Gearhead

BY STEVE D'ANTONIO

Engine Room Clues

Techniques and tools for spotting trouble before it becomes a crisis

Checking the engine room is a task most cruisers know they are supposed to do, but it's not always clear what they are supposed to do once there. During a telephone troubleshooting session I asked a client if he had recently carried out an engine room check. He asked me to hold on a moment, and when he returned he said, "I checked the engine room, yep, the engine's still there."

He was joking, of course, and most folks understand the importance of this task and take it seriously. Yet, what exactly is being checked varies considerably from vessel to vessel and skipper to skipper.

WALK-THROUGH

When I evaluate a vessel, I carry out a pre-start-up inspection of the engine room, following a routine I've established over the course of many years and many hours in engine rooms. Routines are important aboard your vessel because they establish regularity, and regularity thwarts the tendency to forget or overlook items, some of which can be critical.

While in my case it's a different engine room every time, my routine begins in the same location in the engine room–port forward each and every time. (I use the same technique for scanning hotel rooms before checking out, to avoid leaving belongings behind.)

There are two goals in this process, the first one is obvious: Look for and expose problems or potential problems. Beginning at that location I walk, look, touch and sniff my way around the space in a counterclockwise rotation, using my senses to identify anything that might be loose, chafing, overheating, leaking or otherwise out of the ordinary.

The second goal is less obvious: Aboard your own vessel, doing this over and over again will establish an intimacy with this space, virtually guaranteeing that anything that changes will capture your attention, which, once again, drives home the need to establish and follow a routine.

CHECKLIST

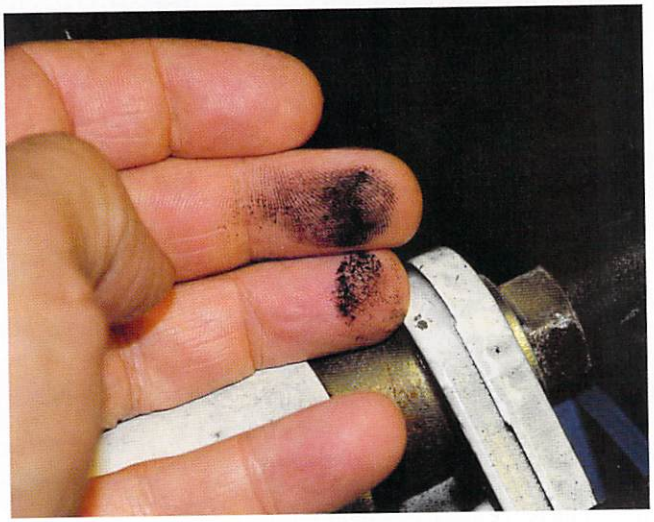
While not an exhaustive list, specific areas to check include: All fluid levels, crankcase oil, transmission fluid, coolant for all engines (check the recovery bottle every time and under the pressure cap at least monthly) and hydraulic fluid.

Belt tension and signs of misalignment and slippage (misaligned belts generate fine dust, while slipping belts overheat, which causes them to become brittle, cracked and shiny on the surface that touches the pulley).

Transmission and throttle cable linkages (look for loose parts or wear on pivot pins and eye terminals, retaining clips should be safety wired).

Fixed fire suppression system charge, pressure switch wiring and manual cable engagement (loose switch wiring can lead to an unplanned engine shut down or failure to start–make sure the service pin is removed, enabling the extinguisher to be manually discharged).

Those carrying out engine room checks, both underway and at rest, must be ever vigilant for loose fasteners.



Excessive, rapid accumulation of belt dust is often an indication of misalignment of a component or automatic tensioner.

Place your fingers on every one of the shaft coupling and motor mount fasteners, all should be tight.

Look for signs of fretting, fine brown dust that is generated when ferrous metal parts move against each other.

Check the security of the exhaust system looking for signs of leaks, salt and soot, and loose hardware, especially support struts.

