4.3 Routine Maintenance

4.3.1 General

Generally external cleaning is all that is required. The chambers are not to be touched or removed. If chamber cleaning is required, contact FurnacePros.

WARNING. DO NOT ATTEMPT TO OPEN OR MANUALLY CLEAN THE CHAMBERS OR THE FURNACE MAY BE INOPERABLE DUE TO DAMAGE TO THE INSULATION. Contact the manufacturer if cleaning is required.

4.3.2 Daily Maintenance

Daily maintenance consists of a simple series of functional checks that will alert maintenance personnel to any signs of developing problems. The importance of regularly checking the machine cannot be over stressed to prevent not only damage to the machine, but also loss of productive time and product. Whenever the furnace is started up the failure alarms should be checked for signs of trouble. An intermittent exhaust failure indicates that something is wrong and that the alarm mechanism, system exhaust fan, and possibly exhaust ductwork must be checked and corrected as necessary. Other alarm functions should be monitored, such as the lamp failure indicator, to see if corrective action is required. As the machine is being started, each control and switch should be briefly checked to ensure that all functions are working properly. Any controls that do not respond as expected, or alarms that do not clear should be checked out and corrected before putting the machine into operation.

4.3.3 Monthly Maintenance

Monthly maintenance, in general, means four weeks of operation for one eight-hour shift per day. This period of operation is not an absolute number, and it is possible that some of the tasks are needed more or less often. Experience with the machine and process being performed should dictate the need.

Note: Run a temperature profile, no less often than monthly, on machines that are used for sensitive processes.

On machines that are used for a variety of products, it is advisable to set up a profiling schedule so that each process can be checked periodically. The most sensitive profiles should be checked at least monthly, while less sensitive profiles could be checked every 2-6 months.

4.4 Other Preventive Maintenance

4.4.1 Recommended Maintenance and Frequency

The following table lists furnace equipment and maintenance tasks and recommended intervals. Many of these items are optional equipment and may not be found on your furnace. In many cases visual inspection can determine whether any preventative maintenance is required. Often maintenance intervals are determined by the process and furnace use.

Table 4-2 Recommended Maintenance & Frequency		
Equipment	**Recommended Maintenance**	**Recommended Interval**
Air Filters, Process gas	Remove the door panel below the flowmeters and replace filter set in the compressed air line to assure furnace receives clean dry air, nitrogen or other process gas.  	6 months or as required.
Belt Shaft Bearings-perm	To gain access to the belt shaft bearings remove the end covers from both ends of the machine. Located at both ends of each belt shaft are permanently-lubricated bearings. These bearings should not be lubricated.	None
Belt Shaft Bearings with grease fittings	Bearings with grease fittings should be lubricated with general multipurpose bearing grease. Apply enough grease to the bearing block so that excess grease can be visually seen squirting out along the shaft of the device. Wipe off all excess grease that has squirted out to avoid dirt accumulation.	6 months
Belt Shaft Rollers	The belt shaft rollers should be inspected periodically to make sure that they are centered on their respective shafts. Remove the end covers to gain full access to the belt shaft rollers. If a roller is misaligned, loosen the setscrews that hold the roller onto the shaft and use a rubber mallet to move the roller on its shaft. Use a scale to make sure the rollers are centered to within 0.125 inches on the belt shaft.  Roller at Entrance	After first 30 days, annually thereafter
Belt Tracking Adjustment	The belt should be checked periodically to make sure that it is tracking through the center of the oven. Belt tracking can be checked visually at the entrance and exit ends of the oven. The belt should be centered between the belt guides at the entrance and exit ends of the oven. If the belt tracks off-center this problem can be rectified by realigning the belt shafts. First, set the belt speed to zero and remove the end covers at the entrance and exit end of the machine to expose the frame ends and the belt shaft bearing mounts at the end of the belt shafts. The following procedure can be used to 	Verify tracking weekly; adjusts only if requried

