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MAINTENANCE ISSUE



MER
EQUIPMENT

The **MER** *made* *Mechanic*

MARINE ENGINE & REPAIR *quarterly*

news you can use:

**COWL Exhaust—Oil Coolers—BMEP & HP
—Spare Parts Kits ... & Ivan Fox**

S o u n d o f S i l e n c e

EXHAUSTS, MUFFLERS, SILENCERS—Dan & Bob's Exceller Adventure

"Over the last four years we've been losing our hearing," says Dan Macdonald of the engine roar on his limit seiner, *Exceller*. But once he got ahold of MER's Bob Allen, "The sky cleared," he says. "He really came up with a solution for us. And at the end of the day our exhaust problems are behind us." How loud was it?

"This boat was so loud," Dan says, "when we were on sea trials here, went down the bay—with all the engine people onboard—and coming back, dockworkers said we sounded like a tug." Tugs with several thousand horsepower.

"When we got to Kodiak, several friends of mine in the shipyard said they heard us 15 minutes before they saw us.

"Didn't find the solution til I ran into Bob." Dan's excellent adventure with MER's Bob—first meeting in '95 when Dan bought an MER 70-kW Isuzu genset to run his refrigeration and hydraulics. "That piece of equipment's been trouble-free," he says, so hadn't really seen him since.

Fishing nearly 40 years, boat owner for 26, "We used to be a salmon boat," Dan says. "We used to be a herring boat." He saw the writing on the wall, opted out, and now with his brother Pete usually keeps the boat working 10 or 11 months a year. Switching gear from seine, longline, pots, and trawl—California to Adak—the boat fishes squid, sardines, halibut, tanner crab, and P-cod.

Kodiak-based and currently living in Bellingham, Dan bought the 1983 California-built *Exceller* in '85, sponsoring the 58-footer to a 24-ft. beam in '92. He repowered June 2000 with a 660-HP QSK19M Cummins replacing the original 440-HP 3408 Cat.

"Installed this engine 4 years ago," he says. "On sea trials I could tell it was too loud. From that time to last fall I was trying to figure out a way to address the problems with this engine. Love the engine—it's a great engine. The new generation of engines just run hotter, built to conform to the new emission standards.

"Started with an 8" muffler installed inside the freestanding mast because it wouldn't fit in the engine room." While it didn't silence the noise, "It was also of a diameter that did not allow for adequate airflow around it inside the mast," says Dan, capturing even more heat.

"It was loud enough, when running full speed, we had to have the pilothouse door open even on a nice day—the deck and pilothouse are closest to the exit point. Know what it's like when you go to the engine room without earmuffs? That's almost what it was like here in the pilothouse. The guys would wear earplugs back there overhauling gear. Got the Cowl in the engine room last fall—immediately quieted the engine. Now we even put a stereo on deck. Have to ask 'em to turn it down sometimes.

"There's no comparison. It's like night and day. It's the quietest the boat's ever been. I don't expect the boat to have No Noise. It has very little—less than the Cat."

"Found Bob by accident on this exhaust project, on the Cowl website as a dealer. Had Cowls before but didn't think I could get one in there that would fit. Had almost given up putting a muffler in the engine room"—resigned to putting an eyesore on top of the house.

Exceller's Dan Macdonald:



"I couldn't be happier with the response I've received from Bob. He just wouldn't let it die. Took it on, had no idea how large or small the job was gonna be, but just didn't quit working on it til he got a solution. Those guys are as good as you're gonna find, and I've dealt with most everybody in the North-west."



"Bob's solution was to find a Cowl muffler of a configuration that would fit in the engine room. He really took the project seriously, which led to a real good end result." Although immediately cutting noise Dan says it resulted in "slightly excessive backpressure on sea trials when installed in series with the existing muffler in the mast. Bob was really right on the money with his computer program—it predicted this. The sea trial confirmed what he thought would happen.

"Our fishing schedule didn't allow us to complete the second phase of Bob's recommended solution to our problems until now. Able to get by so far—depends on the load. Been running the engine at a lighter load." Can't do that during summer's upcoming sardine fishery off Astoria, though, "sometimes bucking current 4, 5 knots at the Columbia," he says.

Tied to a Bellingham shipyard dock this spring to replace the old muffler in the mast with a Cowl/EM low-backpressure secondary muffler—designed for use in these situations—Dan expects sea trials to confirm reduced backpressure and noise.

Of the new, cleaner engine's problems, he says: "One is noise, one is heat. We often run up to 1200° at the turbo—Bob uses a better grade of insulation blanket to handle the heat." MER's computer program not only dialed-in the backpressure but also allowed for precision fitting of the insulation blankets. Time was you measured, drew a sketch, faxed it off and hoped they'd fit.