Look for signs of coolant and seawater leaks on engine hoses and expansion tanks–seawater and coolant leave behind distinct residue even when dry or "cooked" by engine heat. Mark the location of the coolant in each recovery bottle; it should rise above this mark when the engine is hot and return to it after the engine has cooled off. If coolant returns to a level lower than the mark, there's likely a leak somewhere in the system.

UNDER WAY

Working in an engine room while a vessel is under way presents inherent risks that must be taken seriously. Ideally, belts and pulleys should reside behind or under guards. While this is de rigueur for new engines, many older models provide no such protection. Move through this space carefully and deliberately, don't rush.

As someone who spends a great deal of time in engine rooms, I routinely remind myself to move carefully. A few years ago while conducting an engine room check in stocking feet, I slid on a slick gelcoat deck. My foot grazed the rotating shaft coupling, which was equipped with a set screw and seizing wire, the bitter end of which yanked a few threads out of my sock. It was a close call and a stark reminder that rotating machinery and limbs don't mix.

While on the subject of personal safety, when entering an engine room, ear and eye protection is a prerequisite; avoid wearing loose clothing, drawstrings or hooded sweatshirts.

Fuel vacuum gauges should be installed at every primary fuel filter. If they are the recording variety and they should be, note and reset the position of the drag needle before getting under way. During the underway check, review this gauge once again–anything above 5 inches Hg is cause for concern, anything over 10 inches Hg calls for filter element replacement, or switching to a clean filter, as soon as possible. If your air filter is equipped with a vacuum gauge, be sure to have a look at it as well.

Your most effective tools for these checks remain the ones you were born with: sight, smell, touch and hearing.

Leaking fuel and coolant, particularly if they are leaking onto a hot surface, have a distinctive smell. Even if the source isn't immediately obvious, don't ignore these clues.

Your next most effective tool is an infrared pyrometer. The checklist for areas where it can be used is a long one; however, a brief list follows below. As good as IR pyrometers are, they are not foolproof, and their results can be skewed by highly reflective surfaces like chrome or polished stainless steel. This can be overcome by placing black adhesive tape over the location to be measured.

Because a pyrometer's typical sensing footprint is cone-shaped, its accuracy is diminished as the distance to the object being measured increases. Therefore, no more than a few inches should separate the gun from the surface whose temperature it's measuring. Make note of typical temperatures so you can later identify anomalies and trends.

IR CHECKLIST

Alternator: Wave the IR pyrometer around the alternator case while holding the trigger, use the highest reading.

Exhaust, dry and wet: No part of the exhaust system that can be touched should exceed 200°F. Ideally, the wet portion, the parts that rely on hose and fiberglass pipe, shouldn't exceed 160°F. Use the same scanning technique as you would with the alternator, looking for the highest temperature.

Stuffing box: For both conventional and dripless, scan the stuffing box as well as the cutless bearing if one is installed in the shaft log just aft of the stuffing box. The temperature shouldn't exceed 30°F above the temperature through which the vessel is moving.

Coolant expansion tank (where the pressure cap is located): The temperature should be very close to that shown on your dashboard instrumentation, if it isn't, there's a problem.

Oil pan: Measure temperature at the vertical halfway mark on the side of the pan; ideal oil temperature is between 180°F and 220°F.

Thrust bearing, if equipped: Each manufacturer has its own protocol for maximum allowable temperature. Generally, anything over 165°F is an indication of a problem.

Finally, engine room checks aren't very useful if they aren't carried out regularly. While you can't check this space too often, doing so once every hour or two makes it likely that you'll identify problems before they become critical.

Ask Steve

A SPECIAL THANKS

Hi Steve, I just wanted to give you an update. We launched our boat this morning even though Georgian Bay is still very cold, I just couldn't wait any longer to see if my problem was fixed!

It ran like a charm for well over an hour and various speeds, the best it's ever run!

