

Fuel Efficiency & Exhaust

It's time to get serious.

In recent weeks I have received a lot of e-mails asking me what is the number one design objective of the **Integrated Exhaust Hull Structure®** system and what inspired me to design it.

At first, I focused on exhaust noise. However, after reading a report written over 20 years prior, my number one design objective became engine and fuel efficiency. This report, "*The future of marine fuels aboard ship*", by the S.N.A.M.E was a real eye-opener. And as the years came to pass, it's words become truer and truer. Considering the rising demand, expense and availability of marine fuels, it became increasingly clear that we should all be building more fuel-efficient boats both in hull design as well as in engine design. In the report, it states that "*it has been determined that approximately 30% of the energy used in the US is wasted. It is also estimated that approximately one-third of this wasted energy is technologically recoverable with minimal influence on our standard of living. Considering that our present petroleum demand is approximately 16 million barrels per day (1977), conservation has a real potential for increasing our available resources. To many people there is sound rationale in the premise that the benefits / cost of energy conservation exceed those of alternative energy resource*". In 2000, according to OpecWorld Energy Model (OWEM), total world oil demand was 76 million barrels per day.

In all my years of going to sea as a yacht master I always had the idea that the exhaust could be put to work to save fuel. I realized that much of the waste of fuel was related to the exhaust. As we started putting mufflers behind engines, back in the 1960s and 70s boats were built with straight pipes but were very noisy. Least of all, were concerns about future demands and the price of marine fuels. It probably never crossed anyone's mind that there should and could be a much better way of providing for engine exhaust as well as conserving the energy it consumed.

When I first related exhaust to fuel efficiency I was running a 57' Connie powered by the newest Detroit JT- 8V71-TI. The engine was, at the time, one of the hottest twin turbo charged engines on the market putting out 450hp, but the exhaust noise was deafening. The boat was built with no mufflers and we were running 10" straight pipes. After running the boat for almost a year, the owner decided to install a set of marine inline mufflers. After the installation, it was like running a new boat but not all was good. We reduced the exhaust noise by about 8 to 10dba, but other things started showing up, such as smoke and soot on the transom. The engine started leaking oil. Turbo seal problems started occurring and fuel burned, went up 10% to 15%. During a trip home from Nassau, we blew a piston on the starboard engine. I started asking a lot of questions during the rebuild. I met an old diesel mechanic who he told me the problem we were having was related to backpressure. Take the mufflers out and the problem will go away he said. We had a lot of conversations on the subject of backpressure and just what it does to a diesel engine. One thing he told me was that diesel engines will not run well with high backpressure. As the backpressure increases, so will cylinder head temperatures. Also, the higher the backpressure the higher the fuel burn rate. The owner of the boat understood this as well. He related engine backpressure problems to his days of flying a B-17 during WWII. High manifold pressure and cylinder head temperature

made for less fuel efficiency and fuel efficiency was obviously critical since flying home on fumes was more often fact than cliché. Our mufflers were pulled out and to tolerate the noise we all wore earplugs.

My experience aboard this boat gave me great insight to the problem and I knew that a better way had to be found, for power systems in motor yachts were growing and so was the long-range outlook for engine technology. By the 1980s everyone was trying to build faster boats, so engines were getting much more powerful. By the '90s it was clear to everyone that the power systems within motor yacht hulls would be reaching four times the power we had in the '70s. Engine technology was changing so fast it was hard to keep up with the problems as they arose relating to these new engine systems and some of the old problems like we had on the 57' Connie still plague us. The muffler company's still had no solution to the backpressure problems. As one marine engineer told me, since the '70s the boats have not really changed very much size wise but the power has increased three to four times. It's like trying put 10 lbs of potatoes into a 5 lb bag. It's just not working, and the new engine system requirements for lower backpressure has lead to us to bigger pipes and bigger mufflers. Along with the same old problems, now space availability a big issue. Even the wealthiest yacht owners can no longer afford to accommodate power without conservation.

It is clear that if the engine companies are spending millions on R&D to build more efficient engines such as the new rail technology, that all this would be a waste of time unless we can do something about backpressure and find a way to reduce the size of the exhaust systems. As one of our clients said, the size of the pipes coming out the back of the transoms are getting a little much and the room the exhaust is taking up in the interior of the boat is getting way out of hand, taking up space for needed fuel and equipment. Some builders tried conventional underwater exhaust dumping amidships but this was not the solution. Conventional underwater exhaust using large underwater pads to pull the exhaust out had a lot of problems and reduced speed and increased fuel cost.

The solution is to redesign the exhaust system from scratch, and to quote a well-known TV chef, kick it up a notch!

The IEHS® is the solution to both engine and space requirements and for the first time the exhaust itself is now "used" to improve both hull efficiency as well as fuel efficiency by using the exhaust thrust to create both hull lift and forward moving energy.

You have to put an exhaust system into your boat, and with the always-rising cost and demand for fuel, should you not get the most efficient use out of you engine and hull if the technology is available to do so?

At Vonwidmann Designs LLC. we continue to work with our builders to ensure the most efficient exhaust system possible. The IEHS® is the only exhaust system available now resulting in cleaner burning, low backpressure, fast and quieter running as well as less fuel consumption and less space required for installation.

Today the builders who embrace IEHS® technology can truly say to their buyers they are building some of the most efficient yachts in the world and helping us all conserve the energy that powers them. Can we afford not to?

