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SMD Operations Procedures Manual

8.1.1.46 OPERATION OF THE LONG COIL OVEN

Text Pages 1 through 9
Attachment(s) 1

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page No.</u>	<u>Initials</u>
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1 **Purpose And Scope**

1.1 To provide instruction in the operation of the Long Coil Oven located in building 902. The oven is a product of L&L Special Furnace Company, Aston PA.

2 **Responsibilities**

None

3 **Prerequisites**

3.1 Training

3.1.1 Operators shall be instructed by the Technician supervisor before using this procedure.

3.1.2 Operator shall be trained as an "knowledgeable employee" as defined by BNL SBMS Subject Area: "Lockout/Tagout (LOTO)

3.2 Equipment

3.2.1 L&L Special Furnace Co., Model: FN2214-FD15-01-G698-480R3K-B06, Serial: B306LL. Max. operating temperature: 1875⁰F/1025⁰C Process Gas: Argon

3.2.2 DOT 4L200 Container for liquid argon including valves on top of the container.

4 **Precautions**

4.1 Verify that all guards and shields are in place.

4.2 Ceramic Fiber Cautions: This furnace contains a mineral wool, fiberglass and/or ceramic fiber product.

CAUTION

Ceramic fiber has been classified as a possible carcinogen. Breathing fiber can cause lung injury and exposure to fiber might cause skin or eye irritation. Do not use this product until you have read the MSDS.

4.3 Do not exceed maximum operating temperature listed on nameplate.

4.4 Do not breathe furnace air. May cause internal burns or may be harmful.

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4.5 Install barriers to limit transient access.

4.6 Read all cautions listed on nameplate.

CAUTION

The liquid argon containers are equipped with a relief valve and a rupture disc from the factory to prevent over-pressurization

CAUTION 2

Only the “gas use” and “pressure building” valves are to be used. Under no circumstances should any other valves be opened

CAUTION 3

No adjustments to the factory installed regulators shall be made

CAUTION 4

Contact your supervisor if a significant amount of ice forms on the top of the argon container in use

5 Procedure

5.1 Overview

5.1.1 The purpose of the procedure is to provide operating instructions for the L&L Oven used in magnet division.

5.2 Powering Up The Furnace

5.2.1 Make sure the furnace doors and control cabinet doors are closed.

5.2.2 Using appropriate PPE, turn ON 440VAC switch labeled LARP OVEN (Fed from PSB2 switch 12):

**PPE: Safety Glasses
Ear Plugs
Full CAL-70 Suit with Gloves**

5.2.3 Make sure UPS is “Turned On”. Pull Control knob to turn ON control power.

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5.3 Set-Up and Use of Argon Liquid Containers

5.3.1 Argon Container Setup

5.3.1.1 Argon gas is supplied to the oven and the reaction fixture from a liquid argon container using a regulator and flex line. One container is used at a time. A second regulator and flex line are available for use when switching between containers so that flow is not interrupted.

5.3.1.2 Fully back off the pressure adjusting knobs on both regulators.

5.3.1.3 Attach one of the regulators to the “gas use” port of an argon container. The “gas use” port is the only one in which the regulator will fit and is the only port to be used on the container.

5.3.1.4 Open the argon container “gas use” valve and adjust regulator pressure to 40 psi.

5.3.1.5 Open the “pressure building” valve on the argon container. This accelerates the conversion of liquid to gas to ensure that enough gas is available to maintain the required flow.

5.3.2 Argon Container Changeover

5.3.2.1 When the container in use is nearly empty it must be replaced with another container to maintain argon flow. Each container has a level gauge. Monitor container weight for a more precise indication of liquid remaining. Change container when the weight drops to within 25 pounds of the container tare weight.

5.3.2.2 Attach the second regulator to the “gas use” port of a new argon container. The “gas use” port is the only one in which the regulator will fit and is the only port to be used on the container.

5.3.2.3 Open the “gas use” valve on the new argon container and adjust regulator pressure to 40 psi.

5.3.2.4 Open the “pressure building” valve on the new argon container. This accelerates the conversion of liquid to gas to ensure that enough gas is available to maintain the required flow.

5.3.2.5 Close the “gas use” and the “pressure building” valves on the empty container.

5.3.2.6 On the empty container, fully back off the pressure adjusting knob on the regulator. Close inline valve at the regulator.

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5.3.2.7 Remove the regulator from the empty container and attach regulator to a full Argon container.

5.3.3 Argon Container Shutdown

5.3.3.1 When the oven cycle is complete the argon flow can be terminated.

5.3.3.2 Close the “gas use” and the “pressure building” valves on the container in use.

5.3.3.3 Fully back off the pressure adjusting knob on the regulator.

5.3.3.4 Remove the regulator from the container.

5.4 Purging The Furnace and Retort With Argon Gas

5.4.1 Press the Key # 3 Button on the Honeywell Operator Interface.

5.4.2 Using the Page UP or Page Down on the Honeywell Operator Interface; scroll to furnace atmosphere control page PB258.

