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Recovery of Waste Engine Coolants
Using Advanced Vacuum Distillation Technology

Millions of gallons of waste engine coolants are generated each year during routine preventative and other maintenance procedures. A significant percentage of this waste is generated by vehicle fleet operations.

Waste glycol that was routinely dumped down the drain is now being recycled on-site using sophisticated vacuum distillation technology.

Waste engine coolants are basically composed of water, ethylene glycol (or occasionally propylene glycol), broken-down corrosion inhibitors, corrosion by-products and possibly heavy metals.

Sending waste engine coolant down the drain is undesirable for several reasons:

- Ethylene glycol requires large quantities of oxygen to be broken down during the sewage treatment process. Sewage treatment plants require a proper oxygen level to efficiently process sewage. Waste engine coolant can upset this delicate oxygen balance.

- The bulk of the inorganic corrosion inhibitors, broken-down corrosion by products and heavy metals settle into the sludge that is periodically hauled from the sewage treatment plants. This sludge may exhibit toxic characteristics in part due to processing waste coolants.

- Ethylene glycol itself comes from non-renewable resources. Every effort should be made to recycle this valuable material. The ethylene glycol we are using today, we are borrowing from our children and their children.

What is engine coolant and why is it used in engines?

- Concentrated antifreeze generally consists of 95% ethylene glycol, 3% corrosion inhibitors and 2% water. Engine coolant is typically a 50/50 mixture of concentrated antifreeze and water. This mixture is critical to the performance of modern combustion engines.

- A proper concentration of coolant provides protection against freezing in low temperatures when the engine is not operating and also helps prevent boil-over during hot weather (the 50% ethylene glycol lowers the freeze point and raises the boiling point).

- One of the most important functions of quality engine coolant is the protection of internal metallic engine components from corrosion. Modern engines contain various metals including iron, brass, copper, and increasingly aluminum. Without proper corrosion protection, these metals can quickly corroded causing premature damage/failure of engine and cooling system components.

- Aluminum is being increasingly used in engines to save weight, helping vehicle manufacturers meet strict fuel economy standards. Unfortunately, aluminum is a reactive metal that is easily affected by coolant that has depleted corrosion inhibitors.

- Failure to maintain and change engine coolant according to the manufacturers recommendations can result in internal engine and component damage.

Why use vacuum distillation to recycle waste coolant?

Simply put, Finish Thompson's vacuum distillation system provides the highest quality recycled coolant available!

Distillation has been used for many years by industry to recover valuable waste solvents created during the manufacture of most of the products we use every day.

Finish Thompson's advanced vacuum distillation technology has been tested and approved by numerous automotive and heavy duty OEMs' and has been proven to produce the highest quality recycled coolant available.

Our distillation process excels at removing suspended and dissolved solids (broken down corrosion inhibitors, dirt, rust, etc.), heavy metals and is the only process that allows the removal of excess water.

Are there any special challenges for heavy-duty vehicles users?

Heavy-duty vehicle users (18-wheelers, construction equipment, military vehicles, etc) face an additional challenge due to the common practice of the addition of supplemental coolant additives (SCA's) to the engine coolant on a regular basis. SCA's are commonly added to help prevent cylinder sleeve

erosion. Unfortunately, this results in a coolant with higher dissolved solids levels compared to automotive engine coolants.

Eventually the level of dissolved solids can reach a point where the liquid reaches a saturation point and the solids begin to dropout (particularly when the engine is off and exposed to cold temperatures, a liquids ability to keep solids dissolved diminishes as the temperature drops). This can cause problems such as water pump seal failure and blockage of radiator passages.

Vacuum distillation is the preferred method of recycling waste engine coolants by heavy-duty users due to its ability to remove virtually all solids both dissolved and suspended. This process results in a recycled coolant that is virtually identical to new.

What about water quality issues?

Waste coolant typically contains excess water (greater than 50%). Advanced distillation technology is the only process on the market that removes excess water and produces a concentrated clean glycol. With Finish Thompson's distillation process, you always add water to return the coolant to the proper 50/50 mixture.

