Bruest Catalytic Heater Operation

Step 1:

Begin the electrical preheat by providing power to the heater's electrical element. Wait 15 minutes.

Step 2:

With the electricity still on, activate the safety valve to allow fuel gas into the heater. Manually operated heaters have two options for the safety valve, either the Baso or Maxitrol Mertik.

-For BASO safety valve: press the button on the safety top firmly, then release it.

Figure 1: Example Baso H17 valve, shown without red cover on pushbutton

-For Mertik safety valve: With the dial in the OFF position, turn it towards IGN until it won't turn anymore, then press the dial into the valve like a button. While continuing to hold the dial down, turn it all the way past IGN to the PILOT position until it won't turn any further. Release the dial and finish turning it to the ON position.

Figure 2: Maxitrol Mertik GV33 safety valve and temperature controller

If you have a gauge installed downstream of the safety valve, check the pressure during this step. When the safety valve opens you should see the gauge dial change. If the pressure jumps and does not return to zero, then the valve should be open. Bruest Catalytic Heaters require 3.5 inches of water column (8.7 mbar) to operate at full rated capacity or 1.7 inches of water column (4.4 mbar) for half fire. Adjust the pressure regulator to ensure full gas supply pressure is available.

Only one safety valve can be used per heater. Standard heaters include the Baso valve, while the Maxitrol Mertik is an optional item. The Mertik has built-in thermostatic control, which can be added in the field to add additional system. When adding the Mertik temperature controller the Baso valve must be removed for the system to operate correctly (Note: The same thermocouple is used with both safety valves and should be kept when making the modification).

If the safety valve does not open, wait a few minutes and repeat step 2.

Step 3:

Leave the electricity on for a minimum of 10 additional minutes after the safety valve is opened to ensure the heater reach full operational readiness.

The heating pad must reach 300-400°F (149°C - 204°C) before the safety valve will open. Once open, the fuel gas (which will be at ambient temperature that is at a much lower temperature) will cool the interior of the heater a bit before it starts to oxidize and create heat. Turning off the electricity too soon can result in a loss of interior heat and shut the safety valve off prematurely.

The preheat cycle by the heating element will only heat a portion of the heater pad. It will take time for the heat to spread across the entire heater face. The additional 10 minutes of electrical power will help to ensure the heater pad stabilizes. For older heaters, or heater pads exposed to long periods of humid condition during periods of non-use, additional preheat time may be needed for start the heater pads.

Be sure to turn off the electrical element after startup. Leaving it on for extended time periods can shorten the lifespan of the element.

During normal operations, the typical surface temperature of the heater will vary between 700°F to 900°F (371°C - 482°C). The temperature over the entire surface area of the heater pad will vary slightly but should not be less than 450°F (232°C). If multiple areas of this critical temperature is observed during normal operation it may be indicative of service requirement.

Shut down:

To turn off the heater, simply shut off the gas supply to the heater. If a Mertik is in use, turning the dial to OFF will also stop the fuel supply.

Pressure Regulator Settings:

Regulators are pre-set at the factory, but it is not uncommon for the settings to shift during shipping. Bruest heaters are designed to operate with a maximum pressure of 3.5" of water column at the fuel inlet. If the pressure is measured upstream of the heater fuel inlet, be sure to account for tubing length, elbows or other sources of pressure loss that could be restricting fuel flow. It is ideal to measure the pressure as close to the heater as possible.

Recommended Regulator Pressure Settings		
	Max Inlet Pressure	Target Outlet Pressure
Fisher 1301	6000 psig	20-50 psig
Fisher 912*	50 psig	0.5 psig
Maxitrol RV20L, RV47L or R400S**	0.5 psig	3.5" w.c.

*The Fisher 912 can handle more than 50 psig for safety reasons, but it has trouble reducing to 0.5 psig or lower with higher inlet pressures. For Class 1 Div 2 Group D locations (FM approved heaters) the appliance regulator is not required, so the 912 regulator will reduce to 3.5" w.c. in its place.

*Also with the 912 regulator, for large heaters (50,000 Btu/hr+) the inlet pressure needs to be sufficient to handle the flow capacity. 20 psig into the 912 is sufficient for even the largest heaters. Spec sheets with flow capacity are easy to find for this regulator as well. A single 912 regulator can service multiple small heaters, but larger heaters will each require their own 912.

