CUMMINS ENGINE ALARM SYSTEM FAILURES –

HOW TO IMPROVE THE WAYS TO MONITOR ENGINE VITAL SYSTEMS AND PERFORMANCE PARAMETERS

This service topic explains ways to improve on the short comings of earlier Cummins mechanical injection engines gauge panels / alarm systems and how we can make your engine smarter, more reliable and fuel efficient.

Over the last few years we have noticed some of our customers' engines showing issues with lack of maintenance which resulted in loss of performance and in some cases catastrophic failures due to inoperable alarms and gradual overloading.

Please review the options available that can make you and your engines smarter, much like the current computer controlled common rail engines offered today.

Unlimited Yacht Services Inc. can assist you by evaluating what you have and recommending some or all combinations of these simple upgrades to make your engines smarter.

APPLIES TO: Cummins 6BTA5.9-Series 210-220HP 250-270HP 300-315HP 315-330HP 355-370HP
Cummins 6CTA8.3- Series 350HP 400HP 430-450HP

Most of the equipment manufactures can be viewed from our website:
www.unlimitedyachtservices.com

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ENGINE VITALS AND PERFORMANCE MONITORING then and now

MODERN DAY DIESELS (Cummins480CE Series- QSB-QSC-QSM-11)

All the new diesels on the market today have a computer brain (ECM –ECU) which allows the operator to monitor all aspects of the vital engine systems and performance data. The ECM of the engine adjusts itself to changing conditions to load, operating temperatures and boost pressures. This is how they make for a much cleaner fuel burn and economy. With electric injectors and waste gate turbo chargers, multi valve cylinder heads and the infinite control the ECM has over the amount and the way fuel is delivered into the cylinders are only some of the ways these new engines have an edge over the older style mechanical injected engines.

The other advantage is that they have numerous sensors to monitor the engines vital systems-both raw water and closed cooling systems, lubrication and fuel condition. When any aspects of these systems gets out of a safe operating parameter the ECM tells the operator with alarms (both visual/audible) and in some cases puts the engine in a power reduction mode to help prevent permanent damage to engine. Some of us mechanics say these engines are smarter than we are.

NOT SO OLD DIESELS Cummins B Series Diamonds or ReCons – C Series Diamonds or ReCons

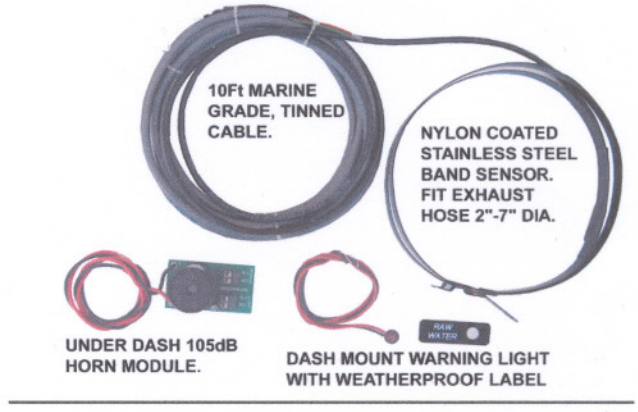
Before the use of ECMs, diesels had evolved and greatly improved the performance aspects by increasing fuel injection pressures, boost pressures and controlling air and fuel temperatures. So much so that a lot of these engines with HO (high output) rating are running on or near the ragged edge. That is alright as long as you do not go over the ragged edge. These engines had very few sensors to monitor vital systems and gave you little or no warning that something was up. The most critical was a loss of raw water. The most vulnerable was the Cummins engine that used the Cummins VDO analog gauge panels which used the same temperature and oil senders that ran the analog gauges to set off an alarm which was never loud enough. These had a small circuit board that measured the OHMs to the gauge to set off the alarm. This system had no redundancy. You are relying on only one VDO sensor/sender to never fail and operate correctly. The circuit board was especially susceptible to salt water and corrosion and often failed. If the alarm did go off it was hard to hear if you had engine noise or wind noise. On 50% of all the repowers that Unlimited Yacht Services was involved with, we did not use these Cummins panels and used more stylish gauges which had their own senders and a separate oil pressure and temperature switches to activate a buzzer or bell. This was a better system but lacked anything to tell you if you had a loss of raw water flow. If you did lose raw water flow the closed system would eventually get hot enough (210*) to set off the temperature alarm. That is alright for the engine but by then you had damaged the exhaust connections and possibly more down the line. Even someone who watches gauges continuously will have little chance of preventing this. These engines did not let you monitor load percentages, which if equipped with turbo boost and exhaust gas temperature gauges, you would know if the engine is operating at 100% of the designed (published) horse power and fuel burn curves. So in the following pages I will show you how we can make your engine smarter and safer by adding a few sensors, gauges and alarms.

ENGINE RAW WATER FLOW MONITORING

Loss of raw water flow due to blown pump impellor ,clogged intake or strainer will first start burning exhaust hoses and components and start over heating engine. The engine temp will rise slowly since the closed water system with antifreeze/coolant takes a minute or two to get hot enough to set off the engine temp. alarm. While that is happening, the exhaust system is getting cooked. Not good!!!

