The Line Shaft

The Official Newsletter of the

NORTH JERSEY ANTIQUE ENGINE & MACHINE CLUB

March 2014

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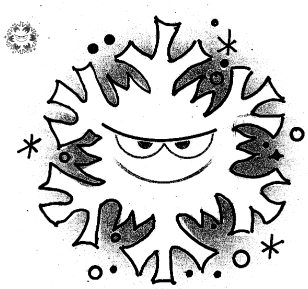
Founded on October 15th, 1979 by: Arthur Goble, Fred W. Westbrook, John Snook, Roy Bischoff & Lewis Quince



Unfortunately the February 13th meeting was

SNOWED OUT!

Military Transport Association Show

The MTA's 13th annual SWAP MEET will again be held at the *Fairgrounds* on April 26th and 27th...it would be appreciated if you could bring a tractor, truck or engine. Call Jeff Brooks to "enlist" or if you need any further information at: 973/997-5284!

REMINDER: 2014 DUES ARE DUE!

Annual dues are $25.00 and payable at the March meeting or send to:

NJAE&MC-Anne Marie Adams

7 Gunn Rd.

Branchville, NJ 07826

Our next meeting will be 7PM at the administration building on March 13th 2014

Engine Overheat!

Where to start…a good place is to nose around:

Do a serious walk-around and pre-start inspection:

Look for clues: find out if the machine has been operating OK...are the brakes dragging, does the engine lug on an up-shift, etc.?

Take a good hard look at the machine: is it equipped with any special or add-on attachments? Are any panels or sheet metal missing or damaged?

Use logic: what is the application and environment; over-the-road, dirt, mud, mulch, landfill, transfer station etc…some operations are more prone to overheat problems.

Inspect the belly pans (if equipped)…are the pans full of dirt and debris and the engine covered with dirt? Remember, approximately 7% of the engines and transmissions heat is "radiated" to the air!

Before you start the engine and get it hot and burn yourself, check the following:

Check all fluid levels and the air intake:

In particular, check the coolant level and concentration of anti-freeze…it should be a 50/50 mix. Straight water cools-the-best and a 100% antifreeze solution is a poor conductor of heat and can cause overheat! If the cooling system is low, fill it and pressure-test it. Check for any external leaks and don't forget the heater core!

Drain down the radiator top tank and inspect the core tubes. Look for corrosion, solder bloom and blocked tubes.

Pull the temperature senders, cooling system plugs and filter if equipped and look for corrosion, scale build up or silicate-phosphate dropout. *Insulated senders will give false readings and scale build-up on plugs etc. will give an indication of the cooling jacket condition.*

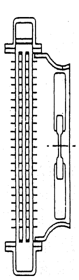
Do not forget to inspect the pressure cap, and/or the relief valve. Also inspect the filler neck and cap seat. This is a very common and often overlooked problem…the forest for the trees syndrome! *You should be able to pressurize the system and maintain pressure indefinitely…if the pressure drops (without an external leak) you may have an internal problem.*

Check for signs of coolant in the lube oil. Pull the dipstick and filler cap and look for condensation. If in doubt, remove the valve cover and check for sludge and condensation...and don't forget to inspect the water pump "weep" hole for leakage.

Also, crack open the crankcase oil drain plug and check for coolant…it will be at the bottom of the oil pan on a cold engine. Are you not sure? Take an engine oil sample and make sure you write in the COMMENTS section…PLEASE CHECK FOR INTERNAL COOLANT LEAK!

A clogged, restricted or dirty air filter or intake will cause the engine to "over-fuel" and, if not the main cause, will add to an existing tendency to over-heat in high ambient operations...and keep in mind, the incoming air helps to cool the cylinder head.

Do a static inspection of the airflow system:



Make a static check of the radiator, oil and air coolers for clogging (airside). Check the fins for deterioration or debris damage (particularly on construction equipment) Use a bright light and be sure you can see thru the cores.

Check to see that the surrounding tin-ware and foam (if so equipped) is in place and that the airflow is not bypassing the cores.

Check the fan "drive" system and fan belt tension (if so equipped) and that all belts and pulleys are not worn and are free of oil.

