

## Diesel Technology Time Travel: Repowering the M/Y Discovery

### On The Blog

The MER Technical Support Blog is online to aid our customers in keeping their equipment running safely and efficiently. Just go to: <http://merpower.wordpress.com/merpower-technical-support/> and enjoy a 2-minute click-fest! We are especially strong on HOW-TO resources:

"How does a Common Rail fuel system work?" "What tools will I need on the boat?" The MER Blog is also peppered with high quality graphics. All of this will help you get to the heart of marine repair and maintenance needs.

Check out our blog at:  
<http://merpower.wordpress.com>

### Calendar of Events

#### Pacific Marine Expo

November 18-20, 2010 This is the place to find everything for workboats and commercial fishing boats. Visit us in booth No. 1321!

#### Seattle Boat Show

January 21-30, 2011  
The Premier show for boat buyers, builders and those who equip them. For more show information please call 1.800.777.0714.

#### MER Marine Lighting Seminar

February 11, 2011  
This presentation will feature high efficiency marine LED lighting.

#### MER Diesel Engine Troubleshooting

March 11, 2011

#### MER Preventive Maintenance Seminar

April 8, 2011  
Call Brian at 206.286.1817 to reserve your place!



*The 90' Motor Yacht Discovery*

Captain Ben Swanson enjoys sharing the history of his M/Y Discovery. Built originally for William Morris, the founder of the William Morris Talent Agency, the 90' boat was designed by D.M. Callis and built by Harbor Boat Works of San Pedro California. Completed in 1931, she was originally christened the "Holiday".

First powered by a 6-cylinder Union, direct reversible engine, the CAT D-375 that Ben ran for years was the boat's second engine, installed in the late 1940s. This same engine model was used extensively in WWII and had a significant presence during the invasion at Normandy during the Second World War. The old CAT engine was well known for a high noise level, that only increased with the addition of the supercharger.

The CAT D-375 is a big piece of iron. With the old Snow-Nabstedt transmission, the engine weighed a little over 12,000 pounds, was 120" long, 55" wide and 80" high. The 3" propeller shaft is 35 feet long and spins a 52" X 48" wheel.

#### Repowering with a New Deere

Captain Swanson oversaw the repower of the vessel this past winter with a John Deere 6125AFM-75 M1 coupled with a ZF W650 transmission. Rated at 341HP at 1800 RPM, the new equipment is just over 4000 pounds, one-third the weight of the old

engine and transmission. Even after pouring 6000 pounds of concrete in the keel, the boat still rides a few inches higher in the water.

The repower included the fabrication of a new engine bed, and a 6" stainless-steel exhaust system with all new thermal insulation.

#### Comparing Old and New

Beside the size and weight, a comparison of the Cat D-375 and the Deere 12.5 is surprising for the many differences between the engines. The heavy-duty John Deere uses modern technology and efficiency to produce similar horsepower.

The CAT engine's low idle speed was 450 RPM, with a high idle of 1315 RPM. The wheel speed would max out a 438 rpm with the 3:1 reduction of the Snow-Nabstedt transmission. Power ratings for the CAT eventually reached 329HP continuous, at 1225 RPM, with the "Roots-type" supercharger. The supercharged D-375 engine was extremely loud. The 5.75" bore engine had a piston stroke of 8". It took a little over 21 gallons of fuel per hour to operate the engine at the full 329 HP rating.

The old CAT oil pan capacity was 49 gallons, while the engine and heat-exchanger cooling system held a full 35 gallons of coolant. Given the required oil

*continued on page 3*

## Products We Recommend

### MER Hydraulic Power



MER supplies heavy-duty Hydraulic Power Units (HPU) to the US Navy, oil spill response contractors, and Alaska's commercial fishermen, among others. The range of HPUs is from 20 gallons per minute (GPM) to 350. We also build Hybrid units that produce both hydraulic and electrical power. HPU cooling options include radiator, heat-exchanger, or keel-cooling, which is often the method of choice for machines like oil skimmers that must operate in contaminated waters.

The MER machines have the capability to maintain the engine oil, hydraulic oil, and the coolant temperatures in the ideal temperature range under adverse operating conditions.