5.4.3 Press F1 button to turn FUR-nace ATMO-sphere ON. Argon supply solenoid valves will open when activated.

5.4.4 Open Process Gas Shutoff valve located on the control panel. Set the Process Gas pressure using the regulator on the control panel to 20-25 psi. Adjust the flow rate of Argon to Furnace using knob on left flow meter. See Attachment 1.

5.4.5 For the initial purge of the furnace, open furnace vent ball valve located on the top rear of the oven.

NOTE: Argon process gas returning from retort first enters course particle filter then to a fine particle filter. There is a valve to bypass fine particle filter. Retort exhaust flow is controlled by flow valve after fine particle filter, it is then directed to O₂ sensor where it is also plumbed with the oven port for gas sampling.

5.4.6 Adjust the flow rate of Argon to retort using the knob on the right flowmeter and the remote flowmeter located on a portable rack near the furnace door.

5.4.7 Monitor the % of oxygen in the retort and the furnace using the oxygen sensor located on the portable rack. Note: There is one O₂ sensor used for measuring the furnace and retort. The technician will have to switch valve orientation depending on source being monitored. See Attachment 1.

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5.5 Setup Of Data Logging Computer

5.5.1 Load the “Labview” file named ‘KTC Read Long Larp Oven 2’.

5.5.2 Click on the white “Run” arrow.

5.5.3 When prompted, input data storage file path and name (coil # followed by .xls).

5.5.4 When prompted, input cell phone number of the operator(s) who will be responding in case of faults. The format is cell#@vtext.com. Click on “Add” and click on continue. On next screen; for mail server, enter bnl.mail.gov.

5.5.5 Confirm that readings of flow, pressure, and oxygen level and load temperature displayed on the computer monitor are correct.

5.5.6 Turn the Furnace Fans ON by pulling the Fan Control knob on control cabinet.

5.5.7 Click on Faults & Email Notification Tab. Set the Email enable toggle switch to enable. Confirm that alarm set points for various parameters are correct. Enter [c:\Larp_oven_fault_log.xls] in the fault log path address bar.

5.5.8 Set the data logging interval to the desired value.

5.5.9 Computer will now start logging the temperature and other data.

5.6 Loading The Thermal Cycle

5.6.1 Connect the ether net connection cable of furnace to the network connector of the profile loading computer.

5.6.2 Insert the copy protection *Dongle* to a USB port on the profile loading computer.

5.6.3 Log on to the computer and double click on the icon” Specview”.

5.6.4 In the window that opens, click on “Go on Line”.

5.6.5 Communication is now established between the computer and furnace controller.

5.6.6 File with the header BNL:Page 1_FN.GDW will open up.

5.6.7 Click on “Program” button, BNL:Page 4_FN.GDW will open up.

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- 5.6.8 Click on “Recipe” and then select “LARP” in the recipe window. Make changes to the LARP thermal cycle profile (ramp & soak periods) if necessary and then click “SEND”. Click on “Profile” and then designate it as 1.
- 5.6.9 Click “START” in the controller window and verify ‘Run’ mode. Return to the main page.
- 5.6.10 Observe temperature ramp up and segment timing changes as the furnace controller executes the profile. Monitor Argon gas usage.
- 5.6.11 Typical LARP coil profile will take about 7 to 8 days to execute.
- 5.6.12 Do not open the furnace door till furnace internal temperature has fallen below 100deg Celsius.
- 5.6.13 When the furnace temperature has dropped to ~100 deg.C, prepare to shut down.
- 5.6.14 Stop the data logging program and transfer the data to folder called ‘Larp Oven’ on Discovery.
- 5.6.15 Close Process Gas Shutoff valve on the control panel.
- 5.6.16 Turn Fans off by pushing closed Fan Control knob.
- 5.6.17 Turn off Control Power to furnace by pushing Control power knob.
- 5.6.18 Data Logger computer can now be turned OFF.
- 5.6.19 Open furnace door and limit access to area. Allow to cool to room temperature.
- 5.6.20 Using Appropriate PPE, turn off 440VAC switch labeled “LARP Oven” (fed from PSB2 switch 12).

**PPE: Safety Glasses
Ear Plugs
Full CAL-70 Suit with Gloves**

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6 Documentation

None

7 References

7.1 BNL SBMS Subject Area “Lockout /Tagout (LOTO).

7.2 BNL ES & H Manual 1.5.0, Rev 6 “Electrical Safety”.

7.3 L&L Instruction Manual.

8 Index Of Attachments

1. Argon Schematic

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Attachment 1
Argon Schematic

