



## Don't Kill Your Engine By Operating At Light Loads

### ◆ What happens when a diesel engine is operated at low loads?

- ◆ Diesel engines are designed to operate with a load and operate more efficiently in the 70 to 80% range of rated output. When a diesel engine operates for a long period of time below 40% it begins to over fuel. This happens because the injection tips begins to carbonize and disrupt the fuel spray pattern. The most common observation is wetness in the exhaust stack that looks like oil, thus the term wet stacking.

### ◆ What are the consequences of wet stacking?

- ◆ Continued use of the engine under wet stacking conditions can cause diminished engine performance, excessive fuel consumption, and even engine failure because of the following conditions:
  - ◆ Collection of unburned combustion products on exhaust valves, turbocharger and exhaust manifold
  - ◆ Poor cylinder wall lubrication and ring seating.
  - ◆ Cylinder wall glazing.
  - ◆ Excessive lube oil consumption.
  - ◆ Excessive unburned fuel in the exhaust system.
- ◆ All engines are designed to work within a specified load range and at specific temperatures. During combustion, the piston and liner are subject to extreme temperatures. The liners, piston rings and valve train are designed to work under these high temperature conditions. The fuel systems are calibrated to deliver the amount of fuel required to produce the rated horsepower. The cooling systems are designed to remove any excess heat generated to keep the combustion temperatures at optimum levels.

### ◆ When the engine is operated with light loads load the following can occur:

- ◆ Fuel is not completely burned off.
- ◆ The high temperature created during compression ignites diesel fuel. At idle or light loads the cooling capacity of engine exceeds the amount of heat produced creating combustion temperatures that are insufficient to burn all of the fuel. Some of the unburned fuel is left in the combustion chamber while the remainder is pushed through the exhaust system. It then mixes with the normal exhaust soot to create an oily mixture. Some will turn to sludge and gather on the valve stems where there is enough heat to dry it out but not burn it while the remainder is pushed into the exhaust system.
- ◆ Proper sealing between piston rings and liners is not achieved.
- ◆ Also, when engines run below the designed operational temperature, the piston rings do not expand sufficiently to adequately seal the space between the pistons and the cylinder walls. This results in unburned fuel and gases escaping into the oil pan and diluting the lubricating properties of the oil, leading to premature engine wear.
- ◆ A glaze is formed on the liner walls.
- ◆ In addition to pistons rings not expanding sufficiently to achieve proper sealing between the pistons and the liners, a glaze is also



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created on the cylinder wall by the unburned gases. This glaze interferes with the seating of the rings to the liner. If the glaze is allowed to remain for too long, loading the engine will not burn off the glaze and allow the rings to re-seal themselves. In severe cases the glaze can only be removed by disassembling the engine and re-honing the cylinder or liner.

- ◆ The most common complaint on lightly loaded engines is that oil is dripping out the turbo or exhaust connections. Most of this is fuel mixed with soot.

- ◆ **How to correct wet stacking?**

- ◆ Correcting a wet stacking condition can be as easy as applying a constant load (70-80% of rated output) to the engine to burn off the excess fuel and oil and reseat the rings. If the engine can be loaded, it needs run with a sustained load until the wet stacking condition clears up. Often, this can take up to two hours of run time at minimum output of 80% rated power. The exhaust temperature should be closely monitored during this time. If the exhaust temperature is not elevated to the desired temperature it will have no positive effect.

- ◆ **ESL advises its customers to avoid wet stacking and reiterates the reasons:**

- ◆ **Expense** - Excessive wet stacking will shorten engine life by many years and before planned replacement.

- ◆ **Power** - Even before an engine is damaged, deposits will reduce maximum power. A prematurely worn engine will have a lower maximum power than it was designed to develop.

- ◆ **Maintenance** - An engine experiencing wet stacking will require considerable more maintenance than an engine that is adequately loaded.

For more advice, please contact ESL at [customercare@eslpk.com](mailto:customercare@eslpk.com)