UNISERVICE/TURKIYE
VISWA LAB. FUEL ANALYSIS
BULTEN # 19

TECHNICAL UPDATE

UNDERSTANDING YOUR TURBO CHARGER

In an earlier technical update some of the turbo charger problems were addressed. This Update will attempt to help understand the function of the turbo charger from a practical point of view.

The turbo charger is a device that extracts energy from hot exhaust gases and transfers this energy to compress the charge air before feeding it to the diesel engine cylinder. What is unique about this device is that both the functions described above are mounted on the same shaft. Therefore a malfunction on the turbine side affects the air charger side and vice versa.

The turbo charger is a fairly rugged and reliable mechanical work horse. The energy that it absorbs from the exhaust gases is directly proportional to the mass of the exhaust gas, its velocity and the heat it loses (entry temperature less the exit temperature) in the turbine. When all the above parameters are at their maximum, the turbo charger rotates at maximum rpm, assuming that on the air charger side everything is fine.

What are the things that go wrong on the turbine side? If you have the fuel control at a lower point, the reduced quantity of fuel will have reduced exhaust gas energy to transfer to the turbine. On the other hand, with fuel control at the maximum, if the combustion in the cylinder is defective the exhaust temperature could be higher. There will be deposits forming due to burnt and unburnt hydro carbon particulates in the exhaust passage and also on the turbo charger nozzles and blades. This will have the effect of throttling the passage of exhaust gases through the turbo charge blades and will also adversely affect the heat transfer from the exhaust gases to the turbine. In this case the temperature of the gases exiting the turbine will also be higher. Hence, the energy absorbed by the turbine will be less. The net result will be for the turbo charger rpm to drop, again assuming that the air side is fine.

What about the air side now? If the air suction filter is choked the quantity of air entering the charge side is reduced. Since there is less work to be performed on this smaller quantity of air the turbine side of the turbo charger will have a tendency to speed up. In other words while defective combustion will bring down the turbine speed, defective air suction will increase the speed. **You may then have both defects and respectable turbo charger rpm giving you feeling of complacency if you are only observing the rpm!!**

This is not the end of the story!! You cleaned the turbine side and the air side of the turbo charger and you still do not see much improvement in the engine running. Now look at the passage of gases beyond the turbine and through the EGE. Measure the back pressure acting on the turbine side. It could well be high if the exhaust passage through the EGE is choked. This will slow down the turbo charger rpm.

At the root of all this would be a bad fuel with very poor ignition and combustion properties. Unfortunately, there are a lot of bunkering ports where the quality of the fuel is exactly this way. In an earlier Update we briefed you about fuels bunkered at Durban. You could very well experience all the problems detailed above. **So watch out!! Do not look at the turbo charger problems in isolation. It could well be the fuel you bunkered.**

Best regards,
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