Table 4-2 Recommended Maintenance & Frequency		
Equipment	**Recommended Maintenance**	**Recommended Interval**
	correct tracking problems at either end of the furnace. Loosen the belt shaft bearing mount bolts at one end of the furnace (entrance or exit). While facing the end (entrance or exit) of the furnace, use the following procedure. If the belt is tracking to your left, pull the left side of the belt shaft forward and/or move the right side of the belt shaft rearward. If the belt is tracking to your right, pull the right side of the belt shaft forward and/or move the left side of the belt shaft rearward. Repeat this procedure at the other end of the furnace. It is best to make these adjustments in small increments. Adjustments that are too large will cause a belt tracking problem in the other direction. At the exit end of the furnace, the transport motion sensor will also have to be loosened and moved with the belt shaft to maintain engagement with the gear on the belt shaft. Now run the belt at its highest speed and observe how the belt is tracking. Repeat the adjustment procedure until the belt tracking is centered.	
Chamber Inspection	To inspect chamber internals: 1. Disconnect main power, 2. Remove supporting brackets (and chamber bolts on H_2 furnaces), 3. Connect 110-120 Vac power to chamber lift, 4. Open chamber using remote control, and 5. Inspect top and bottom sections for damage and or deposits.  Chamber Open – At Entrance	1 year for most processes

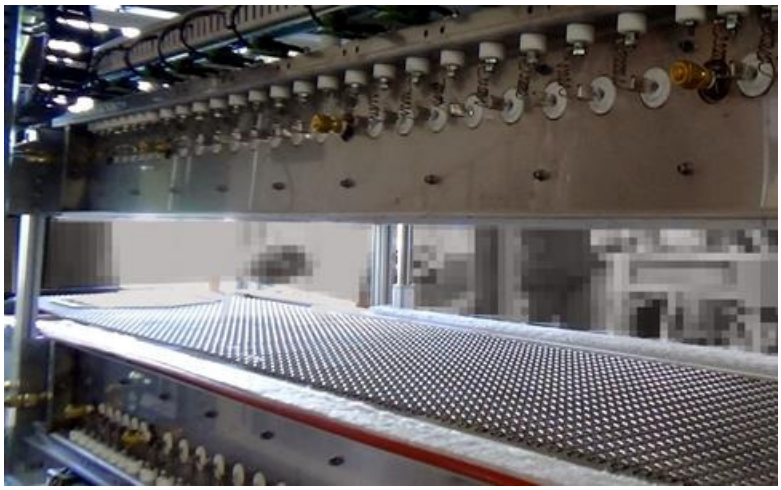
Table 4-2 Recommended Maintenance & Frequency		
Equipment	**Recommended Maintenance**	**Recommended Interval**
Chamber	The chamber normally does not require maintenance. If a problem with the chamber is suspected, the manufacturer should be consulted. Because the process gas is inserted through the insulation, the gas flow away from the insulation prevents contamination from building up on the chamber walls. To help reduce flux residue buildup in the chamber, the zones can be set at 400°C and the furnace can be put into a self-cleaning cycle for about an hour to burn out these organic residues.  Chamber Open – Side View  Chamber Open – Top IR Lamps	Process dependent
Cooling Fans	If optional cabinet cooling fans are installed, Inspect all system cooling fans for freedom of movement and proper operation.	1 year
Drip Trays	Remove and clean the drip trays, located under the process exhaust stacks. Access to the trays is through the top removable section of the furnace chamber, located above the trays, or at the furnace entrance, behind the cosmetic entrance molding. For procedure on removal and cleaning of the trays, consult Section 4.10.3. Depending on the process, if very little buildup is found, cleaning may not be necessary more than once a year.	After the first 6 months of operation, as required thereafter

