TechTip G10 – Insulating SPF Equipment

Purpose
The purpose of this TechTip is to provide contractors with simple way for better insulating their equipment to minimize chemical temperature loss and improve the processing of their chemicals. Properly maintaining your chemical temperatures is the most important feature of this TechTip.

Insulating Your Equipment Components

Why Insulate?
Properly insulating your equipment will improve ratio, spray performance and yield. By insulating your equipment, you will better control material temperatures, which effect material viscosities. Lowering material viscosities will improve pressure control and impingement mixing, which in-turn will improve your spray pattern and material yield.

How do we control this scenario?
Insulating and heating each component provides a smooth consistent flow as you gradually increase the temperature. Materials being too cold (or too hot) may adversely affect the fluid flows.

It is important to properly control your fluid temperatures. There are a few simple steps you can take to set-up your system for optimal results and minimal temperatures losses. For our recommendations, we will start at the drum and work toward the gun.

Material Conditioning

At colder temperatures, the resin materials have a much higher viscosity than the Iso material. For spray foam materials, viscosity increases as material temperature decreases. As viscosity increases it becomes more difficult to pump. If the feed pump cannot adequately feed the proportioner with the necessary volume of material it will be difficult to stay on-ratio. This temperature-viscosity curve for SPF materials is shown in Figure 1.

Accurate and consistent pumping of cold materials is a common issue in colder climates. The figure below shows how cold temperatures increase material viscosity.

This issue can be minimized by properly conditioning the chemical(s) prior to use.

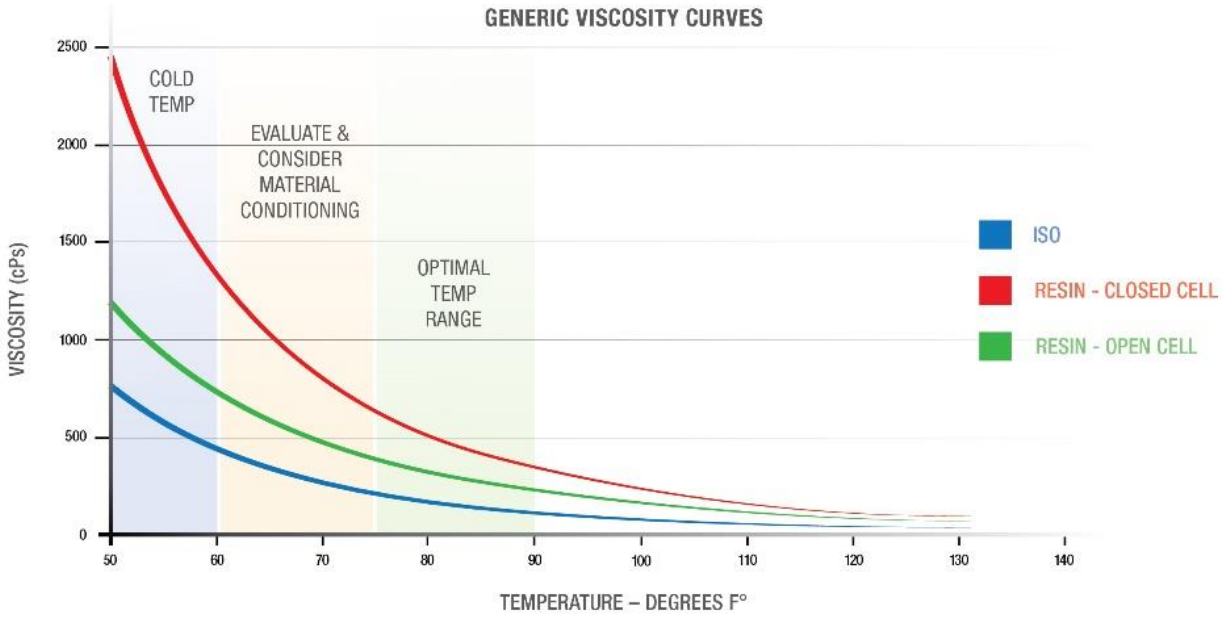

Figure 1 – Temperature-Viscosity Curve for SPF Chemicals

Recommendations:

- If possible, keep your chemicals in a conditioned space overnight. This space may be a conditioned warehouse or a truck running a space heater.
- Since it is common practice to use transfer pumps to draw material from the bottom of the drum/tank it is best to use an aluminum heat plate under the drum to properly maintain drum chemical temperatures. Heating from the bottom of the drum is ideal since added heat to the hot fluid will rise within the drum and the colder fluid will sink to the bottom of the drum. This process makes heating the chemical efficient and effective. It also assures that when you draw the material from the bottom of the drum you are pulling chemical closest to the heat source to give you the best chance for pumping well-conditioned material.
- In cold climates, if chemicals cannot be kept in a conditioned space overnight, it is best to run the plate heaters overnight so you chemicals are well conditioned and ready to spray in the morning. A typical full drum of material weighs about 500 lbs. This thermal mass can take up to 8 hours to properly condition. Turning the plate heaters on in the morning just prior to spraying may not adequately heat all the fluid in the drum in a timely manner.

