



## Run In Your New or Recently Overhauled Diesel Generator

- ◆ Most of the engine manufacturers claim that their engines do not require any running-in. Although current technology provides the means of manufacturing engine parts with unimaginable precision, the manufacturer may still fall short of achieving the near perfect fit that a proper running-in will provide. This running-in is all the more needed when the engine is put into service after an overhaul. The information below has been adapted from an article by Diesel engine experts at Ford Company. It shows what happens or can happen during the first few hundred hours of operating your generator.
- ◆ **What is running in?**
  - ◆ All engines but particularly diesels (because of high compression pressures) require some kind of running-in period. Running in is a term used to describe the allowing of the cylinder and piston ring surfaces to properly mate with each other when the engine is running. Properly mating these two surfaces is the aim of a correct run-in. It will help these two specific parts form a very tight union in each cylinder. A tight union is very important because it minimizes the escape of unburned fuel and pressurized gasses into the crankcase while further minimizing crankcase oil from entering the cylinder above the top compression ring.
- ◆ **Prevention of blow-by is the main reason for running in a diesel engine:**
  - ◆ During run-in, a minimal amount of compression blow-by oil-fuel dilution and oil consumption will be experienced. This is perfectly normal in new engines. However it is essential that these things be as close to nil as possible after running in is complete. Blow-by is the main reason the piston ring and cylinder wall need to fit together tightly. Diesel fuel is introduced into an air environment that is under extreme pressure in order for it to burn without an ignition source. When the fuel burns, the gasses produced multiply the compression pressure in the cylinder. Pressurized gasses that escape by means of the compression ring / cylinder wall interface are called blow-by gases. Pressure that escapes the cylinder in this manner results in a loss of energy. Whether it is pressure lost on compression or combustion, it is unable to be utilized to drive the piston through the power stroke. This loss ultimately results in:
    - ◆ A reduction of fuel economy
    - ◆ A reduction of power and
    - ◆ A reduction in engine's ability to sustain high torque loads over extended intervals.
- ◆ **Why should an engine not be subjected to heavy loads during the first few hundred hours of operation?**
  - ◆ In order for running in to be achieved reasonable amounts of heat friction and wear will take place before the compression rings will properly mate with the cylinder walls. When the piston rings and cylinder walls are new a modest amount of heat is created just from the friction of the new piston rings passing over the new cylinder wall surface.
  - ◆ While friction heat is significant the real heat is generated from the combustion of fuel in the cylinder. If enough fuel is introduced and burned the resulting gasses will actually expand the cylinder wall and the compression rings. Expanding these parts places additional pressure on them which creates more friction and correspondingly more heat. Heat is important to assist wear for running in but too much can cause major problems.
  - ◆ This is the reason we should not subject the engine to significant loading for the first few hundred hours of operation. Loading heavily will introduce more fuel into the cylinder and will add significant amounts of heat and pressure to the cylinder components. The engine oil lubricating the cylinder walls will flash burn when it contacts the hot piston rings. The burned oil will leave a hard enamel like residue on the cylinder wall commonly known as oil glazing.
  - ◆ The glaze has very smooth and friction free properties that do not allow it to be scraped away by the rings. This inhibits further metal-to-metal wear between the cylinder wall and rings preventing proper mating of piston ring and cylinder. The small gaps between the piston ring and cylinder surface will never seal. These spaces will then allow pressurized gasses and unburned fuel to escape into the crankcase while allowing oil from the crankcase to enter the cylinder above the top compression ring.
  - ◆ Once this glaze builds up the only repair is costly and requires disassembling the engine and re-honing the effected cylinders.
- ◆ **Running the engine at no or very light loads is equally disastrous:**
  - ◆ Running the engine at idle or under no load can create a similar condition to glazing. The piston rings need to expand slightly during this initial running in period just not so much that they overheat and flash the engine oil. The engine needs to be moderately loaded in order to run in correctly.
  - ◆ Running the engine under very light or no load prevents the oil film placed on the cylinder wall from being scraped away by the



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expanding compression rings. The rings will instead pass over the deposited oil film allowing it to be exposed to the cylinder combustion. The oil film will then partially burn on the cylinder leaving a residue that will build up and oxidize over time. Eventually this leaves a hard deposit on the cylinder wall that is very similar to the glaze left from flash burning. As a result:

- ◆ Oil consumption increases.
- ◆ The rings never really seat well if they cannot expand from the dynamics and heat that a load produces. Poor fuel economy results due to the passing of compression and combustion gasses around the compression rings.
- ◆ Also expect to see increased bearing wear and engine wear due to the fuel passing the rings diluting the engine oil.
- ◆ **Moderate loading say up to 50% is the answer:**
  - ◆ Moderate loading is the way to correctly run in for the first 200-300 hours. It permits the loose fitting piston rings to expand into the cylinder walls allowing them to perform as intended scraping oil off the cylinder wall and to create friction that will promote wearing the two surfaces in relation and proportion to each other. Moderate loading will permit the piston rings to get hot but not to the point where it will flash the lubricating oil supplied to the cylinder walls.
- ◆ **Running-in drastically improves the sealing potential of the piston rings and the liners:**
  - ◆ Once the rings and cylinder have bedded in they will have worn away a considerable amount of their roughness. They will wear slower than they did when they were new. This reduced wear rate indicates the end of running in and a decrease in oil consumption should be apparent. Blow-by and fuel dilution should also be reduced but may not be as evident. Eventually the cylinder wall wears to the shape of the ring and subsequent cylinder wear evolves to a polishing process. This extended process drastically improves the sealing potential of the cylinder that will correspondingly reduce blow-by and the amount of physical wear on these components.
- ◆ **In summary the best way to run in your diesel generator is as follows:**
  - ◆ **DO NOT** run the engine hard for the first 200-300 hours.
  - ◆ **DO NOT** let the engine idle for more than five (5) minutes at any one time during the first 200-300 hours.
  - ◆ **DO** put a load on the engine (70%, 80% or even more) at around 300 hours and get the thing hot! Diesels are designed to work and in many cases they operate best under a load.
  - ◆ We can now understand that running in is important if you wish to maximize the possibility of your generator reach full efficiency. Please contact ESL at [customercare@eslpk.com](mailto:customercare@eslpk.com) to provide additional help to obtain maximum fuel efficiency and power out of your engine and thousands of hours of trouble free operation specially after an expensive overhaul, which is just not replacement of few parts. There is much more to it, which should only be left in the hands of experts.