Finish Thompson's distillation technology has the added benefit of dramatically improving water quality by producing a high quality, reusable water stream. The customer can add this distilled water to the concentrated recycled glycol to produce an even higher quality 50/50 coolant mixture.

Coolant is 50% water and water quality is important in a coolant. The vast majority of engine coolant is mixed with ordinary tap water. While tap water may look clean, it contains unwanted minerals. Water quality varies dramatically throughout the country. Distilled water is superior to tap water because it is free of these unwanted minerals.

The minerals found in tap water provide no beneficial effect and only serve to raise the level of dissolved solids in the coolant increasing the likelihood of forming precipitates. Most vehicle manufacturers recommend using distilled or low mineral content water when mixing coolants.

How does the distillation process work?

The BE-55C vacuum distillation system requires minimal operator involvement. Once unit is filled with waste coolant and started, the unit can operate virtually unattended until the process is complete. Following is the normal sequence of operation for a waste coolant run in the BE-55C:

- FILL - The Fill/drain Hose Is inserted into a 55-gallon waste coolant drum. A Fill Switch on the BE-55C starts a vacuum pump. As a vacuum is formed in the process tank, the fill valve is opened to draw in the waste coolant. When the drum is emptied, the operator switches the fill off. A sensor prevents more than 55 gallons from entering the process tank.

- WATER PROCESS - The start switch is depressed and heat is applied bringing the waste coolant to a boil inside the distillation tank. A water rich vapor is first formed due to waters lower boiling point (compared to ethylene glycol). This vapor passes through a heat exchanger where the vapor is turned into a clean water stream that can be reused to make new coolant or drained. The distilled water gravity drains into the processed water receiving drum.

- GLYCOL PROCESS - When most of the water has been processed, the temperature inside the process tank will begin to rise. When this temperature reaches 280°F, a switch closes, energizing the vacuum pump and the divert solenoid valve. At this point, the upper heaters de-energize and remain off for the remainder of the cycle. During this portion of the process, the glycol is vaporized under a vacuum (reducing it's boiling point). The distilled glycol gravity drains into the processed glycol receiving drum.

- AUTO SHUTDOWN - The BE-55C will automatically terminate the process when the liquid in the process tank reaches a low level. This low level sensor de-activates the Process On/off Switch, shutting the unit off.

- DRAIN ASSIST - After the cycle is complete the residue is drained into a residue collection drum. The Fill/drain Hose is placed into this drum, the Fill/drain Valve is opened, and the Drain Assist Switch is depressed and held (activating the air supply solenoid) until the residues stop flowing.

- INHIBIT - After the process is complete, the recycled coolant can be mixed with processed water to obtain the desired freeze/boil protection and inhibited with Finish Thompson's Premium Inhibitor to restore the glycol to a like new condition.

What are the costs to recycle using vacuum distillation?

Not only does vacuum distillation provide the highest quality recycled ethylene glycol possible, but it can be one of the most economical as well. There are no filters, resin beds, freeze point adjusters, flocculants and other chemicals to purchase and inventory in order for the process to work. All that is required is the distillation system, inhibitor and waste coolant. Vacuum distillation can produce coolant (50/50 mixture of clean inhibited glycol and water) for about $1.25 per gallon! When you factor in disposal costs for waste coolants and uncertain, long-

term liabilities associated with disposal of waste coolants, recycling using vacuum distillation is surprisingly affordable.

Can you summarize the advantages of recycling waste coolant using vacuum distillation?

On-site recycling using Finish Thompson's vacuum distillation technology provides the following benefits:

- Allows for the recovery of a valuable non-renewable resource
- Helps protect sewage treatment plants
- Removes virtually all contaminants both suspended and dissolved
- Removes excess water from waste coolant providing concentrated glycol
- Produces high quality, reusable water that is free of unwanted dissolved solids
- Is an OEM approved process
- Reduces coolant costs and saves money
- Reduces long term liabilities associated with coolant disposal

Interested in learning more about vacuum distillation and how it can benefit your company?

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