Check the fan blades: are they in good condition and mounted in the correct direction…*be aware; a fan installed backward will work, but is 50% less efficient, a reversible fan is 10% less efficient than the non-reversible fan it replaced (big dead air hub) and using a reversible fan in suction mode is 35% more efficient (see below) than in blower mode.*

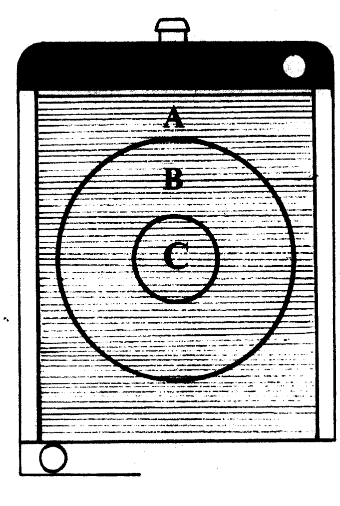
Inspect the fan shroud: is it in good condition, with minimal clearance between the blade tips and shroud?

Now start the engine (and get ready to really burn yourself)

Airflow tests:

Check the airflow thru the radiator and coolers at idle. Adjust your fan for suction and use a rag and see if it sticks to each part of the core (a poor-man's Air Velocity Meter). If you have the luxury of a Air Velocity Meter, use it! Now check it at full RPM. No airflow, no cooling! *Remember; auto-truck applications at least partially rely on the units motion for airflow, while farm, construction equipment and stationary applications rely almost totally on the fan.*

Check the fan speed…use the monitor or a photo tach. The pulley size may be wrong or the electric motor or hydraulic drive could have resistance or flow problems and the fan will turn at less than the specified speed. This is rare (particularly the pulley size), but a poorly thought out and overly aggressive pulley "re-cut" or an electrical-hydraulic failure could produce marginal fan speed and lower air flow.



Be aware of the "zones" of the radiator…they are the zones where the airflow matches the fan blades and <u>produces the most effect</u>…B is the major cooling zone, but a suction fan makes better use of the entire radiator. An "old-timers" tip…you're in blower mode and running warm…shift to suction and you might get thru the day!

Blower fan	*A = 20% cooling* *B = 80% cooling* *C = 0% cooling*
Suction fan	*A = 35% cooling* *B =60% cooling* *C = 5% cooling*

Load it up:

Put a load on the engine: hydraulic stall, torque converter stall, etc. and watch the gauges. Be cognizant of which one rises first…hydraulic, torque converter, or engine? *Be sure it is an "engine" overheating problem and not due to a preheated stacked cooler air-stream or an overheated parasitic hydraulic or powertrain heat transfer!*

While you're at it, check the service manual for specifications and be sure the engine does not pull down below it's rated speed.

Heat and pressure testing:

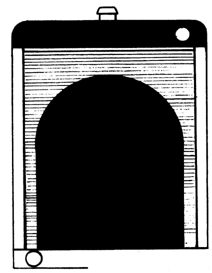
As the engine is heating up, the thermostat blocks flow to the radiator and circulates the coolant only thru the engine block . Use your heat gun to test the opening temperature at which it <u>re-directs</u> the coolant to the radiator. *Remember, the non-tier-early tier thermostats open at 180 degrees, but the tier III engines open between 190 & 195 degrees. Also, the thermostat is the brains of the system and has a short life span...about 2 years...if in doubt, replace it!*

Now use your heat gun to test the radiator inlet and outlet at operating temperature.

Rules of temperature drop:

The normal difference between the radiator top (inlet) and bottom (outlet) tank is 10 to 15 degrees Fahrenheit. Note: if the difference is more, expect a low flow condition, i.e. internally clogged radiator, partially stuck/closed thermostat or a worn out water pump (rare). If the difference is less, expect a high flow condition and possibly a missing or fully open thermostat.

The oil cooler's normal temperature drop is 15 to 20 degrees from the top (inlet) to the bottom (outlet) tank or tube.

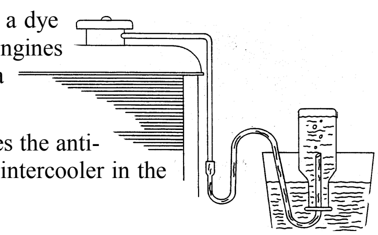


Do you think you have a clogged radiator? Put your fan on suction (so you don't get blown away and get more uniform readings), swing any front mounted and stacked coolers out of the way and bring your engine to high idle at operating temperature. With your heat gun, start checking the front of the radiator core. The coolant flows from top to bottom (*). The coolest core area will be an arch starting at the top of the B area (most fan effect) and encompassing the entire B and C area and the A area below B. The A area surrounding the arch will be somewhat warmer than the inner arch, but gets 20-35% of the air flow and is a serious cooling factor. *You are looking for "hot" areas, which indicate (<u>or confirm</u>) externally reduced air flow and "cold" spots that indicate clogged tubes and "no coolant flow". Be aware, your heat gun will only react to the outer tubes, but the fins are connected to the inner tubes and will be <u>cooler</u> in the area of <u>no-flow tubes</u>. You are looking for uniformity...a discrepancy signals a problem. *Note: if you are working with a cross-flow radiator, where the coolant flow will be left-to-right or vs...merely turn the picture on its side! A cross flow radiator does not have natural thermo-siphoning and relies solely on the coolant pump for flow!*

