Diesel Fuel Fired Heaters- Effect on the Environment

West Coast Collaborative 2014

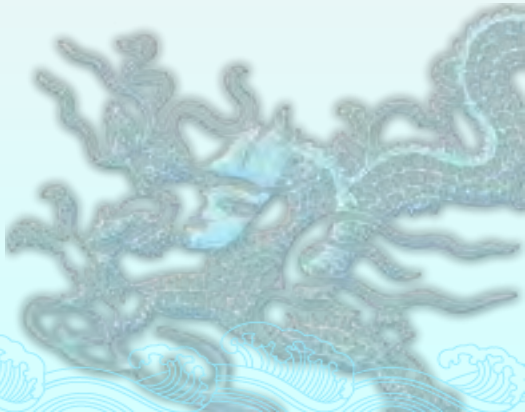
Diesel Engines

What constitutes a cold start?

Cold start is equivalent to 800 miles of driving ,
1 hour of non-use, external (ambient) temperature less than 140 degrees.

1 hour of idle time equals 33 miles of driving

If a engine's normal operating temperature is 185, understand that 75 is cold… The vehicle may start easier than it would at 40, but it still causes wear damage to the key components (engine, turbo, emissions, DPF), uses more fuel and emits more PM.



Fuel Savings

WA Dept. of Ecology funding provides;

Off Road findings support the benefit of pre-heating.

<u>Fuel savings from Cargo Handling Equip.</u>

	Webasto Fuel Fired Heater
Top Pick @ idle 1.25 GPH	.25 GPH
Top Pick under load 9.8 GPH	.45 GPH

Top Pick is put under load to expedite the warming of hydraulic fluid. Webasto pre-heat system with hydraulic warming uses less than .50 GPH in place of running engines under load.

Fuel Savings and More

Key Points on pre-heating – more than Fuel savings

Engine oil temp is already warm at start up. This decreases the amount of blow by past the piston rings. This helps reduce oil in the exhaust, that can damage the DPF.

Exhaust temperatures that the DPF needs to regenerate are increased more rapidly. Reducing the warm up time of the DPF and decreasing the chance of face plugging. The DPF will then be immediately more efficient at start up.

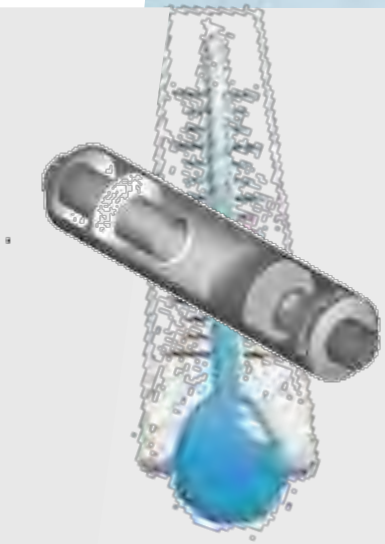
PM is reduced significantly during engine warm up period. Reducing the burden on the DPF.

Cleaning intervals of the DPF are now extended.

Reduces face plugging of the DPF

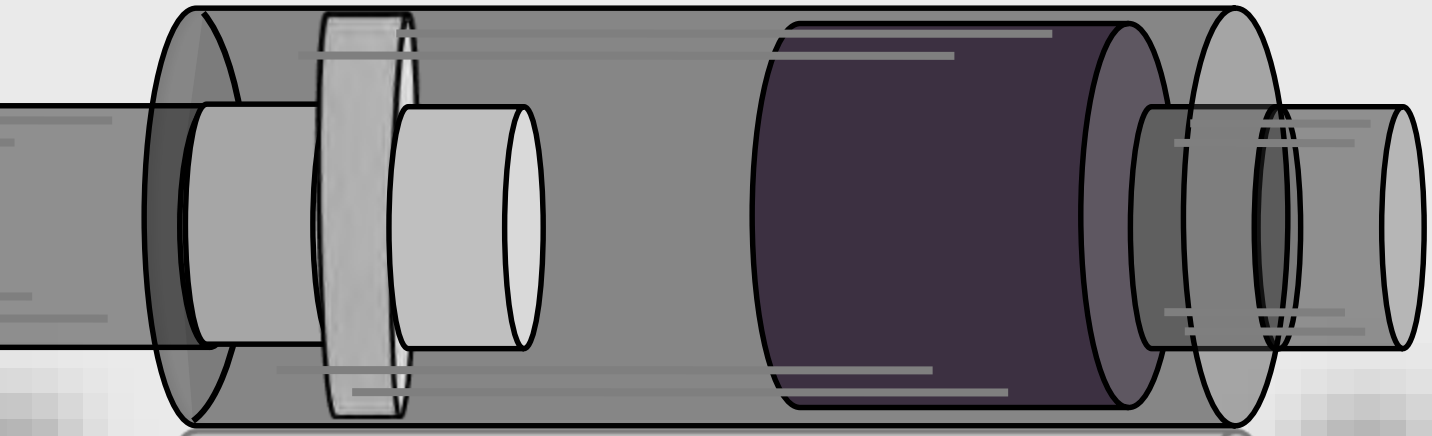
Reduces Turbo and engine wear and engine related maintenance.

Negative Impacts of a Cold Engine / Diesel Particulate Filter (DPF)



Issues Related to a Cold Start:

- More PM produced – Environment and DPF
- Engine and DPF efficiency is reduced, adding expense
  - Fuel, Regeneration, Cleanings, Replacement
  - Maintenance, Vehicle Downtime, Cleanings
- Shortened DPF life cycles (Regeneration and Cleanings)
  - Are not as effective in protecting the environment



Independent Emission Test Lab Report

Table 1: Emission Summary for tests conducted at cold weather conditions

Engine Starting Condition	CO (g/bhp-hr)	CO_2 (g/bhp-hr)	HC (g/bhp-hr)	NO_x (g/bhp-hr)	PM (g/bhp-hr)
40° F	1.02	685	0.09	5.68	0.1911
155° F	0.73	631	0.08	3.39	0.0650
% reduction from 40° F to 155° F	29%	8%	11%	40%	66%

Table 2: Emission Summary for tests conducted at normal ambient conditions

Engine Starting Condition	CO (g/bhp-hr)	CO_2 (g/bhp-hr)	HC (g/bhp-hr)	NO_x (g/bhp-hr)	PM (g/bhp-hr)
75° F	0.69	646	0.05	3.82	0.0936
155° F	0.26	611	0.05	2.24	0.0679
% reduction from 75° F to 155° F	62%	5%	0%	41%	27%

Note: **Tables 1 & 2 present the summary overview for the test results as generated by the IETL. The detailed calculations and steps taken to generate these numbers will be provided upon request.**

Scenario Excerpt

A update on the Webasto heaters installed for us here at APL.
The TSL 17 unit on our UTRs have really changed our cold weather routine here at APL .
The real difference we see on our C7 cat engines is the crank time on cold mornings. These engines are hard to start even in mild weather our crank time has reduced dramatically.
This will save batteries, jump starts and general wear and tear in my opinion also defrost time on the freezing days.
We have a large fleet of Cummins engines that start easier than the C7s, we see the same benefits.
The four 2008 Taylor top picks that have your Thermo 90ST D and the hydra liners in hydraulic system also benefit the same as our UTRs.
The Taylors have as set of variable displacement hydraulic pumps which will not operate until hydraulic fluid is up to set temperature, which the hydra liners aid in a quicker operational machine.
In all we are seeing less idle time, warmer units in am and probably **less engine wear and tear.**

-Robert Hammerly, APL