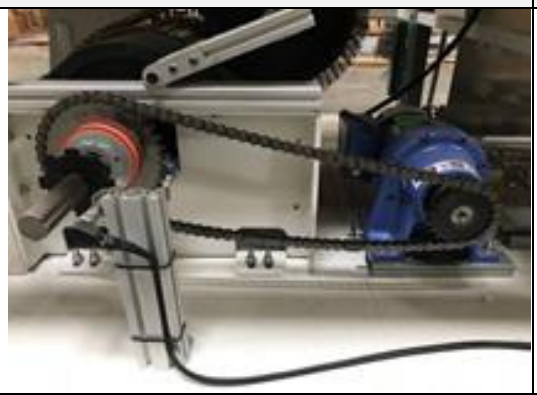
Table 4-2 Recommended Maintenance & Frequency		
Equipment	**Recommended Maintenance**	**Recommended Interval**
Drive Chain	The chain drive system is contained in the motor enclosure at the exit end of the oven. Lubricate the drive chain with TPS #100523 chain lube or a commercial quality non-dripping chain lube. 	Every 12 months of operation
Drive Chain Tensioner	The chain tensioner is equipped with grease fitting for lubrication. The chain tensioner should be lubricated every 6 months with a general multipurpose bearing grease. Apply enough grease to the tensioner so that excess grease can be visually seen squirting out along the shaft of the device. Wipe off all excess grease that has squirted out to avoid dirt accumulation.	6 months
Drive Motor Mounts	The drive motor is contained in the enclosure at the exit end of the oven. The motor mount bolts must be checked periodically and tightened if necessary.	Annually, or as required.
Exhaust Stack	A visual inspection of the stack is recommended along with each drip tray cleaning. After 6 months of operation 1. With a flashlight, look down the furnace stack. 2. Check the exhaust stacks for possible buildup of materials generated from firing processes. The stacks should be cleaned, as necessary, with a brush and solvent to remove the buildup. A periodic inspection of the stacks is essential to establish a sensible maintenance cycle, since some processes will require frequent cleaning, and others require none at all. Contact TPS if new gasket material is required to reattach the stack.	After the first 6 months, and thereafter as required.
Lamp Heating Elements, IR	No maintenance is required for the heating elements other than replacement when one burns out. Note that with low temperature operations, the lifetime of the heating element is in excess of 100,000 hours. It is only at temperatures in the 800°C to 1000°C range that the expected lifetime begins to shorten. The heating elements degrade little over time. The control system compensates for this loss until complete element failure occurs. Should failure occur, it will be sudden and catastrophic. Use ohmmeter for best results visual inspection is unreliable. Refer section 4.10.5D for changing heating elements.	Inspect regularly; replace lamps as indicated by furnace software.