"Had a digital camera," Dan explains. "Following Bob's suggestions I took pictures, and with my tape measure in the foreground emailed Bob the downloaded pictures—he put it all in the program. That's how we got the blankets manufactured. That's totally custom.

"Another part of the picture is a bellows flex. Accordion style, it takes up vibration and thermal expansion. Put heat in, steel expands; our system probably grows an inch from engine to top of stack. Had two failings in four years in the piping, in the flex itself. Lost 4, 5 days fishing. Bob came up with a better grade of flex for high-heat applications.

"That company's always made itself accessible. Bob knows what he's talking about, don't have to worry about educating them. They are extremely organized people, and customer service is really important to them. You can tell that." Excellent.

Exceller's Cowl—rated to take out 30 dB(A), the secondary (stack) silencer another 12-20 dB(A). Backpressure in the old stack silencer measured 1.9 inches Hg, the new EM (right) projected at .08" Hg.

(below): MER's precision-fitted blankets insulate the engine room's Cowl exhaust.



2 stack silencers ensuring shipyard fit.



Fairhaven Shipyard's Mac Macomber takes out the old, loud, hot mast muffler—running up to 1000°—to replace with a smaller, quieter Cowl.

"That rusty mast, that's not my style," says Dan. "Every year we get up there—sandblasting—and repaint, but every year the heat just bakes it off."

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G e a r b o x

TRANSMISSIONS—Keeping It Cool

Oil Coolers

Oil coolers are consumable. No doubt—it's gonna fail, just a matter of when. Question is, when it does, do you want it to take your transmission out with it.

A transmission's oil cooler contains tubes of fresh- or saltwater coolant in a sealed bath of hot tranny oil transferring heat from oil to water. The water supply comes from one of two sources—the source ultimately determines system cost, potential problems, and longevity.

FRESHWATER: Coolant shared with the engine in a closed system—**externally cooled by raw water.** Freshwater from the engine jacket also cools tranny oil before it's pumped through **keel cooler** tubes mounted on the outside hull or in the heat exchanger inside the boat.

A freshwater oil cooler lasts more or less indefinitely, or at least, says SeaKamp Engineering Owner Clark Bergman, "As long as the plumbing on your house."

RAW WATER: Cooling tranny oil with **seawater pumped inside the boat, inside the oil cooler,** inside the jacket of a **heat exchanger** serving as an internal miniaturized keel cooler.

"Bad things happen sometimes when you do that," says MER's Mark Miller. "What happens in a seawater-cooled system, when it fails it dumps saltwater into the gearbox, and tranny fluid looks like a strawberry milk shake." Watch for tell-tale milky oil droplets. Or better yet, says GM Mike Hoyt—service your oil cooler by changing it periodically before it fails:

"If your buddy's breaks down at 5 years might want to change out at 4 1/2."

There's really no other way to tell, but Mike offers a tip for ZF (Hurth) trannies with rubber end-caps instead of fittings: "The caps deteriorate over time. If a cap deteriorates enough to fail, then probably it's a good idea to replace the oil cooler. They don't sell end pieces."

Although costs vary, to compare Mike says about \$100 to \$500 replaces the oil cooler, but a failed transmission can run \$2,000 to \$15,000—or more.

So why doesn't every boat play it safe with a freshwater oil cooler? Well, it's less costly for the builder to put the oil cooler in the raw-water flow. They save money using a smaller cooler, the plumbing is less costly, and it will make it through the warranty period either way.

THINGS TO KNOW: Although dissimilar metals can cause electrolysis, this is not the only cause for oil-cooler failure. There are 3:

ELECTROLYSIS—electricity taking a particle at a time, eating a hole in the tubes. Think Zinc. **CORROSION**—rust-like effect of saltwater on material. Sailing south? Warm seawater run through an oil cooler corrodes, and the warmer the water, the more corrosive. Make sure your oil cooler is cooper-nickel, grounded, and zinc protected.

EROSION—pumping in silty, sandy raw water—from Bristol Bay, a river—works like a sandblaster. Tubes get paper thin over time. Think Keel Cooler, or plumb it on the freshwater circuit.

Cu or CuNi? Tubes are made of copper or a more expensive copper-nickel alloy. The alloy holds up to saltwater corrosion much better; copper is all that's necessary for freshwater flow. MER stocks mostly CuNi for it's superiority and warm-water protection.

Seakamp's Clark says oil coolers on commercial vessels and diesel engines most likely go copper-nickel. Gas engines don't last as long, pleasure boats don't get as many hours of operation—they're likely copper.

"Usually don't own the boat long enough," Clark says of their short-lived copper-tubing. "It'll fail on the next owner." He suggests pleasure cruisers to Alaska carry a spare or put a new oil cooler in first, keep the old as a spare.