### Marine GreenLyt

MER now supplies the GreenLyt, a marine grade light that enables more efficient lighting on the water, and cuts energy input by nearly ninety percent. GreenLYT marine fixtures carry a 5 year warranty on all LED parts and drivers, and the LEDs are individually replaceable. The fixture continues to operate even if an individual LED fails. The marine powder coated aluminum housing will not rust and dissipates heat much faster than stainless steel. All hardware is marine grade stainless steel. Gasket material is marine grade GE silicone (not rubber). All GreenLYT marine fixtures are equipped to be safety chained. Instant on Instant off - No warm-up time - No sudden outage - No light bulb to replace. The LED are made in the USA and Assembled in Washington State. Visit the U.S. Department of Energy Link for more on LED lighting: [http://www1.eere.energy.gov/buildings/ssl/using\\_leds.html](http://www1.eere.energy.gov/buildings/ssl/using_leds.html)



## Vendors We Love

### Spencer Fluid Power and Seakamp Engineering



Folks have said the MER facility at 338 W. Nickerson in Seattle is like a beehive, and during the recent Gulf of Mexico Oil spill MER received accelerated orders to supply Hydraulic Power Units (HPUs) to drive oil skimmer equipment. We needed the vital pieces to build the machines, and we needed them "yesterday"!

Two of the crucial components were the hydraulic pumps, and oil coolers. The pumps were used to power the skimmer equipment, while the oil coolers handled both the hydraulic and engine oil under gulf conditions.

The folks at Spencer Fluid Power did a great job, specifically Dave Fleuret, in technical

sales. As usual we dialed Dave first for the Eaton pumps we use. He fired up the factory, begged, borrowed and stole pumps that showed up just in time.

Then we dialed Clark at Seakamp Engineering to order the heavy duty Cupro-nickel heat exchangers. Seakamp is well known for their fast response on custom oil coolers, and heat exchangers of any configuration.

Within days, timely lots of pumps and oil coolers were arriving at the same rate as our "worker bees" could build the tough little HPUs for both Kvichak Marine and Marine Spill Response Corporation.

We didn't stop the oil spill, but with the help of friends we're assisting in the clean-up!



## MER Service Training



The MER service department continues to conduct marine engine and power generation training. Feedback from students is very positive, and has led to an expanding list of classes. Beginning this December MER is adding Marine Power Generation to the list. Classes cover topics that help reduce maintenance costs and improve vessel safety. They are geared toward beginners, DYSErs, and professional maintenance staff. To ensure participants receive maximum benefit from the class, they are tailored to the skill level of the students and focus on the engines they are using.

## MER Says Thank You

MER is constantly adapting to the changing market and updating our services to provide the custom products our customers need. The lessons we've learned in the service of the fishing fleet the past 50 years have been invaluable. Now we're using those lessons to serve customers in a range of industries across the globe. This has come to include oil, gas, and wind, commercial fleets from Foss to Brusco Tug, and boat builders Kvichak and Trinity, and of course you fisherman out there. Recently, we've added 3D CAD to our capabilities. This has improved the look and performance of our products, shortened design time, and, amazingly, made us more cost competitive. We are here because of the trust the fleet has put in us and our products, and we thank you for that. We will continue to innovate, working to provide the products you need, when you need them.

## Getting Home Safe-Ron's Tip For Damaged Fasteners

*This tip comes from our Shop foreman, Ron Quinlan. It's a great method for removing the nut from badly damaged threads of a bolt out on the fishing grounds when you have to keep things going:*

- Often a rusted nut has been seized in place for years. What if the alternator is bad and you have to put on the spare, but the bolt threads are damaged?
- The nut needs to be backed-off of the damaged threads, but how to do it?
- If it looks badly rusted or the bolt threads are damaged, Ron first coats the damaged threads with never-seize compound, a special lubricant made of grease and graphite particles.
- With some effort the nut can be turned through the damage and off of the bolt.
- In a pinch, a stream of penetrating oil will also sometimes work. Be sure to carry marine grade anti-seize compound on the boat! It is also known as NEVER-SEIZE.



## Repowering the M/Y Discovery, Continued

change interval of 150 hrs and using a price of 13 dollars a gallon the total cost of changing the oil would be \$85,000. The old 375 Marine Diesel included the latest technology available in 1940, which included a, then high, fuel injection pressure of 800 PSI. The fuel system had the advantage of being completely re-buildable in the boat.

The Deere's low idle is set at 600 rpm, while the expected max loaded rpm for the 12.5 M1 is 1800, and 341 Hp. This goes up to 2100 and 526 Hp for the M4, the highest horsepower model of the 12.5 liter. The 4.4:1 gear ratio of the new ZF gets the wheel speed down to 400. At 320 HP, the max rating of the D-375, the JD 12.5 burns 16 gpm, 5 gpm less than the CAT. At \$3.50 per gallon this equals \$350,000 in savings. This fuel efficiency is in part due to electronic engine control and the engines' ultra-high injection pressure of 23,000 PSI. It also helps the engine achieve it's EPA Tier II emission certification.