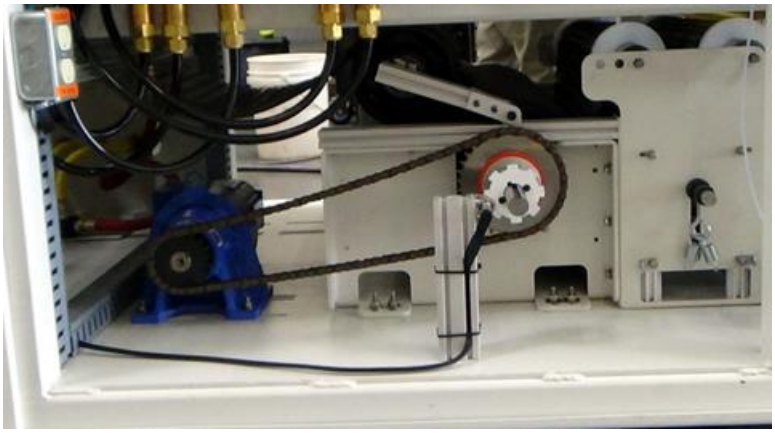
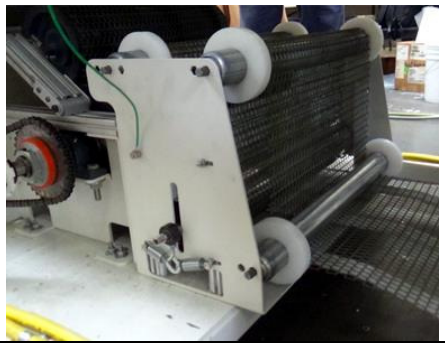
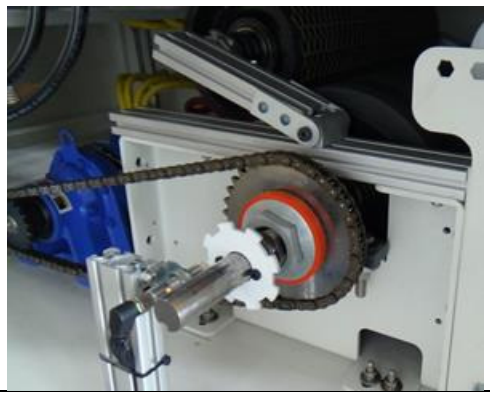
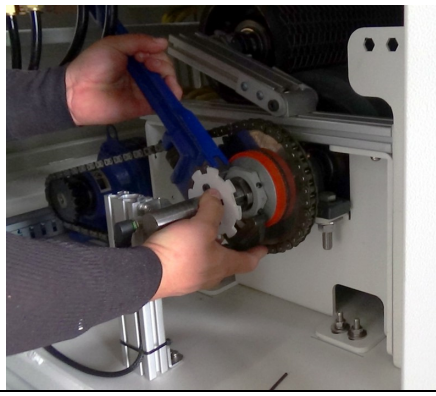
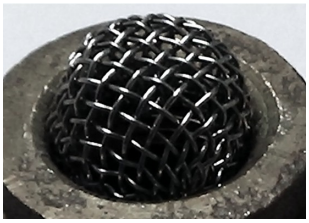
Table 4-2 Recommended Maintenance & Frequency		
Equipment	**Recommended Maintenance**	**Recommended Interval**
Lamp Heating Elements, SiC	No maintenance is required for the heating elements other than replacement when one burns out. Note that with low temperature operations, the lifetime of the heating element is in excess of 100,000 hours. It is only at temperatures in the 1000°C to 1250°C range that the expected lifetime begins to shorten. Also, the heating elements degrade little over time. The rate of ageing is affected by the surrounding atmosphere, and also depends to a large extent on the operating temperature (and hence on the power being dissipated). The control system compensates for this loss until complete element failure occurs. Should failure occur, it will be sudden and catastrophic. Use ohmmeter for best results visual inspection is unreliable. Refer section 4.10.5D for changing heating elements.	Inspect regularly; replace lamps as indicated by furnace software.
Lamp Seals	Inspect the lamp seals for loose, cracked or missing packing material. Once the side covers are removed, the lamp seals can be visually inspected.	12 months
Sprocket Alignment	The sprockets are contained in the motor enclosure near the exit end of the furnace. Visually verify that the sprockets are aligned. Adjust according to the furnace, section 4.10.2C. 	After first 30 days and annually thereafter.
Sprocket Shaft Bearing Block	The sprockets are contained in the motor enclosure at the exit end of the oven. The sprocket shaft bearing block is equipped with a grease fitting for lubrication. The bearing block should be lubricated with a general multipurpose bearing grease. Apply enough grease to the bearing block so that excess grease can be visually seen squirting out along the shaft of the device. Wipe off all excess grease that has squirted out to avoid dirt accumulation.	12 months

Table 4-2 Recommended Maintenance & Frequency		
Equipment	**Recommended Maintenance**	**Recommended Interval**
Transport Belt Length	Check the length of the transport belt and shorten it if the gravity loop comes within 6 inches of the floor. A properly shortened belt should hang between 2 and 3 inches below the main frame.  	Annually, or as required.
Transport Clutch	The clutch should be inspected periodically to insure proper tension on the belt. To adjust, a large hex nut at the chain sprocket end of the drive drum must be tightened until the drum turns. If the drum cannot be stopped by firm pressure with your hands, the clutch is too tight. Do not over tighten the clutch, as it is there for safety reasons.  	As required if belt slips.
UCD Tank	Remove belt weight and inspect tank for cleanliness. Remove any debris and wipe down interior of tank. Make sure tank drain screens are clear of obstructions. 	Annually, or as required.