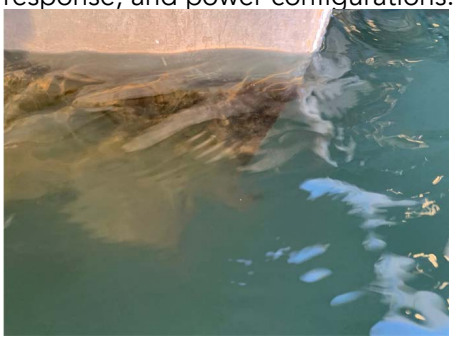
Abstract

Hull Shield has collaborated with Bennington boats, a subsidiary of Polaris, to test the efficacy of the Hull Shield ultrasonic driver system when installed on aluminum pontoons. Aluminum boat owners have limited bottom paint options due to the galvanic corrosion resulting from a primary anti-fouling used in bottom paint - copper oxide. This study implemented multiple test configurations to determine optimal design and installation practices of the Hull Shield HS75 system such as transducer placement, frequency response, and power configurations.

Preliminary results have proven that most configurations currently tested are effective at preventing fouling from accumulating on aluminum pontoons. Results indicate that transducer placement has no significant affect on results. We have noted that improved results were achieved when driver frequencies are focused in bands of higher resonance and lower impedance.

Future testing is scheduled to determine optimal power levels that will best acheive a mode of operation which provides optimal performance and efficiency.



Day 14 Result - Unprotected Pontoon

Day 14 Result - Pontoon with Hull Shield HS75

Introduction

Above: Pitting caused by galvanic corrosion.

Galvanic corrosion is a natural process that affects aluminum boats and pontoons. This process results in pitting and eventually holes within the submerged aluminum surfaces. Galvanic corrosion is accelerated when bottom paint containing copper oxide is used for the purpose of anti-fouling. Bottom paints which exclude copper oxide are often implemented, however these paints are less effective and permit higher fouling growth rates. To complicate matters, it is more difficult to remove fouling from aluminum surfaces as compared to FRP/GRP substrates.

The application of ultrasonic anti-fouling on aluminum boats and pontoons can dramatically reduce marine fouling growth rates, even when no bottom paint is utilized. Hull Shield ultrasonic systems provide an effective and safe solution for use on boats with aluminum hulls and pontoons.

The procedures of this study were selected to determine optimal transducer placement, system power requirements, and frequency response on aluminum pontoons. Testing is carried out under "worst case" scenarios. For this study, a high growth area was selected. The pontoon surface is also left unpainted.

Below: Hull Shield test transducer on pontoon.

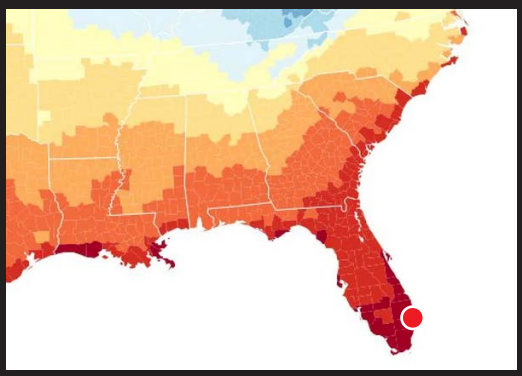
Test Location

West Palm Beach, FL - USA

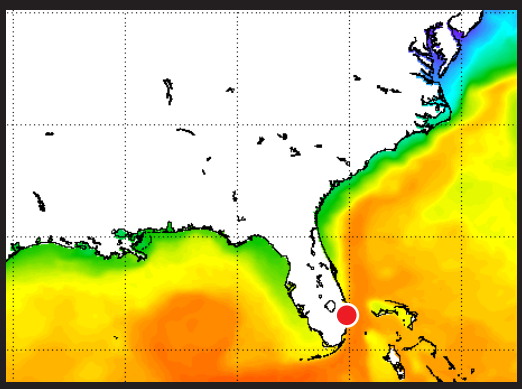
The study is being conducted in Palm Harbor Marina in West Palm Beach, FL.

