

Owner of Jetcraft 2175XS Undertakes Sound Damping Experiment

In June , Steve Vincent of Fairbanks, Alaska took delivery of a Harbercraft Jetcraft 2175XS. This Mercury Optimax 200 powered jet boat is an excellent shallow water performer but very loud while operating. Rather than wearing headphones or resorting to a flight COM system for himself and his passengers, Vincent decided to experiment with noise reduction techniques of the new sound damping technology.

Vincent contacted HushMat—manufacturers of a full line of vibration damping, thermal insulation, tape and sound absorption materials. A phone meeting with Tim McCarthy, president of Hushmat ensued explaining Vincent’s experiment. Graciously, McCarthy agreed to provide the material.

As a point of reference, all readings were taken with a Radio Shack digital sound level meter (Cat# 33-2055). The accuracy of exact pressure levels will vary depending on the equipment used, however, Vincent’s interests were only to measure the amount of noise reduction I could achieve.

For the readings, Vincent ran the boat with the top up—no side or rear curtains—at 4150 to 4200 RPM upstream on calm water, which were taken in 20-second intervals from the passenger seat with the sound level meter microphone facing to the stern.

“I did find that running the boat with the side and rear curtains down reduced ambient noise by almost 3 db”, Vincent said. “It should also be noted that the rear curtain sits forward of the engine’s doghouse and that I had insulated canvas covers made to replace the stock canvas covering the battery and oil access ports.”

Vincent’s initial readings were 100 to 102dbC before the application of the sound deadening material. This is extremely loud. He also measured a level of 82dbC from the inside of his 2005 diesel Dodge pickup at 55 MPH (windows up, no CD on the sound system). Sonically speaking, a 9db increase in sound pressure level is what most humans perceive to be “doubling” the volume. Electrically speaking, it takes twice as much power output from an amplifier to produce a 3db increase in volume at the

speakers. OSHA regulations state that a worker cannot be subjected to 102db noise for longer than 1.5hrs per day without approved hearing protection, 4hrs at 95db, and 8 hrs at 90db. A 9db noise reduction would be significant and 12-15db would be outstanding.

On a technical note, sound meters read at either “A” weighted or “C” weighted. “C” weighting is a linear sound pressure reading. Sound pressure levels must be reduced over a spectrum of 20 to 20k hz (once specific frequency spikes are leveled out) to show a reduction in noise. “A” weighting looks more at the areas of sound in the human hearing range and theoretically would show larger reductions in noise levels during the course of this experiment. Vincent chose to use “C” weighting, as he was interested in reducing not only the noise, but the vibrations he experienced while driving the boat.

There were four main sources of noise in the boat. Engine and exhaust noise (mid to high frequency), the jet drive (low frequency), fundamental vibrations generated by both and carried through the aluminum (low to mid frequency), and sympathetic harmonics also transmitted through the aluminum hull and consoles (full range).

The first order of business was to remove the Jetcraft’s “sound insulation” which consists of foil faced and backed 1/2” bubble wrap that is glued with contact cement to the inside of the doghouse. It took scrapers, wire wheels, strong hands, several band-aids, many hours, and patience—lots of it.

The next step for almost any other type of sound deadening material besides Hushmat would have been to remove the contact cement using some type of caustic chemical. Fortunately, Hushmat’s Ultra Mat adhesive allows it to be laid directly over the contact cement remnants (even WD-40) without prep.

Ultra Mat is designed to deaden fundamental and sympathetic vibrations that travel along, and through, solid surfaces, which in this experiment was the aluminum in the hull, consoles, and doghouse of the 2175XS. It is important that this type of material/compound has direct contact with the surface you are attempting to deaden. Products that are “sandwiched” (foam/deadening material/foam) will have substantially less effect on wave forms traveling through the aluminum than a direct contact of an inert deadening compound applied to the surface of the aluminum.

Because the engine, compressor, and exhaust emitted a substantial amount of sound in the mid to high frequency range, the use of ½” Hushmat Silencer High Frequency sound absorbing foam was applied over the Ultra Mat on the inside of the engines doghouse. Vincent applied the foam over the entire inside of the doghouse with the exception of surfaces directly adjacent to the mufflers.

After the removal of the stock bubble wrap and prior to the installation of the Hushmat products Vincent had picked up the doghouse and tapped it with a hammer. It rang like a bell. After the installation of the Hushmat products it was a “dead ringer”—no resonance whatsoever.

The sound levels after the doghouse-deadening project produced readings of 95-96 dbC, compared to the pre-sound dampened readings of 100 dbC to 102 dbC—a substantial noise reduction of 5 to 7db.

Vincent’s next task was to cover the inside of the transom, bottom of the swim platform, and underside of the rear deck with Ultra Mat and he was rewarded with an additional 2-3 dbC noise reduction, a reading of 92-94 dbC.

After removing the rear passenger bench seats Vincent filled the passenger compartment from the floor to the top of the canvas.

“While I had not recorded sound levels prior to this installation, I can say that the ride was quiet—very quiet. I was even able to make cell phone calls while talking at normal levels,” Vincent explained.

Future noise reduction projects on this 2175XS, include the application of Hushmat Ultra to the inside of the hull, outside of the fuel cell, inside of the consoles, and sides of the Jetcraft to reduce primary and sympathetic vibrations. Because the area underneath the stern deck, directly aft of the attached dog house and including the inside of the transom, are open to the engine compartment, Vincent surmises that noise in the mid to high frequency range is being amplified in that “sound chamber”.

His plan is to reduce noise in this area by applying either ½” or ¼” HushMat Silence High Frequency sound absorbing foam to these areas.

Vincent's theory is similar to the acoustic properties of an acoustic guitar. In order to deaden the sound without covering the sound hole in the guitar one would need to deaden the sound board, the inside of the guitar body, and use sound absorbing foam to deaden the incoming mid to hi frequencies entering the sound chamber.

We'll have to wait for an update on this theory. So far Vincent is pleased with the 8 db noise reduction that has been achieved and the performance as well as ease of installation of the Hushmat products.

Meanwhile, Vincent reports, "The current noise level reduction has made the use of this boat much more pleasurable for my wife, friends, our dogs and myself. "