Purpose

The application summary provided will outline the effects of cold oil in used-oil combustion and the some suggestions in working with cold oil.

Description

Used oil is marked by its high and inconsistent viscosity. During the life cycle of lubricating oil, much of the viscosity modifiers blended into the oil that regulates its viscosity are broken down. As such, used oils are more susceptible to the cold and thicken significantly at lower temperatures. The pre-conditioning of used oil that occurs in the EnergyLogic (EL) fuel train is targeted in large part to reduce the effects of the increased viscosity. A viscosity independent metering pump and a high volume, high temperature (160°F), preheater are among the tools employed to deliver to the combustion zone of the burner, a fuel that can be consistently atomized.

Any process of course, has its limitations. If the viscosity of the incoming oil is too high, the pump will be unable to draw or deliver the oil flow necessary to match the pre-set combustion air flow of the burner. The result will be poorly atomized combustion and a furnace output well below its target. Poor light-off and flame-outs are also to be expected. Additionally, even if the pump can deliver the oil to the preheater, if the room temperature does not bring the oil temperature up, the preheater will not be able to sufficiently thin the oil. The result will be a narrow mist pattern leaving the nozzle and large droplets of oil in the atomized stream. Smoking and coking would be observed. Also, with the preheater thermostat acting as a safety interlock, the furnace could short-cycle as the internal thermostat opens up.

Problem Avoidance

EL recommends that the used-oil temperature be a minimum of 50°F and that the room temperature where the fuel lines are run be at least 50°F. A few key guidelines are given below to insure this circumstance:

1) Avoid installing the final oil storage (furnace feed), oil pump, copper lines or furnace outside.
2) Even if installed inside, verify that the furnace will supply enough heat to the room where it is installed to maintain the 50°F temperature (Do not duct all of the heat into another room and leave the furnace room cold).

3) When oil is added to the storage tank from a cold environment, it should be either allowed to warm to room temperature for two hours or should be mixed with oil already at room temperature at a percentage of not more than 50%.

Preparing for the Worst

In applications where the oil and/or the room where the furnace is located will be colder than 50°F, some modifications to the fuel line can be made to prevent high vacuum and insure appropriate oil flow. These modifications and their intended consequence are listed in the table below.

Table 1.1: Cold Oil Application Modifications

Part To Be Modified	Modification	Intended Consequence
Suction Line	Increase to 1/2" OD	Reduce Vacuum
Suction Line	Add Heat-Tape	Reduce Vacuum
Suction Line	Add Fill Port & Expansion Tube	Ease Priming
Filter Assembly	Add Filter Heater (EL Part #20505110)	Dramatically Reduce Vacuum
Pick-Up and Pressure Relief	Add Foot-Valve & Return Pressure Relief To Tank	Prevent Loss of Prime
Discharge Line	Increase to 1/2" OD if longer than 50'	Reduce Pressure
Pre-Heater	Increase Pre-Heater Power	Maintain 160°F Oil Temperature

The modifications listed to the suction line need very little explanation. Reducing the vacuum to no higher than 6 inch of vacuum on a clean filter should ensure full oil flow. By increasing the suction line from 3/8 inch OD to ½ inch OD, the vacuum may drop as much as 50%. Not only should the suction line of a cold weather application be increased in diameter, but its length should also be minimized to reduce vacuum. In instances where the increase in diameter is not enough to reduce vacuum sufficiently, self-regulating heat tape can be added to further reduce it.

In applications where the oil is extremely cold or thick, it may be necessary to heat the filter with the EL filter heater (PN 20505110). This wrap-around heater is designed to raise the oil temperature to an appropriate temperature for pumping and can dramatically reduce the vacuum at the pump.

In rare cases where the furnace is located in a room that drops below 50°F, it may be necessary to increase the preheater power. Please consult with an EL technical service team member who can direct you to the appropriate preheater for this type of application.

Direct Pumping from an Outside Tank

EL strongly encourages the use of an inside day tank. EL offers several options to allow for oil transfer from an outside storage tank into an inside tank. See the application solution entitled “Remote Pumping and Oil Transfer Applications” for details. The use of a day tank will result in cleaner fuel and less maintenance and will remove concerns about oil thickness and temperature in almost all cases.

When it is absolutely necessary to pump directly from an outside used oil storage tank to an EL furnace, several precautionary steps must be undertaken. Please speak with an EL technical service team member if you have an installation that appears to require direct pumping from an outside tank. The technical service team will qualify the installation and provide the necessary information.