat usually in the engine compartment. It is not warranted as waterproof and must be protected from full weather exposure.

The wiring loom is directly connected to the boat battery (if there is more than one battery choose the one which drives the on-board accessories) and runs to a sheltered location in the cabin adjacent to the drydock connection point.



- Panel Outlet
  - Choose a discrete location in your cabin for the FABDock connection outlet. This will ideally be a wall with a cavity leading down to the engine (or battery) compartment. In an

open boat without cabin, find a situation which protects the wiring behind the outlet socket.

- Using the 30mm hole-saw provided drill a hole for the LLT panel connector.
- Pass the blue intermediate connector (the one without a cap) down through the hole from above and connect it to it's matching connector on the controller.
- Using the LLT pre-wired panel connector as a template, drill the two fixing-screw holes using the 3.2mm drill bit provided. The holes should be vertically above and below the 30mm hole already drilled.



- Fit the panel connector back into its hole and secure with the two stainless screws.
- Engine Compartment
  - Run the cable back to the battery on a tidy line and fasten the 2 terminals directly to the battery. Generally this will mean doubling up with the boat battery terminals already fitted.
    - The **Black terminal** connects to the Negative (-) side of the battery.
    - The **Red terminal** connects to the Positive (+) side of the battery.

CAUTION. Reverse connection of the controller to battery will result in instantaneous damage to the controller which is remedied only by replacement.

- Arrange so that the cover of the controller is visible.
- Retain the cable neatly with cable ties and trim the tails.
- Excess cable should be coiled neatly in an out-of-the way position (e.g the cabin wall cavity).
- **Power\_On** occurs when the battery cable is connected and is followed by the controller *fabdock* screen, then 3 flashes of a **blue** LED indicating successful **boot** (or reset).



#### **CONTROLLER FUNCTIONS:**

- Pumps are monitored and run in separate channels. Green lights indicate pumps running.
- Pumps run momentarily every 2 hours to check if water is present. JP1 selector can change the testing period to every 6 hours ("6").
- If there has been wave wash or a rain shower the pumps will run as needed. If one pump stops the other will continue until all water is gone.
- Each time the dock cable is unplugged the controller resets (reboots). When the cable is re-connected the controller runs an initialisation to find which pumps are present. Depending on internal configuration, the controller can monitor up to 4 pumps and can run a lesser number of pumps on any combination of the 4 channels. At the end of the initialisation the blue Function LED flashes 3x.

#### • Signal Indications (<u>Red LED</u>):

Flash once every 5 seconds	Battery has dropped below 12.3V (if pumps are off) or 11.8V (if pumps are on). Requires voltage to increase (recharge) to 12.6V before pumps will restart, and then only after present pump time sequence has
Flashes 6x every 5 seconds	elapsed (5 min, 15 min, or 2 hrs). Battery system is 24V. Will not run.

#### • Signal Indications (<u>Blue LED</u>):

Flashes 1 - 7x after pumps	Indicates pump sequence. When cables are
stop, and does not repeat	first connected, pumps run again after:
	1 5 minutes
	2 5 minutes
	3 5 minutes
	4 15 minutes
	5 15 minutes
	6 15 minutes
	7 2 hours
Flashes 1x every 5 seconds	Pump 1 has over-current fault
Flashes 2x every 5 seconds	Pump 2 has over-current fault
Flashes 3x every 5 seconds	Both pumps have over-current fault. This
	may signal reversed polarity in the cable
	connectors.

# 5. Operating Your FAB Dock

See FAB Dock **Operating Manual**.

# 6. Reminders

- 6.1. **Never** drag any inflatable when deflated and bundled. Dragging results in holes on material creases and hard spots. The bundled dock may be lifted or rolled only, and carefully.
- 6.2. **Never** allow open valves to drop below water level.
- 6.3. *Always close and cap valves* when not actively inflating or deflating.

# 7. Repairs

(The detailed version.)

#### 7.1. TOOLS AND MATERIALS

Check that the following tools and materials are ready before starting the repair:

• Glue



- Glue brush
- Material / patches
- Roller or something similar which can be used to apply pressure to the patch
- Solvent, MEK (Methyl Ethyl Ketone)
- Rags

•

- Pen or pencil
  - Measure



• Heat gun or hair dryer

Scissors

#### 7.2. DOCK REPAIR PROCEDURE

Follow these steps carefully to get a permanent and professional repair.