Zincs—On any haul-out or grid you can plainly see that putting new zincs on the hull provides the sacrificial metal protecting keel coolers from saltwater electrolysis. It's not so easy to see inside the raw-water oil cooler, but if you're thinking out of sight, out of mind—you could be out of zinc, out an oil cooler, out a tranny.



Mark Lundsten recalls the time he similarly lost zinc in his hydraulics heat exchanger while fishing the schooner *Masonic*. Cost \$4,000 or \$5,000 to fix, flush, and replace pumps and motors by the time the problems sorted out. He says ever since he always checks those zincs when changing oil—every 200 hours: "Never have a problem if you change the zincs."

Antifreeze—Pulls double duty. Oil can get hotter than water. Antifreeze keeps freshwater from boiling by raising its boiling point, but also has anticorrosion products to keep rust and scale from forming inside the cylinder and water passages inside the engine block (see photo inset).

"A little bit of scale goes a long way," says Mike. "One-eighth-inch scale equals 4 inches steel in heat transfer."

Overcooling—If water's too cold oil never gets up to temperature. Too large an oil cooler—especially seawater—can cause condensation in a reverse-gear transmission. So why aren't trannies thermostatically controlled? Clark says a thermostat assembly can cost as much as the oil cooler itself, so they're usually just sized not to overcool. Then you don't need a thermostat.

It's hard to test for an oil cooler going bad—you either got a leak or you don't. If you catch it soon enough you may still save the transmission.

Think Maintenance. Especially with raw-water oil coolers, regular maintenance means routine replacement. Like we said—when they fail, they fail big.

S h o o t i n g T r o u b l e

SOLUTIONS TO PROBLEMS

Spare Parts Kits (a.k.a. Cruise Kits)

Whether workboat or pleasure craft, something's bound to wear out. They're called "consumables" because in normal operation they're going to get consumed. Used up. Think ENGINE FIRST-AID/SURVIVAL KIT.

Here at MER we have history records on our parts so we know what you'll need down the line. We're hooked up directly with John Deere for factory warehouse-direct parts access. With no middleman between us and the factory you get more immediate shipments, emergency service—all the things you need at the last minute.

Off-the-shelf or Custom-built: We've got parts kits ready to go for a long cruise or short. Or tell us what engine, what you're going to do—and we'll put together the appropriate kit.

The Short List



Hey—we stock spare parts! Got Deere? Got Isuzu? Got Yanmar?

A Long List



Commercial vessels: Coming soon ... check out our website for the complete list of *What-I-Wouldn't-Give-To-Have-One-Of-These* ... just in case you forgot something. Better to stock now than charter that delivery floatplane later.

M E R ' s M a i d s & M e n

MEET THE MER CREW—Kathy Hoyt, Office Manager



MER Pres.
Bob Allen

Wash.
Gov.
Gary
Locke

Office Manager
Kathy Hoyt

Don't let the fact she might be the only woman on the MER payroll fool you—**Kathy Hoyt** knows her way around an engine about as well as the next guy. Knows her way around the financials, computers, parts books, and control panels too. With phones ringing and printers humming she seamlessly fields calls without missing a beat, keeping the crew on track and MER's engine running.

Same as on a boat, a woman can add that certain something that makes a crew more like a family. Kathy's clearly the heart of the operation, on occasion some at the shop even calling her Mom:

"I like what I do and treat the company as I would if I owned it."

Kathy made her way up through the ranks because she's smart, works hard, and is good at what she does, always

reaching to learn more. Mostly self-taught, Kathy keeps books, mastered computer technology as it came online and evolved, builds all the MER control panels. Yep, Kathy wired those gauges. So if a woman answers your phone call at MER, rest assured—yes, she probably can help you, or get you the person who will.

Between accounting duties she also helped take parts calls before Parts Manager Mark Miller started. "Taught myself how to read the parts books," she says. "Figured, 'I could do this!' The guy's been up all night, don't want to take a lot of time—I got good at it."

Kathy set off on a mechanical path back in a college auto mechanics class, migrated north from California back in '78 working accounting jobs for John Deere dealer Craig Taylor Equipment Co., then mechanical contractor Holmberg Co. Some years later lending her considerable skills to help MER out of a bookkeeping bind, by '91 Kathy came onboard full time joining husband/General Manager Mike Hoyt.

Quick to credit Mike for helping her figure out a lot of the technical end in the shop, the Hoyts became the MER team most likely to answer your emergency call after hours. In summer they tend to be on duty 50, 60 hours a week and then on call when Bob Allen's up fishing his Kodiak set-net site.

"We make it work," she says. "Got the computer online at home, to check stock; come down middle of the night, weekends, whatever, to ship it. Mike talks to guys for hours sometimes. Can charge 'em for the part and ship-out charge, but not all that time spent troubleshooting."

"That's what we pride ourselves on—we try and keep the fishermen fishing. I think that's why a lot of them keep coming back to MER. Our competitors don't offer that."

