Procedure for Recording Temperature Profiles in a Commercial Oven – Nut Muffins

Carry out the steps below in the coolest zone of the oven. If the coolest zone has been pre-determined, then proceed with steps outlined in this document. If the coolest zone is unknown, refer to **Appendix A: Identifying the Coolest Oven Zone** below for guidance.

Step 1: Format the Data Logging Device
- Prepare the data logging device for use by setting to record temperatures at a frequency of every 15 seconds.
- Select either °F or °C for recording temperatures; the final calculator is equipped to convert between these values.
- Refer to your device's quick start manual for detailed instructions on preparing your specific logging device.

Step 2: Placement of Data Logger
- Select a pan of muffins that has gone through depositing and is ready to enter the oven and travel in the cool zone.
- Hold the pan for placement of the data logger.
- Place the data logger directly on top of the muffins in the last row and center column of the pan (see Figure 1).
- Stretch the six thermocouple wires to the row of buns that is farthest from the data logger, concentrating the probes toward the center lane of the pan (see Figure 1).
- Begin by inserting probe 1 in the muffin in the farthest left column and working through, probe-by-probe, until reaching the muffin column farthest right.
- For pans containing fewer than 6 columns, place any additional probes in the muffins closest to the center line of the pan.
- When inserting the probes, pierce through the top of the muffin, being careful to insert the tip of the probe as close to the geometric center of the muffin as possible.

Figure 1

- Once the probes have been set, follow your data logger device's specific procedures to start recording and close the box lid.
- Let the pan continue to travel through the coolest oven zone and retrieve after the baking cycle is complete.
- Follow the device instructions for removing probes and ending recording.
- Download the recorded data to a computer and prepare the data logger for another run.
- Export the data from each run into Excel format and save for later use. For quick reference, save each run under a new tab in the same Excel worksheet.
- Repeat this process until data from a total of five product runs has been recorded.

Step 3: Data Compilation and Oven Validation
- Using the Excel files from the five completed runs, determine which probes took the longest amount of time to reach 170°F (77°C) for each run.
- Converting the Excel data into graphical format allows for easier selection of the coolest probes. In Excel, highlight the entire data series for all six probes, select the **Insert** tab and click on **Insert Line Chart** icon. A graph will display next to the data columns on the worksheet. The lowest line represents the coolest sensor (time along x-axis, temperature along y-axis).
- Copy and paste the column of data for the coolest sensor across all five runs into the appropriate Baking Process Kill Step Calculator tab.

Appendix A: Identifying the Coolest Oven Zone
- Using a data logger, setup a test run following the protocol outlined in Step 2 of the **Procedure for Recording Temperature Profiles in a Commercial Oven**.
- Rather than running five replicates, run three replicates for each position in the oven.
    - Example 1: If there are four lanes of pans, then three replicates will be run at each of the lanes.
    - Example 2: In a revolving oven on Shelf 1 with six pan positions, run three replicates at each of the six pan positions.
- The cool zone would be the position that requires the longest time to reach an internal bun temperature of 170°F (77°C).
- Data generated from the three runs to determine the coolest oven zone counts toward the total of five runs required for oven kill step validation.

*Note: Temperature data from the selected probes must all fall within a range of +/- 10% of the time to reach 170°F. (i.e. if the average time to 170°F is 9 minutes then the range that all temperatures must be in is +/- 0.9 min. or 8.1-9.9 minutes). If temperatures do not fall within this range corrective action should be taken to modify the baking profile until data falls within this range.