What's more, the Deere oil pan capacity is a more efficient 11 gallons. Comparing the lube oil needed for oil changes and normal consumption for both engines over their life cycles is shocking: The CAT will take over 6500 gallons during a 20,000 hour service life, while the Deere will use less than a sixth of this during the same time period.

What about reparability? The 12.5 will probably need a rebuild somewhere between 20-30,000 hours. With front mounted timing gears, this is more easily done in the boat, as there's no need to disconnect it from the transmission. What's more, there are no asbestos gaskets in the

engine, and scraping is down to only 15 linear feet of gaskets, mainly because of modern sealants. The compact design of the Deere engine requires far less space in the engine room.

On the D-375, when it was time for a complete engine rebuild, it wasn't so simple. Most of the gaskets in the old engine were asbestos based material, requiring service people to wear respirators. With nearly 150 linear feet of gasketing to scrape, folks would spend **days** scraping during a complete rebuild!

Most normal service work is performed from the Starboard side of the engine. Captain Swanson reports the new Deere improved accessibility to the engine and engine room, allowing much more space for storage. The Deere 12.5 unit injector fuel system makes repair of the engine on the water

even simpler, and thanks to improvements in fuel filtration offered by Racor (Parker) and Dahl (Baldwin) filters, it is easy to keep the fuel system free of water. This is especially important in newer engines.

**Having just completed the first season since the repower, Captain Swanson says the new Deere requires significantly less fuel than his old engine. He is also enjoying the convenience of starting and stopping his new electronically controlled engine from the wheel house instead of the engine room, and says, while speaking of the engine room, there is now plenty of room to walk about when it's time to service his bright white, and quiet new Deere!**



*The Discovery Engine Room, After the Repower.*

338 W. Nickerson St. • Seattle, WA 98119  
206.286.1817 • 1.800.777.0714  
www.merpower.com

## From The Founder

During my 55 years (1943-1997) of involvement in the Alaskan fishing industry I had many experiences; some that bothered me. None has troubled me more so than the one I'm about to relate.

The salmon season of 1964 had a poor forecast, so the cannery owners decided to consolidate their operations. Only the Uganik, King Crab and Alitak plants would operate. In preparation, that spring we lined up our machinist crew. This, up until then, had included Ed "Slim" Nordstrom. He was our boiler fireman, and had been at Uganik since our boiler was installed in 1941. Slim was 66 years of age and had been a widower for a number of years. He informed me that spring he had remarried and was retiring. He and his new wife were planning a trip to Sweden in late August.

The firemen-boilerman was a pretty important job. We had six 8-car retorts for cooking salmon. Each retort held about 220 cases of 1 pound cans, and it took every Btu of power our 154 HP B&W Boiler could put out to cook that fish. Keeping a boiler running takes a lot of skill. If something went wrong, at best we wouldn't be able to can, at worst someone could be injured or killed.

Since Port Bailey wasn't operating, we borrowed a fireman for the summer. We shipped our machinist crew, and cook house crew North on April 15th to prepare for the season. The machinist crew was very disappointed that Slim had retired; he was so well liked. Our new fireman seemed to know what he was doing, when doing spring maintenance on the boiler.

About the 23rd day of July, we were on our 3rd day of canning. We had enough salmon in the fish bins for 2000 cases, about 46,000 pink salmon. The Logger, a power scow, was at the Fish Float with another 360,000 lbs on board. We had been canning for about 1-1/2 hours. The first retort was filled and cooking, the second half loaded, when there was a loud explosion. The boiler had blown, with hot water and steam spurting everywhere. Several tubes had let go, and we were out of commission. The cannery had an old stand-by boiler, an old Scotch Marine, upright, fire tube rated at 50 hp.

It could only take care of two retorts at a time, maximum. We had a real problem, just starting the canning season.

To be continued...



*Ivan Fox, pictured with his great grandson, Ivan Allen.*

## Is There Such a Thing As a Good Leak?



### Keel-Coolers

This screw on top of the Walter keel-cooler plumbing is where you make adjustments to a controlled internal leak that works to your advantage.

Proper adjustment of this fitting helps prevent over-cooling of marine engines that operate in cold water. This fitting controls whether or not all of the engine coolant is sent to the keel-cooler.