Back in 1999 Kathy joined Gov. Locke in introducing Washington's new online system of reporting state business taxes—the nation's first. As part of the system's test pilot Kathy helped the Department of Revenue both streamline and customize tax filing from the old, error-prone paper forms to high-tech speed and accuracy.

When the governor unveiled this shiny new electronic filing system—ELF—he chose to hold the press conference in MER's back shop (*above photo*), with Kathy demonstrating on the local news.

Yep, always reaching.



P r i m e M o v e r s ENGINES

BMEP & Horsepower

A horse is a horse, of course, of course—but when shopping horsepower, all horses are not created equal. Probably the most important factor you can use to compare one engine against another is what's known as BMEP—**Brake Mean Effective Pressure**. Repowering? Check this out:

"If you look at just the horsepower," says Mike Hoyt, "you know what the engine's capable of but not how much you're stressing it to get it there."

When looking at how hard the engine physically works to perform the job you can see how long it might last—dependably.

Rather than comparing just the horsepower of an engine, **BMEP is the yardstick measuring engine longevity and reliability**. It's the best measure of how efficiently an engine utilizes its piston displacement—not to be confused with fuel efficiency, a related subject we'll cover in an upcoming issue.

So the higher the BMEP, harder the engine's working. With two engines rated 800 HP, the first a 300-in³ displacement, the second 400 in³—the first works harder. All things being equal, of course, which they aren't—things like metallurgy, quality of construction, serviceability, thermal efficiency.

A high-output, low-displacement engine with high rpm will get a very high BMEP. A dragster or race-car driver looks for the highest BMEP they can get—maybe even breaking 200 psi with customized gas engines and 300 psi with high-output diesels. The trade-off is whether it'll get you through the race or not. Lower BMEP gives an

engine longer life expectancy; the difference is—the other one will win the race.

So what's your objective—to be in the race for as long as possible, or to win it?

If BMEP's not listed in the engine manufacturer's technical data you can calculate it if you know the engine's **power** (brake horsepower—BHP), **speed** (rpm), and cubic-inch **displacement**.

Here's how:

BMEP formulas (with given constants)

2-cycle: BMEP (psi)
= 396,000 x BHP ÷ rpm x in³
= 75.4 x lb-ft ÷ in³

4-cycle: BMEP (psi)
= 792,000 x BHP ÷ rpm x in³
= 150.8 x lb-ft ÷ in³

80 psi is an old rule-of-thumb BMEP for a workboat, sometimes used to specify a continuous load rating for a naturally aspirated engine.



Horses of a different color

coming soon: fuel efficiency



1 HP = the energy required to lift 550 lbs. 1 vertical foot in 1 sec., **but all horses are not created equal**. Although each horse is 1 horsepower, this colt would have a high BMEP to perform the same work as the mare.

BMEP tells you how much work you'll get from your horses in order to make side-by-side comparisons of similar engines.



Ivan &
Jody Fox,
2004

From the Founder ...

Ivan Fox Remembers—1964!

Looking back 40 years we asked Ivan to recall the year he and Larry Schusted started MER with a little shop in Ballard. Alaska in '64 leads to one universal memory—EARTHQUAKE. Good Friday, March 27: The Fox family watched the rising tsunami tide lap against the bluff below from a motel in Tillamook, Ore. After the quake—Kodiak, in his own words ...

The tidal wave was a disaster for Kodiak Island. It was on a Friday. I went to Kodiak the following Tuesday expecting the city to be gone. It wasn't as bad as I expected but the damage was catastrophic.

The channel went dry and when the water returned it scoured the channel taking out canneries and all other facilities. The vessel *Jaguar* was in the channel and went dry. The crew jumped off and ran ashore except the cook, passed out drunk in his bunk. The cook died; they raised the *Jaguar* several years later. The power barge *Selief* ended up in town several hundred yards from the water, one person sleeping onboard slept through the whole event.

All the canneries were gone. When the Alaska Packers plant went out to sea they wanted to get something back together right away. They purchased a WWII liberty ship outfitted in the Lower 48 and towed it to Kodiak to continue processing. The vessel was renamed the *Star of Kodiak*—they were building those ships one a day in the war. Kodiak Fisheries and San Juan Fishing & Packing Co. had a joint venture that went away with the tide, a crab processing plant located in the channel. They all got out. Last one out was the bookkeeper, with his records. As he went out the plant floated away.

It was eerie going into that town after the tidal wave. There was an unusual quietness that had settled over the area, a lot of debris and building parts floating all over—the water was full of stuff. There was looting where the bars had been, all the booze washed up. It was a pleasant surprise to find the Kodiak Hotel operating as usual, where I spent a couple of days. Airlines salvaged a couple planes, went over to Uganik to see what damage we had.



NEXT ISSUE: Ivan remembers Uganik after the quake.