- Cut patches allowing 30mm all round bigger than the hole in the dock. A tube tear longer than 100mm will need two patches, one inside and one outside of the tube.
- If you need to mix glue (parts A and B) use 5% activator and thoroughly mix enough for the repair in a small cup. See note below.
- Using MEK solvent, wipe clean the surfaces of both the dock and the patch(es) which are to be glued.

#### 7.2.1. Inside Patches in Tube (see hints)

- Mark a line along the centre of the patch to match the length of the hole in the dock. Use this line to position the patch inside the tube.
- Spread glue on to the dock and on to the patch. Allow the glue to dry 10 15 minutes.
- Place patch through the hole in dock, position on a flat surface to the marked line, heat and roll down hard using plenty of pressure.
- Allow to cool, inflate tube and check for leaks with a little soapy water. Do not inflate hard at this time while the glue is uncured. Release the air from the tube immediately.

#### 7.2.2. Outside Patches

- Mark the outline of the patch on to the dock by drawing around it with a pen.
- Spread glue on to the dock and on to the patch. Allow the glue to dry 10 15 minutes.
- Lay patch on dock, heat and roll using plenty of pressure. If needed, use the end of a blunt screwdriver to work down edges, bumps and creases.
- Let the glue cure until the next day before putting full air pressure in dock.

#### 7.3. HINTS

- **IMPORTANT**: Dock tube materials typically wick air along the reinforcing base-cloth between the inside and outside coatings. The heavier the material, the greater the wicking leakage. If a puncture is patched only on the outside then air from the air-chamber will leak away through the exposed cut edges of the puncture and the base-cloth.
- Incept strongly recommends that heavier materials be patched internally.
- Corners of patches should be rounded to minimize lifting or catching on things, and for professional appearance.

- It helps when laying out the patch to put index marks on both the patch and the dock.
- Wipe the surfaces thoroughly with MEK. To do this, make sure that the rag you are using is well dampened with solvent, but not dripping.
- Allow 15 30 minutes for the glue to dry, although it may be more in cold or damp conditions and less in hot and dry conditions. Glue is dry when the glued surface is dry and warm to the touch and not tacky. More time of drying is better.
- Put patch on dock and gently heat using a hot air gun. Heat activates the glue, providing an instant and permanent bond. Apply roller pressure to work down the patch while it is still warm. The need for heat will depend on the climate and the type of glue being used. Glue supplied by Incept is a special formulation which requires less heat to activate.

#### 7.4. BEFORE STARTING REPAIRS

There are several basic points to observe before starting any repair job:

- Do not use old, expired glue or damaged glue. Old or once frozen adhesive will only fail once it is put under any great stress.
- Do not attempt to glue under cold or wet conditions.
- Best conditions are indoors, warm and dry , minimum 65°F / 18°C. Everything needs to be dry. Water or moisture inside the dock tube will cause problems!
- Large tears or holes need to have a patch on the inside as well as the outside. The inside patch should be airtight before the outside patch goes on.
- Have all your tools and materials ready before starting the job.

- Dock repair glues are Contact Adhesives. These require application to both surfaces, need time to dry before assembly, and need warmth and pressure when the pieces are put together.
- Dock adhesives come in two parts Base Adhesive (A) and Activator (B). Part (A) can work well on its own, but if the repair will get hot in the sun, Part (B) is essential. Part (B) has a short shelf life and must be kept cold and dry.

For more information go to http://www.incept.co.nz/content/repairs.



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FAB Dock 28

# APPENDIX D – FAB DOCK UNDERWATER PHOTOS

# Appendix D: FAB Dock Underwater Photos













# APPENDIX E – FAB DOCK REMOVAL PHOTOS

# Appendix E: FAB Dock Removal Photos

# September 23, 2019













# Appendix E: FAB Dock Removal Photos





# APPENDIX F – EXAMPLE SLIP RENTAL PERMIT AMENDMENT

#### LOS ANGELES COUNTY DEPARTMENT OF BEACHES AND HARBORS

13837 Fiji Way, Marina del Rey, California 90292



#### ANCHORAGE 47 AGREEMENT NO. XXXXX ("Permit") SLIP RENTAL PERMIT AMENDMENT

Effective Date:

Expiration Date:

**BEACH/FACILITY ("Premises")**: Designated Slip #XXXX, Anchorage 47, Marina del Rey

### PERMITTEE:

CONTACT: XXXXXXXXXXXXXXX Phone: Email:

PURPOSE OF PERMIT ("Purpose of Permit"): Mooring of vessels in designated boat slips; use of inwater dry docking system

APPLICATION DATE: \_\_\_\_\_ PROCESSING FEE: \$\_\_\_\_(waive) ISSUE DATE: \_\_\_\_\_ COUNTY OF LOS ANGELES ("County"), DEPARTMENT OF BEACHES AND HARBORS ("Department")

### **RECITALS:**

WHEREAS in an effort to improve water quality in Marina del Rey harbor, the Department installed an inwater dry docking system ("FAB Dock"), manufactured by FAB Dock, Inc., on the Premises;

WHEREAS Permittee agrees to use the FAB Dock for the purpose of dry-docking a <boat type/size> boat;

WHEREAS the Parties agree to modify the Purpose of Permit to include: use of the FAB Dock; and

WHEREAS except as herein specifically amended, all terms, conditions and provisions of the Permit and any amendment thereof shall be and constitute to remain in full force and effect and are unmodified, and each of the parties hereto reaffirms and acknowledges its respective obligations under the Permit as amended hereby.

NOW THEREFORE, for good and valuable consideration of the conditions set forth herein, the Parties agree as follows:

### **CONDITIONS:**

- Operation and Maintenance of FAB Dock. The Permittee shall be responsible for operation and maintenance of the device, according to manufacturer's instructions. The Permittee's vessel shall be dry-docked in the device at all times while the boat is moored in the designated slip. Permittee shall not remove the FAB Dock from the slip, nor shall Permittee utilize the device for any other boat without prior written consent of the Department.
- 2. Installation, Termination of Use, and Removal of FAB Dock. The Department shall be solely responsible for installation and removal of the FAB Dock, including the costs thereof. Either Permittee or the Department may terminate the use of the FAB Dock at any time by giving the other party a THIRTY (30) calendar days' written notice of termination. The Department shall remove the FAB Dock

Permittee's Initials:

#### ANCHORAGE 47 AGREEMENT NO. B20364, Amendment No. 1

within THIRTY (30) calendar days of notice of termination, and Permittee may continue to utilize the FAB Dock until such time as the device is removed from the slip.

- 3. Permittee's Waiver and Release, Indemnification and General Insurance for Use of FAB Dock. Permittee expressly warrants all of Permittee's waiver and release, indemnification and general insurance, as stated under Permit Agreement Rules and Regulations No. 7 - Risk of Loss, License Not Contract, 8 - Release of County, No. 9 - CCC Section 1542, and No. 10 - Insurance, include and extend to its use of the FAB Dock.
- 4. Right to Inspection. The Department shall have the right to inspect the FAB Dock at any reasonable time after giving Permittee twenty four (24) hours' prior notice (oral or written to the email or phone number listed above) of its intentions to inspect the equipment.
- 5. Damages. Permittee shall notify the Marina Manager as soon as Permittee is aware of any damages or equipment malfunctions. Permittee shall be held financially responsible for any damages resulting from its own willful misconduct or negligence and for any acts of willful misconduct or negligence of any third party whose presence in the operating area of the equipment is attributable to the Permittee.

### ACCEPTANCE

IN WITNESS WHEREOF, the parties hereto have executed this Amendment the day and year first above written and agree that it shall be incorporated into and made a part of the Slip Rental Permit Agreement signed by Permittee on , 20 .

The undersigned Permittee acknowledges that it has read, understands and agrees to all the terms, conditions, and restrictions contained in this Permit Amendment.

PERMITTEE:

Signature:

\_\_\_\_\_

Name in Print: \_\_\_\_\_

Title:

Date: \_\_\_\_\_

COUNTY OF LOS ANGELES Department of Beaches and Harbors Anchorage 47 GARY JONES, DIRECTOR

By: \_\_\_\_\_ Property Agent



### ANCHORAGE 47 AGREEMENT NO. B20364, Amendment No. 1

# **General FAB Dock Operation and Maintenance Instructions**

### **ENTERING THE FAB DOCK**

1. Drive into the FAB Dock **in a slow and controlled manner**. Too much forward thrust may result in the floor being drawn into your prop(s) or excess forward hydraulic force applied to the dock. Prevention of damage is your responsibility.

