Gearhead

BY STEVE D'ANTONIO

And the Survey Says…Nothing

"Steve, attached please find the reports from the engine survey and oil analysis, I hope they are more intelligible to you than they are to me, because I have no idea how to read them." That line, from a client whose vessel's engines were recently surveyed by two factory-trained mechanics, expresses a small element of frustration that echoes an observation of mine.

Far too many professionals in the marine industry are guilty of failing to provide to customers intelligible, plainspoken language that supports their observations, analyses and reports. In my work as a consultant for those buying boats or having them built, I'm subject to this all-too-frustrating onslaught of information that is nearly useless to those receiving it. I often act in the capacity of translator, or worse, the one who identifies errors.

I was guilty of this until an engineer from the Smithsonian Institution enlightened me several years ago. He had retained me to carry out a series of inspections and recommendations for the Institution's fleet of vessels. After submitting the first draft of my report to him, he responded saying, "This looks good, lots of detailed info, however, it needs an executive summary."

At first I balked. An executive summary? Why? Everything the reader needs to know is contained within the report.

After a conversation with him, however, I realized he was right. Among other things, if the report was not easily understood by those who had commissioned it, likely I would not be retained again in the future, and those who can't understand raw reports are prone to asking questions; questions I would only be forced to spend valuable time answering later.

An executive summary, a synopsis and interpretation of the findings that is capsulized and designed specifically for those whose time is precious, who may be unable or disinclined to read a detailed report that is laced with the technical argot of the marine trades, should be an essential element of the product produced by a professional.

Excluding such a summary invites misunderstanding, frustration or a failure to act where action is the desired intent. You should, therefore, make your expectations clear regarding this critical information in advance of retaining any professional to prepare a report.

That client note, accompanied by the oil analysis and engine survey reports, was a glaring example of this transgression. The summary "report" from the engine dealer was literally a mass of columns of numbers, disgorged directly from the engine's ECU, which represented various engine readings, temperatures, pressures, etc.

What it lacked was a simple paragraph or even a single sentence that said something along the lines of "all of the readings obtained on the sea trial were within the engine manufacturer's specifications; no action is required or recommended," or "highlighted observations fall outside the manufacturer's specifications, the following actions are recommended."

The note included no personal observations from the two mechanics. Were there any defects? Was anything out of the ordinary? Were any changes or upgrades recommended?

Not all problems and defects surrounding engine operation or installation are obvious, and many are only indirectly related to the engine. Engine instrumentation, especially that used on electronically controlled engines, can be a wellspring of information, from percentage of load to fuel restriction. However, there's no substitute for other tests, such as exhaust back pressure, which require the use of a manometer that is temporarily plumbed to the exhaust system.

Steve D'Antonio

My observations for the engines alone included 11 citations, at least three of which could be deemed critical: a loose motor mount (which affected alignment and thus transmission and shaft wear), exposed block heater wiring (an electrocution risk) and exhaust riser temperatures that were well above the limit established by ABYC standards (a potential burn and fire hazard).

If this were an exception, I wouldn't bother writing this column, but it's the norm. Customers who pay for an analysis from an expert, particularly a factory-trained dealer or technician, are entitled to the benefit of their training

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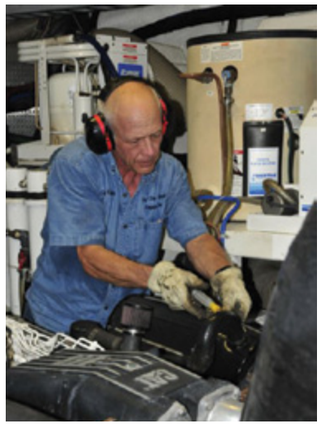
While carrying out engine surveys, savvy mechanics should be able to look beyond the engine manufacturer's checklist and spot defects and impending failures.



and experience, rather than checked boxes.

Particularly where engine surveys are carried out, I expect factory-trained mechanics to identify any details that violate the engine manufacturer's installation guidelines (you should use those words when calling on dealers to review installations, from watermakers to engines). After all, who is or should be better qualified to provide such observations? Oil analysis reports also fall squarely into this category.

To some extent we can blame the labs for the lack of detail or a summary understandable to boat owners or buyers or even a professional. Most labs don't cater to laypeople, making it the responsibility of those taking the samples and sending them out to either choose a lab that does provide useful summaries with reports (they do exist, see Gearhead, *PassageMaker*, March '13) or they should be prepared to interpret the results for the customer.

Unless you count the invoice, the oil analysis report in the above case was sent to the customer sans detail or explanation. When I read it I immediately noticed two glaring flaws. First, the "unit time" and "lube time" hours were erroneously shown as zero, which essentially told the lab that this was new, unused equipment. Of course that wasn't true; this was a used vessel with over 800 hours on the clock.

