Ameritube LLC 1000 N. Hwy 77, Hillsboro TX 76645	Revision Level: B	Procedure No. SOP 300
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Furnace and Exothermic Generator Process and Procedures	This Document expires one day after printing Last Printed: September 26, 2018	

Date	*Description Of Change*	*Signature*	*Rev. Level*
4/16/2012	*New*	*Jeremy Wilson*	*A*
3/19/2013	*Changed Para. 6.1.2, 6.1.3, 6.1.4 to represent current actions*	*Jeremy Wilson*	*B*
9/26/2018	*Changed Para. 5 & 6 to account for current procedure*	*Nicholas Girard*	*C*

Procedure Approval:	**Company Title:**	**Date:**
	Quality Manager	4/16/2012

1. PURPOSE

This document sets forth the minimum requirements for start up, shut down and safety for furnace and generator personnel. Do not attempt this procedure if you are untrained on this equipment.

2. APPLICATION

This procedure concerns Production and Quality Assurance departments.

3. PROCEDURE

3.1. Scope and Responsibilities

3.1.1. It shall be the responsibility of the Production Manager to insure the following:

3.1.1.1. That training and experience requirements are established.

3.1.1.2. That the furnace personnel training program is properly administered.

3.1.1.3. That all equipment is in working order and calibrated.

3.2. It shall be the responsibility of the Quality Manager to insure that all personnel maintain proper training and experience requirements for the job functions they are performing

4. Furnace Cold Start Procedure

4.1. Press the start button below the Rollers Drive label. Visually confirm the rollers are moving by looking at the chain and sprockets. Then turn the “Rollers Drive” override switch to on.

4.2. Press the start button below the Furnace Blower label.

4.3. Press the start button below the Water Supply Pump label.

4.4. Pull the emergency stop button out and reset the Maxon control valve by pulling the leaver back towards you and then push it away. If there is no resistance when pushing back please see Estop reset section.

4.5. Push the auto/manual button on the Honeywell 3200 controllers (top three controllers). Set the output of the controllers to 60.0 to 65.0 using the up and down arrow buttons.

4.6. Start the zone three igniters and listen for a rumbling noise. Once the rumbling has stopped look down the burner tubes to make sure there is a fire in the tube for that zone. If there is no

fire in the tubes then go to the Emergency Stop and reset then shut of the yellow valve. Repeat the same process for zones 2 and 1.

Note: Only ignite 1 zone at a time. Failure to do so will cause loss of gas pressure and both zones will not ignite.

4.7. Once all three zones are lit change the Honeywell 3200 controllers (top three controllers) back over to automatic by pushing the manual/automatic button and adjust the set point temperature using the arrow buttons.

5. **Generator Cold Start**

5.1. Preliminary ignition operations:

5.1.1. Check oil level on the Root Blower and add oil as needed.

5.1.2. Turn the safety alarm switch to safety by-pass.

5.1.3. Turn the gas off by rotating the red valve handle completely shut. Using the down arrow on the Ratio Control Valve (RCV), lower the gas level to zero, as indicated by an “x” in the lower right corner of the RCV’s screen.

5.1.4. Open the exhaust flap that is above the water bath on top of the generator.

5.1.5. Close the process valve that allows atmosphere to enter the furnace and then open the process by-pass valve to ensure atmosphere is exiting the building.

5.1.6. Press and hold the air pump button on for 20 seconds. Let the air pump run for 10 minutes to evacuate any gas in the combustion chamber of the generator.

5.1.7. Turn on the cooling tower pump and cooling tower fan.

5.2. Ignition Operations:

5.2.1. Disengage the emergency shut-off push button, located in front of the furnace, on the side of the furnace electrical panel. This will initiate the gas control solenoid to allow gas to flow.

5.2.2. Take the T-Handle out of the front door of the generator so that a pilot hole is open.

5.2.3. Ignite the oxy-acetylene torch and put the open flame into the pilot hole.

5.2.4. Reset the Maxon control valve. There should be resistance.

5.2.5. Turn the air flow to 4000 CFH, then slowly open the gas valve.

5.2.6. Using the up arrow on the RCV, set the ratio between 13:1 – 15:1

5.2.7. Once the combustion chamber has ignited, remove the torch from the pilot hole and shut off the torch.

5.2.8. Give the combustion chamber 5 to 10 minutes to stabilize and begin warming the generator. Water should evaporate from the exhaust pipe upon contact.

5.2.9. Close the exhaust flap that is above the water bath on top of the generator.

5.2.10. Stabilize the RCV by adjusting the air and gas flow accordingly.

5.3. Atmosphere Introduction Operations:

5.3.1. Only introduce atmosphere to the furnace once its temperature is above 900 degrees Fahrenheit. This will ensure gases pushed into the furnace will combust, preventing any build-up of explosive gas.

5.3.2. Open the process valve to allow atmosphere to enter the furnace.

5.3.3. Return to the RCV and adjust its ratio in incremental stages, according to annealing requirements for the process to be completed.

5.3.4. Allow five to ten minutes of stabilized flow to pass before closing the process by-pass valve, directing all atmospheric flow to the furnace. Make final adjustments to gas and air flow if necessary.

6. Overnight shut down Procedure

6.1. Furnace

6.1.1. Make sure no material is in the furnace or cooling area.

6.1.2. Hit the E-stop and verify no gas leaks.

6.1.3. Relight zone 3 only keep in automatic and the set point to 500 degrees put zone 1 and 2 out puts on 0.0.

6.1.4. Shut the inlet and outlet doors on the furnace and cooling area.

6.2. Generator

6.2.1. Remove the t-handle.

6.2.2. Adjust the gas and air flows down 550 and 5500 keeping the flame lit and stable.

6.2.3. Replace the t-handle.

7. Complete Furnace and Generator Shut Down

7.1. Furnace

7.1.1. Push in the Emergency Stop button and pull the Emergency Stop button out.

7.1.2. Activate the roller drive system and the water supply pump.

7.2. Generator

7.2.1. Turn the safety switch into bypass

7.2.2. Open the process gas bypass and close the process gas valve.

7.2.3. Slowly turn off the gas until the flow meters LED is lit and there is a red bar all the way down the meter.

7.2.4. Allow 5 to 10 minutes for any unburned gas to be evacuated out of the combustion chamber.

7.2.5. Push the stop button on the air pump to shut off the pump.

7.2.6. Keep the cooling tower pump and fan on until the water has reached a safe temperature Then they can be turned off.

8. Emergency Stop Reset

8.1. Furnace

8.1.1. Pull the emergency stop button out.

8.1.2. Push the reset button on the Honeywell 2800 controllers.

8.1.3. Resume the Cold Start Up Procedure.

8.2. Generator

8.2.1. Turn the safety alarm switch to bypass.

8.2.2. Resume the Cold Start Procedure.