I had noticed there was no fuel in the hose when I went to change the anti-siphon valve so I knew right away it was bad. It broke as soon as I put slight pressure on the wrench to unscrew it so the five-minute job turned into a couple of hours. I had to remove the fitting from the top of the fuel tank, drill out the old valve and re-tap the threads, then install it back into a VERY tight spot but it sure was worth it.

I also replaced the fuel pump filter while I was at it and it looked like it had never been changed since the boat was new either!! I don't know what the marina mechanic did for all that money, but whatever it was, it's obvious now that they weren't the right repairs!

This really makes my *PassageMaker* subscription seem VERY cheap. I've always loved reading your column and articles and from now on they will have a very special meaning for me as we once again enjoy boating on Georgian Bay.

Dave Evans
Priceville, Ontario, Canada

While I'm sorry you had to endure so much of a hassle, I am glad to hear the fix worked. Enjoy and in the future make it clear to those carrying out repairs that you have expectations regarding the link between success and compensation. To paraphrase the old salvage operators contract language, 'no cure, no pay.'

—Steve D'Antonio

208 VOLT MISCONCEPTION RE: APRIL GEARHEAD

Steve, you made a comment in the April 2013 Gearhead column, "Inverter Shorepower Equation," noting "Foreign Powers," and the 50 cycles problems. We find boaters from the East Coast typically misconstrue a 208-volt reading as a voltage drop.

On the West Coast, industrial installations and marinas typically use a three-phase system (30/50/100 amps at 120 or 208 volts) at 60 cycles. Only in the metropolitan or large residential areas can you find a single-phase system (30/50 amps at 115/240 volts).

All U.S. marine equipment that is designed for 60 cycles, 240 volts can

utilize three-phase 208 systems and typically allow voltages as low as 200 volts.

The reduced voltage does drop the efficiency of the equipment, that is, motor speeds are a little slower and the temperature of heating or cooking equipment is slightly less, but a 208 voltage does no damage to the equipment.

N. Rondy Dike
Union SteamShip Co. Marina
Bowen Island, British Columbia

Rondy, You make an excellent observation, and on the surface of it you are absolutely correct. Many marinas provide 208VAC service, and most new motorized AC gear is capable of operating safely and reliably on 208VAC provided it is so rated (not all 240 volt gear is designed to operate on 208, commission plates will clearly indicate acceptable voltage; many older motors/compressors are not designed for 208 volts).

The lower, "line to neutral" voltage provided by this 208VAC Wye three-phase service, remains at a nominal 120VAC, which is correct. In my experience, there are, however, two potential problems with this arrangement when used aboard a boat:

1. When operating on 208 volts rather than 240VAC, motor loads like compressors draw higher amperage (and they produce more heat).

Provided wire and circuit breaker sizes take this into account, and that's not necessarily a given, it's not an issue. If, however, there is a voltage drop because of heavy loads on the dock, or undersized wiring, causing the voltage to drop below 208, it can lead to tripped circuit breakers during start up sequences.

2. Vessels that are equipped with isolation transformers (covered in detail in a recent *Channels* e-newsletter column), an increasingly common and otherwise worthy option, typically provide half of their input voltage to the 120VAC secondary or output. Thus, when supplied with 208VAC or 200VAC (I've seen voltage as low as 195 on long docks during the summer, when many boats are drawing heavy air conditioning loads), the output is then reduced to 104VAC, 100VAC or less, below the nominally acceptable voltage for 120VAC gear. If the vessel is equipped with a boosting transformer, and these are not especially common, then this voltage can be boosted back up to an acceptable range. Otherwise, it remains problematic.

Thus, while 208/120 may be common in some regions' marinas, it remains a potential problem for vessels that fall into the above-described categories. Ultimately, every vessel's AC electrical panel should be equipped with volt meters that display incoming AC shorepower voltage (it's an ABYC requirement), if it's below 110VAC, it shouldn't be used.

—*Steve D'Antonio*