The second flaw involved the lab itself, which indicated that all results were "normal." That, however, also represented what should have been an unmistakable signal that something was amiss. How could "new" zero-hour oil contain any contaminants, copper, aluminum, iron, sodium, some in appreciable quantities, as these samples invariably did? Had the analysis reports been reviewed by a professional in preparation for drafting the executive summary, these errors would have been identified before they reached my eyes.

Ultimately, failure to provide executive summaries is a result of poor training and the ability to get away with it–if no one balks and the phone keeps ringing, why make a change? Those who do provide such summaries, on the other hand, exhibit the sort of professionalism many boat owners and buyers expect, or at least hope for, while enjoying greater customer loyalty and the resultant financial reward.

Steve D'Antonio

Ask Steve

OVERHEATING ALTERNATOR

Steve, in my 2008 Nordic Tug 37, I replaced the 440-amp-hour house battery bank with a 660-amp bank of Lifeline AGMs to reduce the frequency of charging. Also, to try to get more charging done while under way, I installed a Balmar MC-614 external voltage regulator on the original 160-amp Delco Remy 24SI alternator that came with the Cummins QSB5.9 electronic diesel engine, so I'd get a three-stage charging profile–at Lifeline's specified voltages–out of the alternator. (Note: my boat uses Blue Sea's ACRs to manage the charging process among the start, house and windlass/bow thruster battery banks.)

While cruising the past three months, I quickly noted that when the batteries were down to about a 60-percent state of charge and I started the engine to move on to another anchorage, the initial charge rate was great (say ~130 net amps going into the house bank of batteries).

However, the charge rate ramped down much sooner than it should have. I began to study the readout on the Balmar regulator and discovered it was reporting the alternator had overheated. In that case, the regulator automatically cuts the charging in half to protect the alternator.

I began to use the regulator's "belt load manager" feature to lighten the load on the alternator. Eventually I had to cut the demand by almost 50 percent to prevent any further overheating, thereby almost eliminating the benefits of having the Balmar regulator and its three-stage charging profile.

I called Balmar and ordered the larger Series 95, 210-amp alternator. I eventually installed it at the end of July, along with larger ground and positive output cables. While this alternator certainly put out a much better charge, right away I noticed the engine rpm would bounce around, whether at idle, fast idle, displacement cruising or planing. Also, you could hear and feel the unevenness.

I had the same symptoms whether the batteries were fully charged or in need of significant charging. I also noted that the Cummins Vessel View readout for gph fuel consumption was about half the normal, at any given speed, and similarly the percent-load readout was reporting about half the usual load for any given rpm.

Balmar advised that this alternator has been installed on large numbers of the Cummins QSB5.9 engines and that they have never had this problem reported. They provided me with a range of tests to fix what they felt was some sort of electromagnetic interference from the regulator and/or alternator with the Cummins electronic controls, none of which worked.

I had an alternator shop bench

test the Delco Remy 24SI and they reported it was working properly. Later, I spoke at length with a Delco technical representative about the 24SI that came with the Cummins QSB5.9. They concluded I was putting too much demand on it and recommended that I consider one of their larger alternators.

I've spoken with our local Cummins office service manager, who has never heard of an issue like mine. I also corresponded by email with a Cummins engineer and he, too, had never heard of a problem like mine.

Balmar has agreed to refund my money. They will also test the alternator when they receive it back from my supplier. I am, of course, hoping that they find the alternator is not operating properly and will simply provide a replacement and that will solve the problem, but I am not optimistic that this will be the outcome.

I'm not sure what direction to head next to solve this problem. Any suggestions would be appreciated. Thanks very much.

Stephen Hill
Nordic Tug 37 / Tug'n
Oakville, Ontarioe

Stephen, while not unheard of, your experience with an aftermarket high-output alternator installation is atypical. If you were being advised by a professional regarding the interconnection of the Balmar regulator and the stock alternator, then I'm disappointed, as doing so violates many of the basic tenets of these systems. Conventional alternators, regardless of their size, are for the most part incapable of producing near-maximum output. You have taken the preferred approach, albeit circuitously, of installing a high-output, continuous-duty alternator.

As for the anomalies you are seeing, I have seen this on a handful of occasions, and in each case it was the result of low voltage on the engine's start battery and DC bus rather than EM interference. However, EMI should not be ruled out. Output cables from the alternator should leave the engine immediately, rather than being routed over or around it, and they should not parallel the engine's wiring harness. It's always best for these to cross at right angles.

Electronically controlled engines are sensitive to voltage fluctuations and low voltage. The output of the alternator should be routed directly to the house battery bank, with other devices then distributing charge to the start and other batteries. If this device is malfunctioning, or not wired properly, or if there are faults that are causing high resistance, it can confuse the engine's electronic control unit.

First, try closing the switch between the house and start batteries. If doing so alleviates the problem it's likely there is an issue with the paralleling device or its wiring. These can be identified by first monitoring the voltage at

alternator output.