This location provides a"worst case" scenario.

West Palm Beach is situated in an area having the warmest waters as well as the most sunlight within the contiguous United States. Both conditions accelerate the growth-rate of marine fouling.



Average Sunlight Intensity (Source: NASA)



Average Sea Surface Temperatures (Source: NOAA)

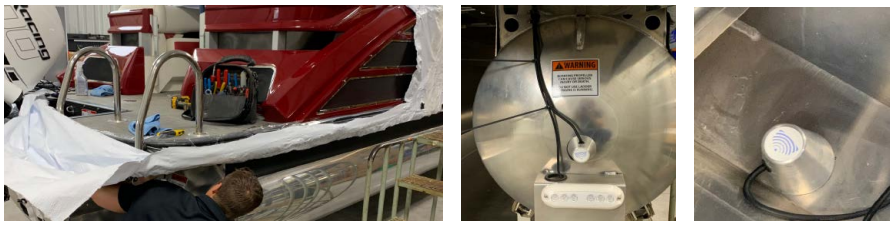
Testing Procedure & Preliminary Results

The Hull Shield HS75 test unit was installed on December 3, 2019 at the Bennington manufacturing plant in Elkhart, Indiana. Hull Shield ultrasonic transducers were mounted to all three pontoons - each at different locations. The control module (shown at right) was conveniently mounted inside the battery compartment.

On December 18, 2019, the test boat was launched in West Palm Beach, FL, and then immediately docked at Palm Harbor Marina.

The test boat was parked while the Hull Shield system remained deactivated. This provided an unprotected control period for comparison.

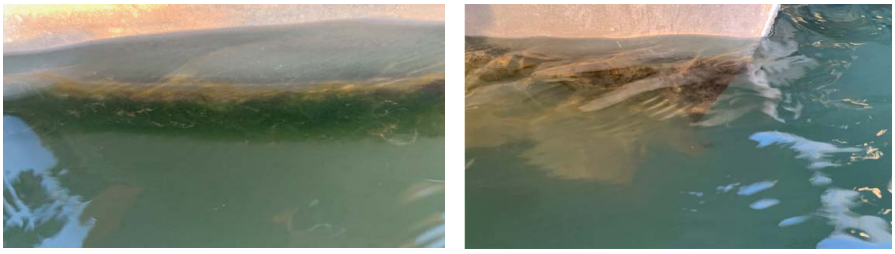
Hull Shield HS75 ultrasonic unit installed in the test boat.



Installation of the HS75 unit on December 18, 2019 at the Bennington Elkhart Facility.

Report Log - January 1, 2020

The test site was visited on January 1, 2020 and the subsequent growth accumulation was documented. The Hull Shield system had been deactive for a total of fourteen (14) days.



Photos taken on January 1, 2020 after 14 days of fouling accumulation on unprotected pontoons.

Report Log - January 8, 2020

On January 8, 2020 a diver removed the existing fouling which had accumulated during the unprotected control period. Immediately afterwards, the Hull Shield HS75 system was powered on and activated.

Report Log - January 22, 2020

The test site was again visited on January 22, 2020 to document growth accumulation. Minimal growth had occured during this time - the Hull Shield system had been active for a total of fourteen (14) days.

Photos taken on January 22, 2020 after 14 days of relatively no fouling accumulation.

Test Boat

Bennington 25QX Series

Bennington provided a 25QX series luxury tritoon for testing in Palm Beach, Florida. The test boat has an LOA of 27' 3" and features a triple pontoon design.

Floor plan of 25QXFBA (Source: benningtonmarine.com)

The Bennington 25QX is docked at Palm Harbor Marina and remains parked for the duration of the study. The site is periodically visited to document the fouling growth rates on the submerged pontoon surfaces.

Photograph of the test boat docked in Palm Harbor Marina on January 7th 2020 .