2. **Connect the FAB Dock inflator to the gate hose**, ensuring it is set to 25 kPa, and raise the gate. The inflation valve yellow poppet should be out (in the closed position). The inflator will change tone as it moves into second phase. It will turn off automatically when it reaches the preset pressure.

3. **Pack the inflator away** in a dry part of your boat.

4. **Connect the 12V electrical lead** between the water pump connector on the FAB Dock and the 12V outlet in your boat.

### **ROUTINE MAINTENANCE**

1. Wash the FAB Dock tubes as you wash your boat.

2. Check the pressure in the front two air chambers and top up if required. There is a oneway feed between the gate and the forward chambers so in practice you should never need to do this.

### **EXITING THE FAB DOCK**

1. **DISCONNECT** the electrical lead from the FAB Dock. Towing it to sea is not a feature we intended. Cap to seal the plug attached to the dock.

2. **Coil up** the lead and store in a dry part of your boat.

3. **Open the valve** on the end of the air hose to lower the gate. Make sure the valve is not dropped in the water while it is left open.

4. When the gate has lowered, and the dock flooded, **check that the FAB Dock floor is clear** of all propellers, transducers, trim tabs and other attachments to your boat.

5. **Close the valve** on the end of the gate air hose and park the hose in the hose clips on the FAB Dock tube.

6. Reverse out of the FAB Dock in a slow and controlled manner.

7. **Enjoy** a great day on the water.

# REMINDERS

1. **Never** drag any inflatable when deflated and bundled. Dragging results in holes on material creases and hard spots. The bundled dock may be lifted or rolled only, and carefully.

2. **Never** allow open valves to drop below water level.

3. *Always close and cap valves* when not actively inflating or deflating.



# APPENDIX G – FAB DOCK DEMONSTRATION EVENT PHOTOS

# Appendix G: FAB Dock Demonstration Event

September 23, 2019













# Appendix G: FAB Dock Demonstration Event

September 23, 2019













# APPENDIX H – NEWSPAPER ARTICLES COVERING DEMONSTRATION EVENT

Los Angeles County Department of Beaches and Harbors

APPENDIX H

#### thelog.com

# Marina del Rey continues efforts to find solutions to reducing copper levels in water

The FAB Dock dry docking system is one of the latest technologies county officials are testing to reduce copper leaching in the harbor.

**By Lindsey Welling** 

MARINA DEL REY—The Los Angeles County Department of Beaches and Harbors is testing out two FAB Docks, an in-water dry docking system, as part of an effort to reduce copper leaching from antifouling paints on the bottom of boats.

On Sept. 23, Dean Howard, the founder of the Australia-based FAB Dock and DBH hosted a demonstration for the boating community at Marina del Rey Harbor to show how the FAB Dock works. It consists of a polyurethane bottom lining and inflatable bumper. The bumper deflates in the rear to allow the boat to drive in and out, a process Howard said takes about three to four minutes. Unlike a typical 'wet' slip liner, it uses pumps to remove the water from between the boat and liner to keep the hull dry when docked.

"This thing is designed to sit in the water and have zero maintenance," Howard said.

Some raised concerns about needing to clean the underside of the FAB Dock or the possibility that it would get so heavy with growth it would sink, adding to the plastic in our waters. Howard said stuff does eventually grow on it but it does not damage it.

"The growth doesn't hurt it, it doesn't affect it," Howard said.

Part of the department's research into the FAB Dock will include looking at the growth on the bottom of a FAB Dock used by the Sea Scouts for about the past year. That FAB Dock was used in a pilot study, which started in September 2018. It was used by the Sea Scouts on a 21-foot motor boat and a second boat of similar size. According to DBH, the FAB Dock was very effective at keeping the boat hull clean. DBH Planner Jennifer Mongolo said they did not have to clean the bottom of the boat once during the pilot period.

DBH has now bought two FAB Docks and is working with two boaters in Anchorage 47 to further test how they work long-term. Mongolo said DBH is looking at this as a possible copper reduction strategy.

"There's no one size fits all solution for all the boats in the harbor but this might work for some boats," Mongolo said.

Copper levels currently found in the Marina del Rey Harbor water column exceed the 3.1 micrograms per liter regulatory limit set by the California Toxics Rule in 2000. Some of that has been blamed on antifouling paint from boats.