For the same reasons using electric drum blankets may not adequately heat a full drum of material in a timely manner.

Feed lines from drum pump to proportioner

Recommendations:

- Avoid using hard piping with 90-degree bends. These bends will increase the fluid pressure loss and metal tubing, or piping will also act as a heat sink, contributing to further temperature loss in cold environments.
- Use ¾" diameter ID hose to making smooth curves and eliminate sharp 90-degree bends from the drum to the proportioner.
- Insulate the feed hose with ½" thick foam pipe insulation as shown in Figure 2. One example brand of pipe insulation is Armaflex which is a soft and flexible elastomeric pipe insulation used in HVAC applications. It has an angled cut opening for more surface area for a better bond. Other brands of pipe insulation may be available at your local hardware stores. To find this type of insulation you may have to get it from a local plumbing or mechanical supplier in your area. The recommended size for ¾" feed hoses is 1-3/8" ID with ½" wall thickness.

FIGURE 2 – Flexible Armaflex foam pipe insulation with easy to seal angled cut

- For extremely cold climates, you may want to add a heat tape to your B-Side (resin) feed hose. A common product you can find is *Briskheat* heating tape as Shown in Figure 3. *A rule of thumb is a 20' hose needs about 40' of heat tape for a good spiral wrap. Using the Briskheat tape rated for 120F will provide a constant heat of about 80F to your feed hoses.*
- Note – All heat tapes should be powered from a GFI-protected outlet in case of a fluid

leak.

- The heat tape should be covered with a fiberglass cloth tape (typically 2” wide) and foil tape to keep in in place as shown in Figure 4.
- Finally the wrapped hose can be further insulated using ½” thick foam pipe insulation. For further protection, cover the insulated hose with shrink wrap shown in Figure 5. This not only protects the foam insulation, it also provides a vapor barrier.

    - Additional details on the Briskheat heating tape can be found at: *https://www.briskheat.com/xtremeflex-rkp-silicone-heating-tape.html*

    - Common models used are:
        - RKP1B0120: 10’ long , for a 5’ hose, 120 V, 60 watts
        - RKP1A0240: 20’ long for a 10’ hose, 120V, 120 Watts
        - RKP1B0480: 40’ long for a 20’ hose, 120V, 240 Watts

FIGURE 3 - Hose wrapped with Briskheat heating tape and fiberglass cloth tape

FIGURE 4 - Hose wrapped with foil tape

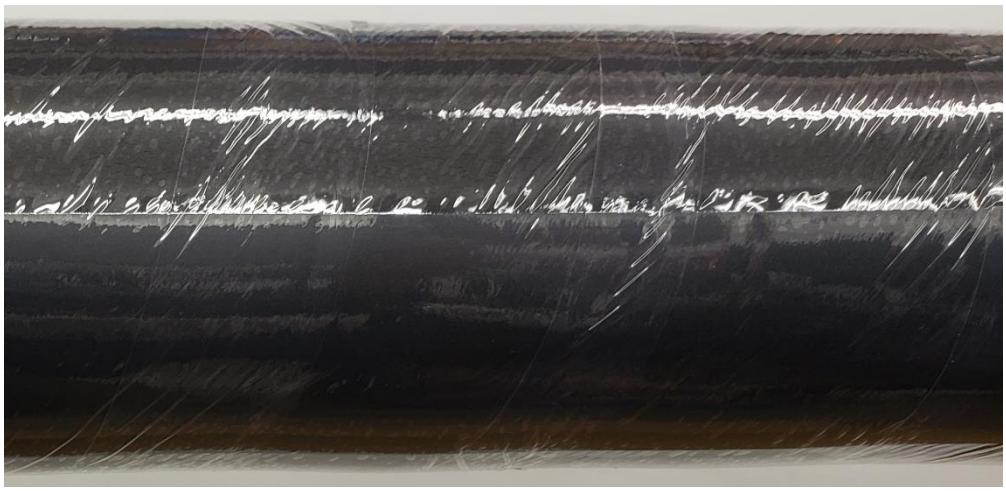

FIGURE 5 - Hose covered with foam pipe insulation and shrinkwrap

Fluid Lines from Pumps to Primary Heater(s)

Recommendations:

- Most proportioners use stainless steel tubing to connect the pumps to the heaters and fluid manifold. You can insulate these tubes with the foam pipe insulation and shrink wrap, if capable, and cover with an outer jacket if you prefer.
- For proportioners with longer fluid lines, cover the A-side lines with ½" foam pipe insulation and for the B-Side lines, follow recommendation for the B-side feed hoses that include: heat tape, fiberglass cloth tape and then ½" flexible pipe insulation.