**Appliance regulator selection varies depending on heater fuel consumption. Maxitrol RV20L is used with heaters consuming 30,000 BTU/hr or less.

**Maxitrol RV47L for heaters using 60,000 Btu/hr or less.

**Maxitrol R400S works for any individual heater, big or small.

Adjusting Pressure Settings:

To achieve the proper pressure setting at the heater, adjust the furthest downstream regulator while observing the manifold pressure. When a 912 and Maxitrol regulator are used in series, it may be necessary to tweak both the 912 and Maxitrol to achieve the proper outlet pressure.

A manometer is the preferred and most accurate low-pressure measurement device we typically use, but a gauge works if a manometer is not available.

The heaters should receive 3.5" of water column at the fuel inlet. Excess fuel can result in unburnt fuel and less clean emissions, but it will also produce a bit more heat. The heaters can operate within the window of 1.5 – 3.5" w.c., so in the case that less heat is desired the fuel inlet pressure can be turned down. Thermostats will do this automatically, switching between high and low pressure based on real

time temperature measurements. At 1.5" w.c., the fuel output is ~50%. 1" of w.c. or lower pressures risk starving the heater.

Troubleshooting

The Safety Valve Won't Open

- Be sure to allow enough time for preheating. Some heaters can preheat in 10 minutes or less, but others may not become hot enough to satisfy the safety valve in that amount of time.

- Make sure that the thermocouple connection into the safety valve is secure and clean. The thermocouple tip needs to be firmly pressed against the contact in the valve and held in that position. Do not over-tighten the threads; just be sure that the thermocouple isn't wobbling around. A pencil eraser works nice for cleaning the inside of the safety valve contact, or anything else that is small and abrasive.

- Check the entire thermocouple for damage, and inspect the safety valve as well. Signs of rust, corrosion or discoloration are indicators that replacements might be needed. Note that the thermocouple won't remain polished and shiny if it is in use outdoors, but some tarnish doesn't affect the operation in that case.

The Mertik Safety Valve Dial is Stuck

- The Mertik can potentially lock the "ON" and "OFF" dial from its full range of motion. This safety lock typically occurs after the device has tripped from a loss of heat.

- If this situation occurs, simply remove the thermocouple from the back of the Mertik and thread it right back in. Breaking the contact of the thermocouple resets the Mertik and should allow for the dial to operate once more.

Heater Was Hot, Came Back to Find it Cold

- Something has stopped fuel flow to the heater over that time period.

- If the low fire setting of the thermostat is not set correctly it could cause the fuel supply at low fire to be insufficient. Be sure to adjust the thermostats accordingly. There are guides available from Bruest on how to properly make these adjustments (see Bruest contact information for inquiry). The ideal low-fire thermostat setting is 1.25-1.5" w.c., but try increasing the thermostat's low fire pressure by ½" w.c. increments if problems continue to occur. Ignore if you do not use a thermostat.

- Try lowering the inlet fuel gas pressure below 3.5" w.c. (try ½" w.c. increments); this will cause the heat source to migrate deeper into the heater body and closer to the thermocouple probe tip which operates the safety valve.
- Thermocouple damage or a loose connection could cause the safety valve to close at the wrong times, but there would most likely be trouble opening the valve in the first place if the thermocouple were the issue.

- Over time the catalyst in the pads can degrade through reaction with certain elements and compounds, and through other more physical means. In cases with old heaters or heaters in harsh environments, sometimes a repair or replacement is the only solution.

- It is important to use filtration upstream of catalytic heaters when there is moisture or impurities in natural gas streams. Filters are useful in all applications, even when "pipeline quality" gas is in use. These heaters and regulators are equipped with small orifices, so any debris could cause issues. Sulfur is the worst enemy of a catalytic heater, because it will directly react with the catalyst and render it inert.

Replacement Parts

- Often times a heater only needs a new thermocouple and safety valve to remedy operational problems, and we recommend replacing those parts first in most cases.

- Please contact Bruest regarding replacement parts.

- Certain parts can be purchased locally (regulators, fittings, etc.), but some are specifically designed and ordered to work with Bruest products. For instance, a replacement thermocouple from the hardware store will most likely not work to replace the factory installed thermocouple.

Thank you for choosing Bruest Catalytic Infrared Heaters.

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