County officials have been trying to address copper pollution and Total Maximum Daily Loads (TMDLs) at Marina del Rey since 2014. The Regional Water Board issued a mandate that Marina del Rey reduce copper levels within local waters by 85 percent by March 2024.

However, Mongolo said since the TMDLs regulations became effective, there has not been a significant reduction in dissolved copper and "additional efforts will need to be employed to meet compliance deadlines." She



This Fab Dock is being tested out at a slip at Anchorage 47 in Marina del Rey Harbor as part of research into solutions to reducing copper levels in the water.

said the county monitors copper levels in the harbor on a monthly basis.

"My thought is we've done a lot of investigation, we've done a lot of testing of products," Mongolo said. "There has not been a wide scale conversion by boat owners to non copper paint."

Boat Yard Marina del Rey President Greg Schem said they are working closely with the county to find an alternative to antifouling paints with toxic metal biocides.

"I think we've taken 40 or 50 boats so far and put on a paint, tried it out and evaluated it," Schem said.

He said so far, they have not found one that works very well but said paints with lower copper levels could be a happy medium. He said he is skeptical of the FAB Dock, saying he is not a proponent of putting more plastics into the water. However, he commended the county for their innovation.

"It's good to try and the county's been great about trying new technologies," Schem said.

He added he thinks the best solution involves the Regional Water Board identifying the correct threshold limit for copper levels in Marina del Rey and switching to lower copper level paints with lower leach rates.

Mongolo said she expects to see lower copper rates in Marina del Rey in the next five years, thanks in part to a 2018 regulation. The regulation prohibits copper-based antifouling paints and coatings with a pre-established leach rate and prevents paint manufacturers from selling noncompliant paints to dealers of retailers.

# NEWS

# Inflatable Dock Could Lift Efforts to Reduce Copper Pollution in Marina del Rey

#### **By Gary Walker**

Environmental advocates and Los Angeles County officials are still exploring ways to keep copper particles that leach from painted boat hulls out of the waters of Marina del Rey, five years after a study by the Los Angeles Regional Water Quality Control Board detected some of the state's highest levels of toxic copper pollution here. Some alternative copper-free paints proved to be costly and controversial; now they're looking at inflatable docks to keep painted hulls out of contact with the water, which would also reduce the need for scrubbing hulls.

In late September, about 20 local boat owners in Marina del Rey attended a demonstration of the FAB Dock — an in-water docking system with an inflatable rubber bed that keeps a boat's hull out of the water while still secure in its slip.

Dean Howard, the device's Australiabased inventor and manufacturer, joined the L.A. County Department of Beaches and Harbors at Anchorage 47 to show how the rear of the device deflates to allow a boat to embark from its slip and re-inflates once the vessel returns.

Once again, however, cost may be a concern. For a 28-foot watercraft, installing a FAB Dock would cost about \$9,000, according to Howard, and for a custom sailboat perhaps twice that amount.

Michael Quill, marine programs director for the local water quality watchdog group Los Angeles Water-Keeper, expressed concerns about the

---- ID



The inflatable FAB Dock keeps copper-painted boat hulls out of the water, but water quality experts worry about its novelty and cost

Oct. 17 2019

FAB Dock's price point and maintenance.

"My understanding is that we'd have to pay for additional slip length if we were to use such a device. The system I was introduced to added two to three feet to slip space needed to moor each boat, which would add to monthly slip rental fees," noted Quill, whose organization maintains a powerboat in Marina del Rey. Jennifer Mongolo, a planner with the Department of Beaches and Harbors, said vessels moored in Marina del Rey are typically limited in how far their sterns

The Amagnant

can extend beyond the slip. If a FAB Dock exceeds that limit, the boat's owner would have to apply for a permit amendment or move to a longer slip.

"I think boat owners need to plan for the FAB Dock to extend about three feet past the end of their boat, but this should always be confirmed with the manufacturer for the model they would need," Mongolo said.

Brock Cahill owns a 28-foot sailboat at Anchorage 47 and is a member of the Sea Change Agency, a nonprofit advocate for the protection of endangered marine species. He says keeping copper pollution out of the harbor means a lot to him.

"I've come to realize that bottom paint is quite toxic for the ecosystem," Cahill said. "We're doing our best to improve the ecosystem all over, and that starts with using one of these inflatable options instead of [re-applying] bottom paint every few years," Cahill said. Howard argues that FAB Dock users would reduce pollution and save money over time versus repeatedly cleaning hulls and reapplying paint.

