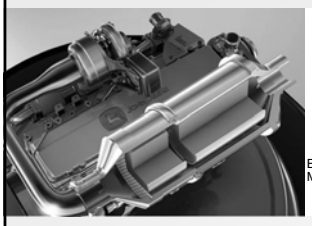

The Evils of Idling and How to Avoid Them

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Idling Evils

- Diesel engine combustion is optimized for hot engine operation.
- Prolonged idling causes the engine coolant temperature to fall below its normal operating range.
- When engine coolant temperature falls below its normal operating range, incomplete fuel combustion can occur.
- When incomplete combustion occurs, partially burned and unburned fuel ends up in the crankcase.

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Continued.

- Unburned fuel can cause crankcase oil dilution and partially burned fuel results in the formation of “gummy” deposits on valves, pistons and piston rings.
- Fuel dilution of the engine oil can lead to engine wear by lowering engine oil viscosity and additive concentration.
- Unburned and partially burned fuel promotes the rapid accumulation of engine sludge in the crankcase; and soot, unburned hydrocarbons and carbon monoxide in the exhaust.

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Cylinder Glazing

- Cylinder glazing from excessive idling can occur at any time and is especially critical during engine break-in.
- If an engine is improperly broken in, it can affect the life of the engine.
- Proper engine break-in is necessary to seat the piston rings against the cylinder walls to minimize both oil consumption and combustion gas blow-by.
- The cylinder walls are honed to produce a cross-hatched pattern that consists of microscopic peaks and valleys.

Continued.

- If an engine is properly broken in, the initial sharp peaks of the cross-hatching are flattened by the interaction with the rings.
- The flattened peaks provide a bearing surface for the piston rings to seal against the cylinder walls, while the valleys provide an oil reservoir for lubrication.
- Cylinder glazing occurs when products of incomplete combustion deposit on the cylinder liner.
- With an improper break-in, the peaks can remain sharp allowing excessive oil retention in the valleys or if the peaks roll over into the valleys (glazing), it prevents necessary oil retention.

Continued.

- If hot combustion gases and combustion by-products are allowed to go past the rings and into the crankcase, blow-by occurs.
- With excessive blow-by, engine oil becomes contaminated with combustion gases and by-products.
- The pressurized crankcase expels oil vapor through the crankcase ventilation system into the atmosphere or air intake system.
- If the peaks are not flattened during break-in, oil consumption will be increased.

Continued.

- Any excess oil in the cylinder wall valleys will be burned during the combustion stroke.
- Glazing can also occur during excessive low temperature operation.
- Because glazing causes improper sealing, it impairs engine compression and can result in power loss.

New Cylinder

Glazed Cylinder

Wet Stacking (Slobber)

- Wet stacking (slobber) is caused by excessive idling and no-load run time.
- Wet stacking is an accumulation of unburned combustion gases, lube oil, condensed water and acids. It indicates that low temperature combustion is taking place. It is also unsightly.
- The exhaust mixture of unburned combustion gases, lube oil, condensed water and acids can have a negative impact on injector tips, turbochargers and valve seats.

Financial Impact of Excessive Idling

- Argonne National Laboratory (ANL) has developed a calculation model to determine the cost of excessive idling.
- It is set up on an MS Excel spreadsheet.
- It requires a number of inputs including:
  - Fuel Consumption During Idling, (gal/hr)
  - Cost of an Oil Change, ($/oil change)
  - Cost of an Engine Overhaul, ($/overhaul)

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ANL Calculation Model

How Much Could You Save by Idling Less?

Instructions: Fill in the blue cells with information about your costs.
You may change any of the items in blue cells or use the defaults entered.

Calculate Costs for Idling that Can Be Avoided

	How much fuel is used for idling? You may consult the table below.			How many hours each year might you use an IR device?			What is the price of diesel fuel?			Avoidable Idling Fuel Costs	
1	0.8	gallons/hour	X	2,000	hours/year	X	$2.75	/gallon	=	$4,400.00	per year
							What is your average fuel economy?			"Miles" of idling	
2	0.8	gallons/hour	X	2,000	hours/year	X	6.1	miles/gallon	=	9760	miles
	How much does an oil change cost?			How many miles between oil changes?						Preventive Maintenance Costs	
3	$150	oil change	÷	30,000	miles =	$0.005	/mile	X "miles"	=	$48.80	/year
	How much does an engine overhaul cost?			How many miles between overhauls?						Overhaul Costs	
4	$10,000	overhaul	÷	500,000	miles =	$0.02	/mile	X "miles"	=	$195.20	/year
										Total Avoidable Idling Costs	
5								Sum	=	$4,644	/year

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Idling Fuel Consumption

How much fuel is used for idling (gallons/hour)?

	Idling Fuel Use (gal/h)		
RPM	AC off	AC 50%	AC on
800	0.64	0.7	0.76
900	0.73	0.79	0.85
1000	0.81	0.87	0.94
1100	0.92	0.98	1.05
1200	1.03	1.09	1.15

Locate your engine idling RPM and the percentage of time you run your air conditioning (AC) while idling. The corresponding number is approximately how much fuel you use to idle. For example, 800 RPM with no air conditioning consumes about 0.64 gallons of fuel an hour.

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Tips for Reducing Idling Time - On-Road Trucks

EPA Guidelines

- Turn off your engine when your vehicle is not in motion. (Follow manufacturers recommendations for cool-down – usually 3-5 minutes after full load operation.)
- Follow manufacturers recommendations for minimum warm-up time – usually 3 to 5 minutes depending on the vehicle.
- Use electric engine heaters (such as block heaters) to minimize idling time during warm-up, especially in cold weather.
- Install a small generator or auxiliary power unit specifically designed for a truck that provides heat, air conditioning, and/or electrical power while the vehicle is not in motion.
- These devices are a better, more efficient alternative to idling as they use substantially less fuel and emit less pollution. Depending on the amount of time spent idling each year, the payback on these devices can be one to two years.

Continued.

- When buying new equipment, purchase engines already equipped with devices that minimize idling and warm-up time automatically.
- Follow anti-idling laws and guidelines in your state.

Tips for Reducing Idling Time - Non-Road Vehicles

- This is more of a challenge.
- Most non-road vehicles are not outfitted with auxiliary power units due to space constraints.
- Plan work to avoid excessive idling.
- For non-road engines equipped with diesel particulate filter (DPF) aftertreatment devices, excessive idling can result in more DPF regenerations.


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