

## **Project History of Skip Schaefer, Industrial Heating Systems, Boise, ID**

### **Project 1- Spray rinse tank on memory discs. Burroughs Corporation, Westlake Village, CA**

The year was 1980. A customer needs a final 180°F final spray rinse for memory disc process line. He needed 5 gallon per minute. I built an electric, all 316L electropolished heat exchanger that had 3- 36kW heating elements, I designed, that were also electropolished. The 36 x 86 x 16 deep enclosures housed the main power disconnect and power distribution to the 3- SCR controllers to handle the temperature. I used a 4-20 milliamp West brand controller. I had to pass a megohm test. They were putting in 18 m/ohm water and I had to return not less than 15 M/ohm. I passed with 16.

### **Project 2- Solder mask ovens for TYCO International, Printed Circuit Board Division, Inglewood, CA**

Solder mask is a critical application in the printed circuit board industry. You must apply the mask to both side of the boards. Screen on one side and bake at 180° F for 15 minutes and screen the other side and bake for 15 minutes and then a final bake at 325°F. The ovens were a popular brand, not mine. I took one back to the shop gutted it and did the improvements to the motor, heaters and air flow. I put in SCR controls and got the temperature to +- 1-degree F. I also incorporated a "final bake" switch. When the button was pressed the temperature would rise to 325° and the timer would start give them a true 30-minute bake. I did 5 more ovens for them after the first one.

At the same time, I was supplying them with our heaters and control systems with the built-in liquid level safety. They even had PAL, a China equipment supplier use my heaters and controls in a system they were acquiring.

### **Project 3- Hot Oil Reflow System for TYCO International Printed Circuit Board Division, Inglewood, CA**

Hot oil reflow systems are designed to reflow the tin-lead on printed circuit boards, especially military PCB's. Tyco had a previous version of a reflow system I had built 6 years previous. Their new requirement was to reflow 3 boards at 1 time. A few design changes and adding more heat and the project was delivered.

### **Project 4- Industrial Oven for plastisol for BURKE RACK CO.**

Baking the plastisol coating on plating racks was the requirement. Even temperature, quick response, good recovery time, good air flow design, and with capability for roll in carts, were the requirements. The oven was 5' x 4' x 6' tall and was electrically heated wit open coil elements. As plastisol heats and get to a certain temperature, it begins to smoke. By passing the air over a large surface area of open element heaters reduced the emissions out the exhaust. The heating elements never needed rebuilding.

### **Project 5- Rebuilding a Plating Shop- Active Magnetic Inspection, Sun Valley, CA**

2007. I build and sold all the heaters and control systems with Liquid level safeties. I had a long relationship the owner and I was 1 of the 3 key people to rebuild the shop. After clearing the site, metal ball beading the concrete, we then 2 part epoxied the floor. Next, we POLYPRO'd the floor with ½" thick, extrusion welded floor with copper stripping laid down under the seams so we could spark test after

welding. The 6 "berm lip was welded in. The tanks, both Stainless and plastic were fabricated and placed on weight distribution pads. The customer didn't want a boiler, only electric immersion heaters.

The wiring layout was determined and the 2 Industrial Ovens, and the 9 rectifiers were all on the 480/ 3 phase service. All the heaters and controls for the tanks were chosen to be on 240 / 3 phase.

They requested DATA collection on the temperature controls. Each oven had a temperature position. The large oven had 36 positions and the small oven 24 positions plus all the 16 for the heated process tanks. This information was collected 24/7 and has since 2007 to the present been in operation. The ovens have not shut off, except for planned belt changes since then.

#### **Project 6- Manufacturing Ovens for - Active Magnetic Inspection, Sun Valley, CA**

2007. Active Magnetic Inspection does Cadmium plating on bolts. Part of the process is to do a post bake from hydrogen embrittlement relief for 23 hours. The specifications call for placing the parts in the oven within 4 hours of plating. With 24 locations to place parts in the small oven and 36 in the big oven the door was going to open and close about every 3-5 minutes. Heat loss is a concern. To over come those losses, I added in ¼ inch thick stainless sheet behind the air wall, where the air would pass over it prior to flowing across to the suction side of the oven which proved to provide the correct amount of heat. The oven came in @ +- 2°F at 375°F. The heat losses, when belt replacement took place, was a drop of 7 degrees. Well within the specification of processing. The ovens are still working flawlessly to present.

#### **Project 7- 2000 gallons of Electroless Nickel Heaters for Quality Plating in Salt Lake City, UT**

2010. I receive a call from a customer who was putting in a 16 ft long Electroless Nickel tank that would hold 500 gallons. Without hesitation, I designed some L-shape bottom heaters 33kW with a total of 66 kW/H with the control system and an AIR BUBBLER Liquid level safety. I explain to the owner that the level control was cheap insurance in relation to the cost of the heater replacement even. I'm pleased to announce that after 8 years (2018) those original heaters are still running to present. He has since, ordered another set for another 500-gallon tank, and 3 sets for the balance of his gallonage in different size tanks. All are 316 stainless.