Check the coolant pump pressure by installing a PSI gauge in the block as close to the coolant pump as possible. The pressure should rise as you go from idle to full RPM with the engine warm and the thermostat open. If the pressure remains high, suspect a restricted radiator or that the thermostat is partially or completely closed (the coolant cannot pass thru quickly enough). *Remember, these are high volume non-positive displacement centrifugal pumps and they put out high flow...example: a 450 HP engine needs 170 GPM to cool.*

If the pressure is low, the lower hose might be collapsing. This is not that uncommon, but in most cases can easily be seen. Install a vacuum gauge on the suction port of the coolant pump and an acceptable reading is zero to 1" of vacuum. *A higher suction would indicate a restriction to flow...either a partially closed thermostat, an internal hose problem or a confirmation of a clogged radiator core. Be aware that high vacuum can draw air into the system due to loose lower hose clamps and low vacuum could possibly be an indication of a rare, but "not" unknown, coolant pump impeller problem.*

Combustion in the cooling system or leaks to the exhaust or intake:



Starting to think cracked head, blown head gasket etc.? Before you start pulling the engine apart, you must do a dye test in the radiator or run a bottle test to check for compression gases in the cooling system. Many times our engines can be stall tested and (if caution is taken) one can simply see the many bubbles in the radiator top tank under a load.

Very rare, is a minute crack in one of the exhaust ports or a water-cooled turbo that opens from heat. This causes the antifreeze to turn to a gas and <u>invisibly</u> exit out the exhaust pipe. The same goes for a water-cooled aftercooler or intercooler in the intake manifold. *All tend to be <u>mysterious</u> coolant losses!*

You will say you have checked everything.

Unfortunately, there are a lot of everything's and we probably didn't cover them all. The cooling system is a complicated and to some extent an <u>abstract</u> system and takes a organized approach to troubleshooting. The key is to do enough checks and tests that you are secure in your diagnosis before "ripping and tearing". *Review how you did your inspection and be sure you recorded the results at each step….with all the checks and tests to be made, it's easy to get confused, lose track of where we have been and miss a key check or test point!*

This article is meant as a troubleshooting guide and not all checks and tests will be required in all situations...however, you must keep them all in mind as you investigate a cooling system related problem.

A little history: the *honeycomb radiator* was invented in 1900 by Wilhelm Maybach of Daimler-Motoren-Gesellschaft (DMG) for the *Mercedes-35*...considered the first true automobile. Radiator cores have changed only slightly over the years and are now manufactured of copper, brass, steel, aluminium and plastic.

Maintenance is another issue:

This should include the water you use...pre-mix antifreeze vs. U-mix and conventional, fully formulated, hybrid and extended-life coolants. Preventative maintenance includes regular chemical and freeze protection testing, additive refortification, internal flushing, external cleaning and an organized inspection and reconditioning program. Some of the above checks and tests should be incorporated into the predictive side of your maintenance program.

Ed Snyder...Bob Triebel

MARKETPLACE

For Sale: Wheel Horse Lawn Tractor...needs motor work , no attachments,
$200.00 or BEST OFFER...Call Danny H. 862/266-7362

For Sale: 1924 Hercules/Jaeger 2HP, 1918 IHC M needs TLC, (2) Delco 32volt light plants, NOVO Square Hopper for parts
Call Andy Mackey 862/432-1552

For Sale: 2500 WATT 1958 Onan Generator with manuals...not running!
Call Martin Little 973/875-4511

For Sale: Sears FF-20 Lawn & Garden Tractor w/42" mower
Call Kevin Adams 973/819-9330

For Sale: Steam bent ash plow handles, $30.00 a pair
Call Bruce Mitchell 973/702-1012

For Sale: 3-Point Hitch 6' wide Brush Hog (came off 9N Ford tractor)
Call John Stickle 862/397-3782

Wanted: Manuals & Parts for Witte 6-HP horizontal diesel
Call Andy Mackey 862/432-1552

Wanted: Thiokol Imp Snow Cat
Call Jeff 973/997-5284

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