Second, with the parallel switch open, if it is fluctuating, then the problem is likely in the alternator or regulator, and further basic troubleshooting can be used to determine which of the two it is.

Third, if it is steady, then monitor the voltage at the engine, at the power supply for the engine's harness, with a digital voltmeter, all while the symptoms are occurring. The voltage should remain essentially steady. If it fluctuates compared to the voltage at the house bank, the problem is somewhere between the two. —Steve D'Antonio

OVERHEATING VOLVO PENTAS

Steve, I have a 40-foot express cruiser with pod drives. They are Volvo Penta IPS 500s (370hp). At cruise speed, about 30–32mph and 3000–3100 rpm, the coolant temperature holds steady at 185°F. However, at wide-open throttle, about 3500 rpm or so, after a few minutes, the temperature starts going up and passes 205°F and the overheat alarms activate.

When throttled back to cruise rpm, the temperature comes back down to 185°F. Both engines do the same thing. The engines have almost 1,000 hours on them and have lived primarily in salt water. The coolant levels are normal. The impellers have been replaced. The heat exchangers have been flushed with Barnacle Buster, circulated through the systems for a couple of hours at least. The intake grills in the drives look clear. Yet the problem persists.

Though this doesn't affect cruising at this time, it seems as if something is marginal and could get worse and potentially cause problems. Where do I go/what do I do next? Your thoughts would be appreciated.

David Scott
Fredericksburg, Virginia

David, overheating problems should be straightforward to diagnose; there are a limited number of possible causes. When the obvious areas that you've already covered don't pan out, using an infrared pyrometer and a vacuum gauge often yields results. Before you resort to these, however, it's important to understand whether this problem has existed since the vessel was new or if it is a recent development. If the former, then it's an inherent defect, likely one that involves water flow to or through the raw-water intake on the drive, or water flow to and through the exhaust system. Restricted exhaust water flow at the injected elbows can lead to overheating. It remains the responsibility of the vessel's dealer and/or Volvo to identify the cause of the problem.

Measuring the vacuum at the intake hose between the pump and the intake valve on the drive will determine if there

is a restriction. Inserting a section of clear reinforced hose (it's under vacuum, which means it must be reinforced to prevent collapse) will also identify any ingress of air, which could cause overheating.

The fact that both engines are exhibiting the same behavior makes it more likely this is a common, rather than esoteric, problem. If it recently manifested itself, then wear-and-tear items should be checked. You mentioned that the impellers were replaced, but were the pumps' cams and cover plates also replaced? If not, their flow rate may be diminished as a result. In addition to being chemically cleaned, was the heat exchanger opened? If not, it should be inspected internally for material that cannot be dissolved by the cleaning solution, such as rubber and plastic.

Was the heat exchanger's closed or coolant side cleaned? In rare cases, and after other possibilities have been exhausted, an insulating film, one that cannot be seen or felt, forms on the coolant side of the heat-exchanger tubes. This can be removed chemically. The wet exhaust temperature should be checked as well, if it's too high (anything over about 150°F is cause for concern, with 200°F as the absolute limit), the injected elbows it may be clogged or restricted.

If the temperature of the raw water exiting the heat exchanger is more than 20–25 degrees F higher than the temperature of the water entering the heat exchanger (the temperature of the water in which the vessel is operating), then it's likely the water is moving too slowly, which points to a restriction, air or a pump issue. —Steve D'Antonio

CORRODING CONNECTION

Steve, I read your article on electrolysis, and I recently had an issue with my prop, strut and through-hulls being attacked quite suddenly. Upon taking apart my shore connector (on a French boat) I found a brown wire going to hot, light blue wire for common and green with yellow stripe attached to ground. The blue common wire was very loosely connected. Based on your article it seems likely this may be the cause of the sudden destruction of underwater metal, can you confirm my suspicion?

Sean Quine
Channel Islands Harbor, California

Sean, with that information, no, I'm afraid I can't confirm the cause of the corrosion. The possibilities are nearly endless.

However, I can say that the shore power itself is almost never the cause of corrosion, and a poor connection on the shore power safety ground, the green with yellow stripe, would in fact reduce the likelihood of corrosion, rather than causing it. Yet, that connection is vital and absolutely necessary for conveying fault current safely to ground, so that circuit must always be well maintained.

If you don't already have a galvanic isolator, consider installing one. Installed in that shore power green grounding wire, it will prevent galvanic corrosion from occurring with other vessels on the same or nearby docks. If, however, the corrosion came on suddenly and it's severe, it's likely stray current. That sort of corrosion nearly always originates aboard your own vessel.

To be certain about the cause of the corrosion, consider the following: Was it pitting or loss of paint around this hardware, etc? Have an ABYC Certified Corrosion Technician carry out a bonding system inspection, while looking for a source of stray current corrosion, and reference electrode test. The latter will paint a very clear picture of the vessel's corrosion protection. You can find these technicians on ABYC's website at www.abycinc.org. —Steve D'Antonio