Heater to Fluid Manifold

This area can be a problem in cold environments. Proportioners typically use a ½" stainless steel tubing to connect to the aluminum fluid manifold. This area may act as a heat sink in cold climates until the fluid manifold comes up to temperature from the hot material flowing through it. In cold weather, by the time the fluid manifold comes up to temperature, you may cool down your fluids coming from the preheater. You may lose 30+° degrees before your heated fluids get to the spray hose. The infrared photo of a proportional manifold in Figure 6 show this heat loss. Notice the rapid loss of temperature into the heated hoses.

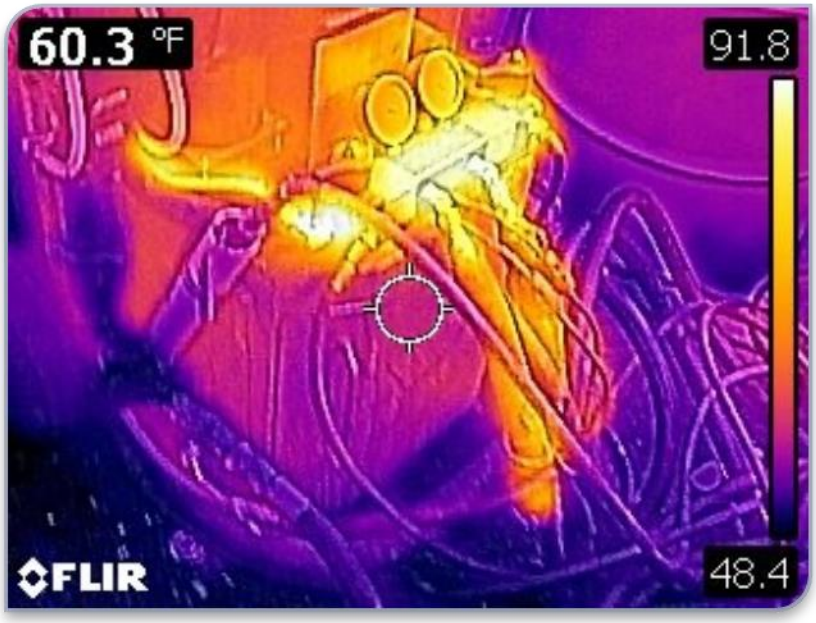

FIGURE 6 – Infrared photo showing heat losses

Recommendations:

- Recirculate your material when possible to bring the fluid manifold up to temperature and to minimize the “heat sink” effect it may have when initially spraying when the fluid manifold is too cold.
- Use ½” foam pipe insulation to insulate the fluid tubes.
- Unbolt the fluid manifold from the cabinet frame and place at least ½” thick foam sheet and heat shield or foil back felt under the fluid manifold. Use longer screws and re-mount the fluid manifold back to the frame.
- Insulate this aluminum fluid manifold with these same products, ½” thick foam sheet and heat shield or foil back felt, as well as you can.
- Put larger foam pipe insulation on the bare fittings and shrink wrap to hold in place.

Spray Hose

Recommendations:

- Inspect your hoses for damaged insulation and repair as needed.
- Feel the outside of your hoses. If you can feel warmth through the outer cover you may have to add thicker insulation on your spray hose.
- It is especially important to be sure the area of the hose where the temperature sensor is located is properly insulated. It is common to install the temperature sensor near the

gun. This is the area of hose that takes the most abuse and where it is common that the hose insulation has been torn off due to wear. When the temperature sensor is in an uninsulated section of hose, it causes the heat in the hose to be easily lost to atmosphere. In this condition the temperature sensor constantly thinks the material is cold and will be signaling for more hose heat, while the rest of the hose may be overheating. Much of the rest of the hose is probably still well insulated since it doesn't take the wear and abuse the section of hose near the gun.

Also, a good amount of the hose may still be coiled on the rack back on the rig. When a hose is coiled on the rack it is building heat and insulating itself from heat loss. In this situation when you pull the trigger you will see hot and cold slugs of material that will affect your spray pattern, and the quality of your foam.

A good analogy to demonstrate the importance of hose insulation is this is the same as trying to regulate the temperature of your home in the winter when the thermostat is located outside on the porch…the thermostat will keep calling for heat and the inside of you home will be way too hot.

Following these simple tips should help your equipment better control fluid temperatures, help lower viscosities, and provide smoother pressures throughout the entire system. These improvements should result in a better spray pattern, better mix and improved yield.

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DOCUMENT HISTORY

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