

HEATEC TEC-NOTE

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CHOOSING HEAT TRANSFER FLUIDS for Heatec thermal fluid heaters

This document discusses heat transfer fluids (also known as thermal fluids) for Heatec thermal fluid heaters. Choosing a suitable heat transfer fluid for Heatec heaters is *extremely* important.

Do not use lubricating oils, turbine oils, diesel fuels or hydraulic fluids. They are not suitable for use in Heatec heaters! Unsuitable fluids can lead to the following problems:

- **Carbon deposits in the heating coils and fluid failure**
- **Greatly increased risk of fire**
- **Accumulation of sludge in the expansion tank**
- **Clogging of jumpers in hot oil jackets of asphalt lines**
- **Failure of pumps**

Fluids designed specifically for heat transfer have special properties. They include additives to help maximize heat transfer and minimize oxidation.

Oxidation is a common problem with fluids when heated unless they are designed for heating. Oxidation significantly degrades the fluid and contributes to the problems listed above.

Always choose a fluid product designed specifically for use in thermal fluid heating systems. These products are known as *heat transfer fluids*. **And don't rely upon claims that similar products from competitors are actually the same, unless confirmed by a qualified representative and backed up by applicable documentation.**

Industrial heaters

Heatec industrial heaters include the following models: HCI, VHCI and HCM. Fluids for these heaters are *predetermined* and named on the documentation furnished with each heater.

These heaters are designed for a specific heat transfer fluid that was designated by the customer. ***This is the***

fluid that should be used. Please contact Engineering at Heatec if you want to use an alternative fluid.

Construction heaters

Heatec construction heaters include models HC, HCS and HCT heaters. Fluids for these heaters are **not** usually predetermined. Therefore, you will need to choose one based on the heater type, its components and your usage.

Your choice should start with fluids that meet the requirements shown in this document. These are bare *minimum* requirements intended mainly to protect the heater and system components.

Accordingly, we have limited our concerns to *startup* temperature, *operating* temperature and *film* temperature. Explanations of these terms are provided on the next page.

Choosing a fluid

The fluid that you use in your construction heater should meet the following requirements:

CONSTRUCTION HEATERS	
Parameter	Value
Minimum fluid temperature rating (no manifold)	Operating temperature plus 50° F
Minimum fluid temperature rating (with manifold)	Operating temperature plus 100° F
Minimum film temperature rating (no manifold)	Operating temperature plus 100° F
Minimum film temperature rating (with manifold)	Operating temperature plus 150° F
Viscosity @ lowest startup temperature	Less than 500 cP
Viscosity @ normal operating temperature	Less than 10 cP

There are numerous other factors that affect fluid longevity and fluid cost. You should discuss your options with a reliable supplier. Reliable suppliers will need to know many things about your heating system, its environment, your operating practices, your maintenance practices, etc.

Explanations of terms

Startup temperature is the temperature of the fluid in the system when the heater is started under the coldest conditions expected. Temperature affects fluid viscosity. The lower the temperature, the higher the viscosity. This is a key concern because the fluid could damage seals in the pumps if its viscosity exceeds allowable limits.

“**Operating temperature**” is usually regarded as the temperature equal to the setpoint you set on the burner controller and monitored by a thermocouple at a single location. However, with normal modulation of the burner, actual temperatures may briefly swing higher. Moreover, HC heaters have additional temperature considerations due to their manifold.

The “**operating temperature**” on HCS heaters (which do not have a manifold) is the temperature of the fluid at the **outlet** of the heater coil and is controlled by the **setpoint** you set on the burner controller.

On HC heaters (which have a manifold) the “**operating temperature**” is the temperature of fluid in the **manifold**—not the coil outlet. And this is the temperature that is controlled by the setpoint you set on the burner controller.

However, fluid at the coil outlet may be hotter than fluid in the manifold. That’s because it mixes with cooler **return** fluid also entering the manifold. Accordingly, fluid at the outlet may exceed the operating temperature or manifold temperature as much as 100 degrees F. So when choosing a fluid it is necessary to allow for coil outlet temperatures that may be hotter than the “operating temperature.” We made allowance for this in the table shown earlier.

In addition to normal burner modulation, an **abnormal** condition could cause fluid temperatures to exceed setpoint on the burner controller. Another controller (the media high temperature controller) limits how much any temperature increase can exceed the setpoint of the burner controller, regardless of the cause.

On HCS heaters the media high temperature controller is usually set for a temperature limit of about 50

degrees F above setpoint of the burner controller. On HC heaters it is usually set for a temperature limit of about 80 degrees F above setpoint on the burner controller. It will shut down the heater if the limit is reached. So these operating temperature variations should also be considered when choosing a fluid. We made allowance for this in the table shown earlier.

Film temperature is the highest temperature the fluid undergoes in the system. It is the temperature of a portion of fluid flowing inside of the heater coil and in contact with the surfaces of the coil. It may reach temperatures 100 to 150 degrees F higher than the **operating** temperature. We made allowance for this in the table shown earlier.

Precautions

Do not heat fluid in a **standard** construction heater to temperatures higher than 450 degrees F. Higher temperatures may damage plug-valves and cast iron strainers in the system.

Heatec can provide **steel** valves and strainers as replacements for those of cast iron. These replacements will allow heating of fluids to temperatures up to 550 degrees F. However, if fluids need to be heated to temperatures even higher than 550 degrees F, please contact Engineering at Heatec.

Selecting a supplier

When selecting a supplier for heat transfer fluid you may also want to consider the following factors:

- Does supplier have technical support capabilities?
- Does supplier offer testing/support service?
- Is supplier knowledgeable about your application?
- Does supplier’s product line allow choices?
- Do you already use the supplier for other products?
- Does supplier have a return/credit program?
- Does supplier have a disposal program?
- Does supplier offer a delivery service?
- What is the regulatory status of the fluid they recommend?
- Does the fluid they offer have thermal stability?
- Does the fluid they offer produce obnoxious odors?
- Do you need heat transfer fluid listed by NSF (National Sanitation Foundation) as HT1 (for incidental contact)? Or certified for kosher use?
- How much is the initial cost of the fluid alone?
- What is the overall cost over the life of the fluid?