"It was designed and built to keep your boat clean and dry, which means you don't need to use poisonous toxic bottom paints and anti-fouling paint, and that's good for the environment. There are no chemicals, and that saves fuel. Eventually, over a few years, the money you'd spend on normal maintenance for a boat that's docked in saltwater now goes toward paying your FAB Dock off, so it's good financially too," Howard noted. Heal the Bay water quality specialist Annelisa Moe said the inflatable device presents an interesting idea for boat owners.

"From what I have seen they are effective in reducing passive leaching of copper from the underside of boats while they are docked. Unfortunately, because they are so new, I have not seen much data about any potential side-effects of using this system," Moe said.

See video of the FAB Dock in action at fabdock.com.

# APPENDIX I – FAB DOCK DEMONSTRATION Q&A

APPENDIX I

#### Questions & Answers (Q&A) from Fab Dock Demonstration Event on September 23, 2019

Q: How long has this device been around and where did it come from? A: Fab Dock is an Australia company that has spent 9 years and over \$2 million on research and design of their in-water dry docking system. We are not aware of another company that currently offers an equivalent product. A Fab Dock is a one piece welded unit - no moving parts, no metal parts - that is portable and runs off of 12-V power (i.e. it can run off the boats battery or solar panels) and keeps the boat 100% dry.

Q: How is this different from the old "boat baths" and "boat liners"?

A: These old devices were made with PVC and often required the use of chlorine to kill fouling growth inside. Today's in-water dry docks are made from UV resistant polyurethane. It is broadly known that the old PVC boat baths and liners often degraded and ended up sinking to the bottom of the marina. This is because PVC is easily impacted by the sun's UV rays, salt, and chlorine, all of which were acting to degrade the material.

Q: Does this product use any kind of bottom paint or any type of protective surface to prevent fouling? A: No. There are no chemicals required for use of this device and no need to put antifoul paint on the boat bottom.

Q: What do you do about the growth on the bottom of the Fab Dock? A: Just leave it. The growth on the bottom of the fab dock does not hurt the device. The only time the bottom needs to be cleaned is when moving it to a different location.

Q: Don't the coral worms and barnacles eat through the plastic and poke holes in it? A: No.

Q: How does this device keep the boat dry?

A: The universal fab docks include 2 fully automatic water pumps (the number of water pumps in custom built fab docks varies by design). Each water pump is wired independently so that if any reason there is a problem with one pump, the other pump will continue to function and keep the boat dry. The pumps are connected to a special water sensing controller that is connected to the boat's battery.

There are 3 pump stages: When you first plug it in, the turn the pumps on and empty all the water out. Then it will turn the pumps off. It will then go into dry-out mode for the first hour, during which time it will do 6 checks and pump out any residual water. Next it will go into rain mode for the rest of the time it is connected with the boat sitting in the dry fab dock, every 2 hours it will check for water and pump out any new water that has collected.

Q: What happens if the pumps stop working?

A: The pumps are what do most of the work in the fab dock, so they do sometimes need to be replaced. The system is designed so that it is a simple process to replace pumps that go down.

Q: What maintenance is required?

A: Keep the top of the tubes surrounding the boat clean and free of debris. The bottoms do not need to be cleaned.

Q: Have you had any of these in Marina del Rey for any period of time to see what the local growth is here?

A: Yes, we recently pulled out a Fab Dock that was trialed by the Sea Scouts for a year. (can share pics/video)

Q: What do you do for boats that don't fit in the Universal Fab Docks (e.g. with keels, struts, propellers, etc.)?

A: Fab Docks for anything other than I/O and outboard power boats have to be custom built. Custom built Fab Docks are designed with special pockets for shafts, rudders, keels, etc. in the precise locations needed for the boat in question, with a custom weighting and pumping system to ensure proper functioning. The only thing that Fab Dock still can't accommodate are wing keels.

Additional details: Hand welded in New Zealand, Special polyurethane from Israel, chemical resistant, UV resistant, electrical fittings are gold-plated, all wires are submersible and waterproof. In Australian conditions, they get at least 10 years out of Fab Docks, even with the high UV radiation. They expect the devices to have a longer life in the US (10-15 years).