

## Fast track installation and commissioning. July 2006

Bogh Industries has recently been tasked with the installation and startup supervision of two pieces of equipment for a customer. The equipment was installed in Malaysia. The task was to install a drop bottom furnace with a 4x8x4 foot heat zone. The furnace is used for solution heat treat. The age oven has a 160”L x120”W x 110” H chamber. The time line for the installation required all major tasks to be completed in 30 days.

### Quick Quench furnace

#### Installation



**Figure 1:** The start of the project. A concrete foundation consisting of a shallow pit is a part of the installation. The foundation was completed prior to the start of installation.

#### Day one



**Figure 2:** The furnace body is raised and secured between the four furnace columns.

#### Day 2



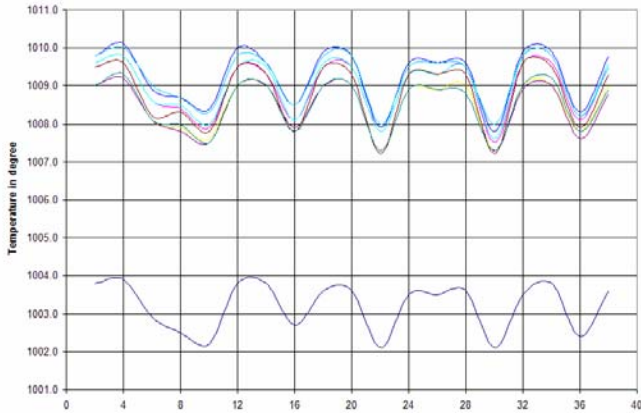
**Figure 3:** Doors hoisted and air plumbing completed. The very tight space for using lifting equipment and the pit made any placement of the heavy pieces a challenge.

#### Day 3.



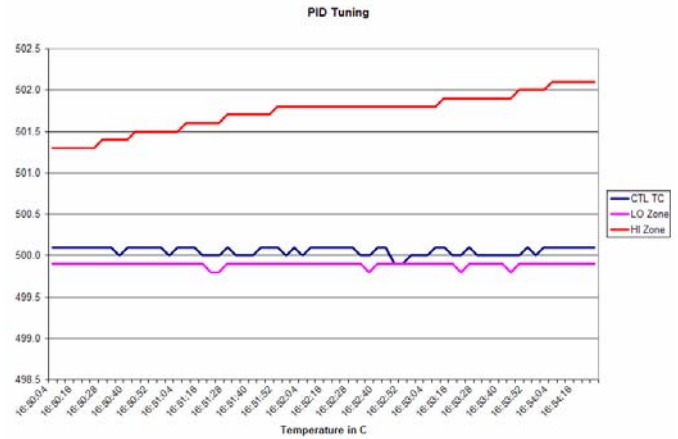
**Figure 4:** All major components installed and connected. (Furnace, Mobile Quench Tank and stationary rinse tank)

The furnace was factory tested by the manufacturer to the extent that heat had been applied and an initial survey completed. The data from the factory testing suggested that the furnace needed to have the PID loop tuned to a better parameter. This was completed in one day when the furnace was brought up to maximum operation temperature as part of the initial on site test.

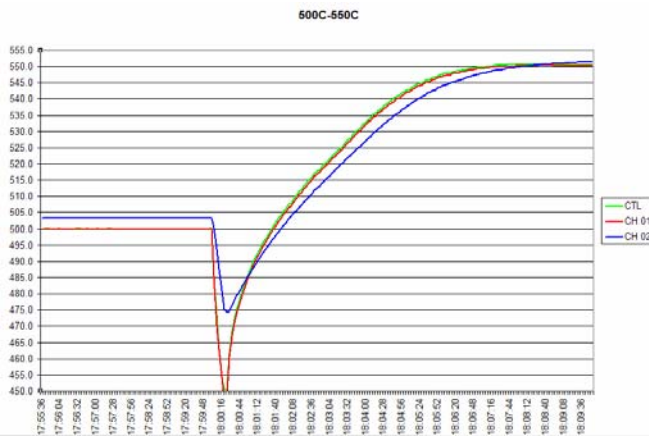


**Figure 5:** The graph shows the oscillation on the PID loop and the spread on the TC's

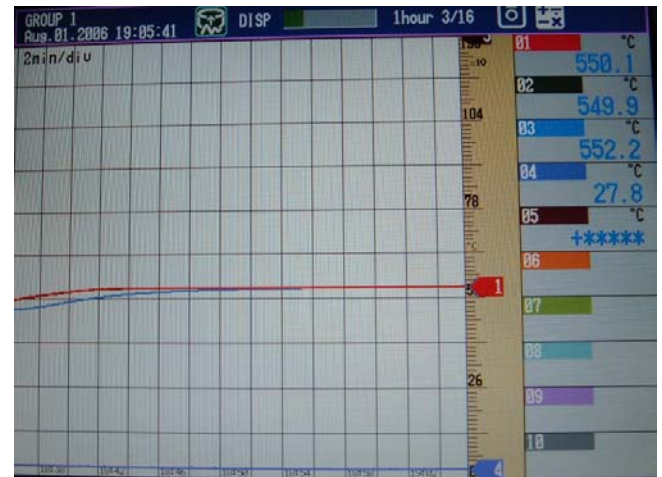
With our experience it will be possible to achieve +/- 1C or better on this electric furnace with the proper adjustments and instrumentation.



**Figure 7:** The figure shows how the control PID is holding temperature. (Blue line)



**Figure 6:** This graph shows the furnace recovery from 500C to 550C. It took 7 minutes for the furnace to reach temperature. The furnace has very fast recovery rates. First TC in soak was 7 minutes after the cold rack was inserted and the last TC was in soak after 13 minutes at the highest temperature (550C)



**Figure 7:** The picture show the machines recorder during the 550C test. No oscillation or overshoot.

As shown on figure 6 and 7, the PID is now controlling very tightly and overshoot is practically eliminated. PID is now controlling the temperature within 0.2° C. Instrument calibration check performed later and the survey accomplished acceptable data for turning the furnace over to production. +/- 1.5°C. Better uniformity is possible but then additional survey time is needed.

**Age oven.**

The age oven was installed during the same time period of 30 days. The oven was shipped as a knocked down machine where wall and roof panels are assembled in the field. The oven was installed in a very tight space where major lifting equipment did not have any access.

Day 1



**Figure 9:** Heater box was raised and the insulated floor assembled.

Day 2



**Figure 10:** The walls and roof is now shown assembled.

Day 3



**Figure 11:** The supply and return duct installed and the heater box placed in the proper position.

Day 4.



**Figure 12.** The door mast and door installed. The oven is mechanical complete.

Bogh Industries with the corporation of on site mechanical and electrical contractors got the job completed in the expected time. For a quick quench furnace alone we will expect 21 days or better from start of installation to first production part out of the furnace. The PID tuning took five hours and uniformity survey took a total of 7 hours with the help of the customers personnel. By combining Bogh Industries experience in fast track installation and commissioning this time line would be a comfortable expectation on a prepared plant site.

Bogh Industries also brings our process understanding and ability to train both maintenance and operators in the most efficient use of the equipment.

If you have any questions please contact us directly through our web site [www.boghindustries.com](http://www.boghindustries.com) or by

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