The first way to monitor this very critical system is to install an actual flow sensor in the plumbing going to the engine by hard plumbing to a thruhull or basket strainer or mounting inline of a hose.

The second way to monitor raw water flow is to keep tabs on the actual tempurature of the exhaust after the mixing elbow with a sensor band or strap pictured below.



These sensors can be tied into your existing bell or buzzer or better yet they can have their own audio/visual alarm.

BUZZER

BELL

LIGHT/BUZZER

BARE MINIMUM BASICS YOU NEED

As I mentioned on the first page, if you have the CumminsVDO analog gauge panel with their poor excuse for engine alarms system, we can add a separate alarm system to you engine to monitor the basic engine temp. and oil pressure very easily by installing an oil pressure switch and water temp switch on engine with it's own bell, buzzer, or light-buzzer combo .

Oil pressure switch sets off alarm at -10psi

water temp. switch sets off alarm at 210*+

Once you have these basics covered you still need to stay on top of that raw water flow.

SAMPLE OF THE DIFFERENT TYPE OF VISUAL/AUDIO ALARM PANELS WE OFFER

As you can see these can also cover single or twin engines with bilge water level, fire, with separate LED lights to guide you to the problem source faster

On top of having a good redundant alarm system in place to get your attention, you still need to have functioning gauges-water temp-oil pressure-tachometer-volt meter-hour meter, this too will help guide you to a problem faster especiallly with just audible alarms.

The next page will show you how we can make your older (non-ECM) engine even smarter by monitoring performance parameters which will help in loading, operation, fuel economy.

HOW TO MONITOR ENGINE PERFORMANCE OUTPUT

A couple of tools a good technician will use when called upon to determine power issues are the pyrometer gauge and turbo boost pressure gauge. This information is good to keep track of overall engine health and performance. Once a base line is established it can help the operator get the most out of that precious gallon of diesel.

EGT

By monitoring the EGT (exhaust gas temperature) you can tell if an engine is overloaded- which is a result of over propping, running gear issues or fouled bottom. If used with a tachometer you can tell where that sweet spot is, or if there is something that needs serviced.

TURBO BOOST

By monitoring your turbo boost pressure at the intake manifold you are able to tell if the charge air circuit is in proper working order (dirty air filters, plugged aftercoolers, loose connections, and worn turbo charger). Once again, along with using your tachometer, a good base line is established which can help the operator find that sweet spot.

All typical specifications are printed by Cummins (Marine Engine Performance Data Sheet) for example:

Cummins B- SERIES 330-HP specs.--- turbo boost pressure-27.5 PSI, EGT-905* @ RATED RPM & HP.

Most exhaust elbows already have a test port to install the thermal probe.

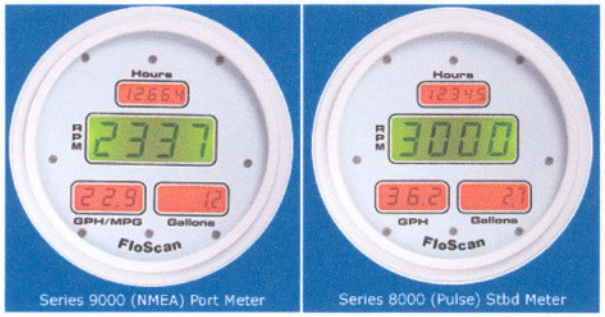
The combination gauge is 3" dia. And you will need one per engine to monitor both EGT and turbo boost pressures and is normally mounted near the throttle.

As long as your Cummins diesel can make it's rated RPM (preferably 100 more) and the boost and EGT are to spec., you can take the printed fuel burn curves to the bank

The products on the preceding pages are good for keeping track of engine vitals first and foremost, plus help in performance management as long as you have functioning and accurate tachometer for your mechanical injected engines. A step up from your analog tachometers would be the use of a digital tachometer which are always spot on and take the guess work out of what actual rpm is between the lines on the dial.

As mentioned earlier once all performance parameters are in check, that you can take the Cummins fuel burn curves to the bank as far as running the engines at that sweet spot and getting the most out of that gallon of diesel. Modern day ECM electronic diesels displays coupled with your GPS data will calculate for you at any RPM----Gallons per mile fuel burn, ----miles to empty (if connected to calibrated fuel tank level sensors)

To do the calculations to figure miles per gallon with the mechanical injection diesels will require some math on your part, which is not much fun when you should really be driving the boat. So to bring you and your engines into that level of modern day diesel technology you can install a FloScan system which gives you gallons per hour or miles per gallon (when connected to GPS data) and digital tachometers too.



Series 9000 (NMEA) Port Meter

Series 8000 (Pulse) Stbd Meter

On vessels with twin engines, keeping the engines in synchronization with each other will also help your fuel economy. Doing this manually is ok but installing an actual synchronizer or electronic engine controls sure makes life easier with improved drivability. These are just a few ways Unlimited Yacht Services Inc. can bring your current power up to today's standards by making your boat safer, more efficient, and reduce catastrophic failures. Give Ron a call to discuss any of this equipment and see which combination is best for your needs.