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Venting through the Bleeders, Modified Vent Procedures for JBT Continuous Rotary Sterilizers

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Objective

Terry Heyliger has given you an overview of the why we study the venting of Sterilimatics through the bleeders, how we perform the testing and what we have learned.

My portion of this presentation is to walk through one set of vent studies on rotary Sterilmatic cookers.

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Background

McCall Farms requested that we study the venting procedure for two primary reasons:

- 1) Reduce energy consumption
- 2) Reduce noise

These tests were conducted at McCall Farms, Effingham, South Carolina in April 2010.

Thank you to Marion Swink for permission to present the following information.

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Vent Schedule at McCall Farms

7 minutes to at least 220°F
with all bleeders and vent lines open

Methodology

- In 1967, Pflug reported that heat transfer film coefficients are drastically reduced if 10% or more air is present in the steam.
- Air is composed of 20.95% oxygen. When the percentage of air in the steam has been reduced to 4.77% or less, the oxygen is reduced to 1% or less. A 1% or less oxygen reading was determined to be adequate, based on work of Pflug, et. al, on heat transfer film coefficients of steam and air mixtures.
- Using the oxygen analyzer, once the oxygen level has been reduced to $\leq 1\%$, the venting can be concluded.

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Reduction of Air & TD confirmation

- Once we have confirmed that the oxygen level <1%, then we confirm the temperature distribution within the retort.
- The temperature distribution is documented using wireless dataloggers that are held in cans that have a series holes to allow the steam inside.
- We used Ellab Tracksense wireless dataloggers for these studies.

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Acceptable Venting Procedure

- Determine the time/temperature to reduce the oxygen level to $\leq 1\%$ using the oxygen analyzer.
- Confirmation with temperature mapping that the temperature distribution within the retort shells is within an acceptable range.
- Given a specified number of bleeders are open.

McCall Farms Cooker Lines

- McCall Farms has 7 cooker lines.
- Can sizes: 300 x407, 401x 411 and 603x700.
- The 401x411 lines have two cooker shells.
- In addition, there are 5-7 bleeders on the top of each cooker that are open all the time.

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Test Plan

- Only three bleeders were left open on each cooker shell (one on each end and one in the center)
- Vent valves were closed.
- Each cooker shell was tested when it is cold, with the oxygen analyzer attached to the bleeder at the feed end
- The retort was set at 240°F

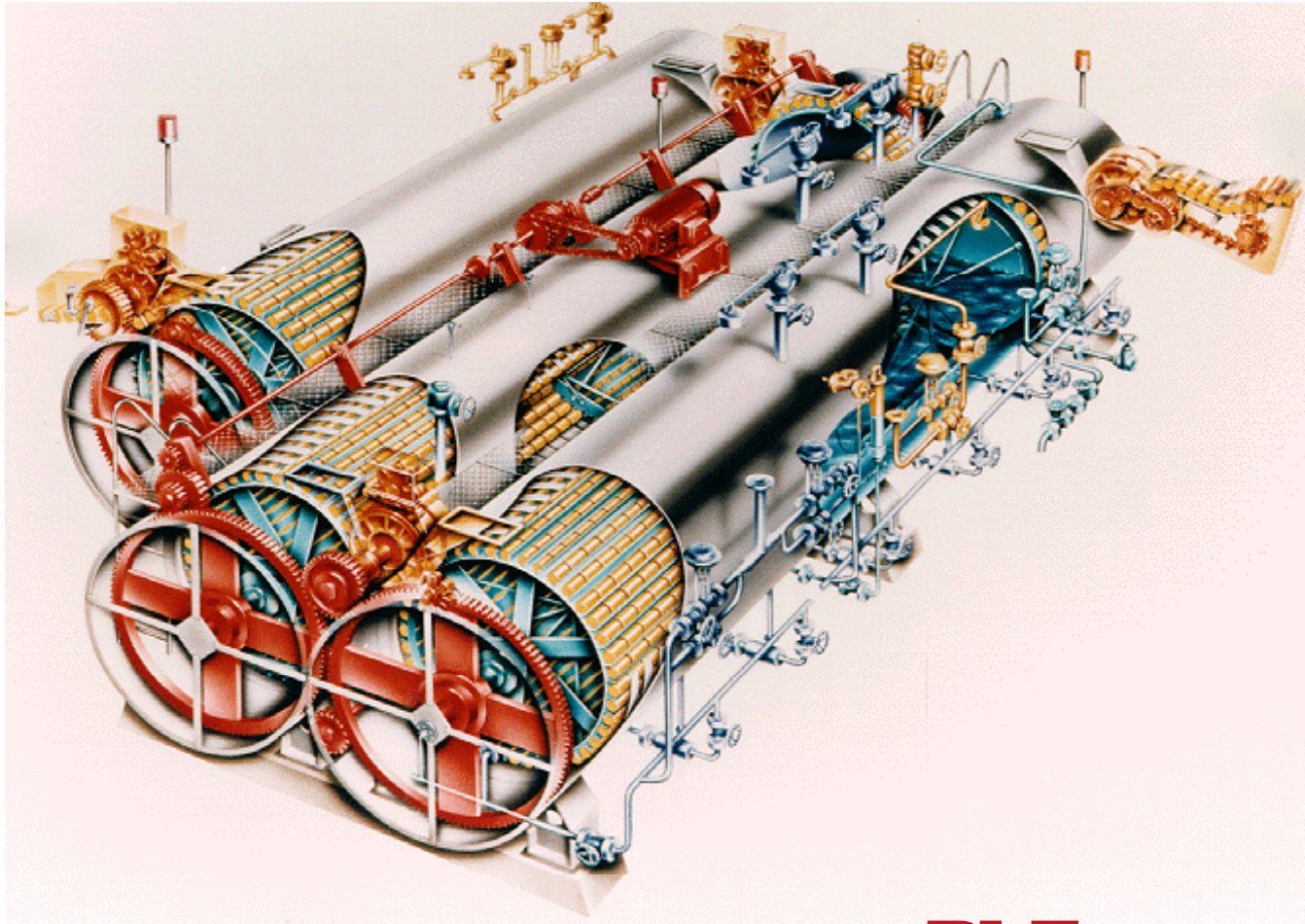
Test Plan (continued)

- The condensate removal line was left open
- RPM set to typical RPM for that line
- The drain remained open until the temperature of the retort was $MIG \geq 190^{\circ}F$
- When oxygen level reduced to $<1\%$, the retort temperature was increased to the operating temperature
- Temperature distribution study was started using Ellab wireless dataloggers as soon as the MIG reached the processing temperature

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Sterilmatic Retort System



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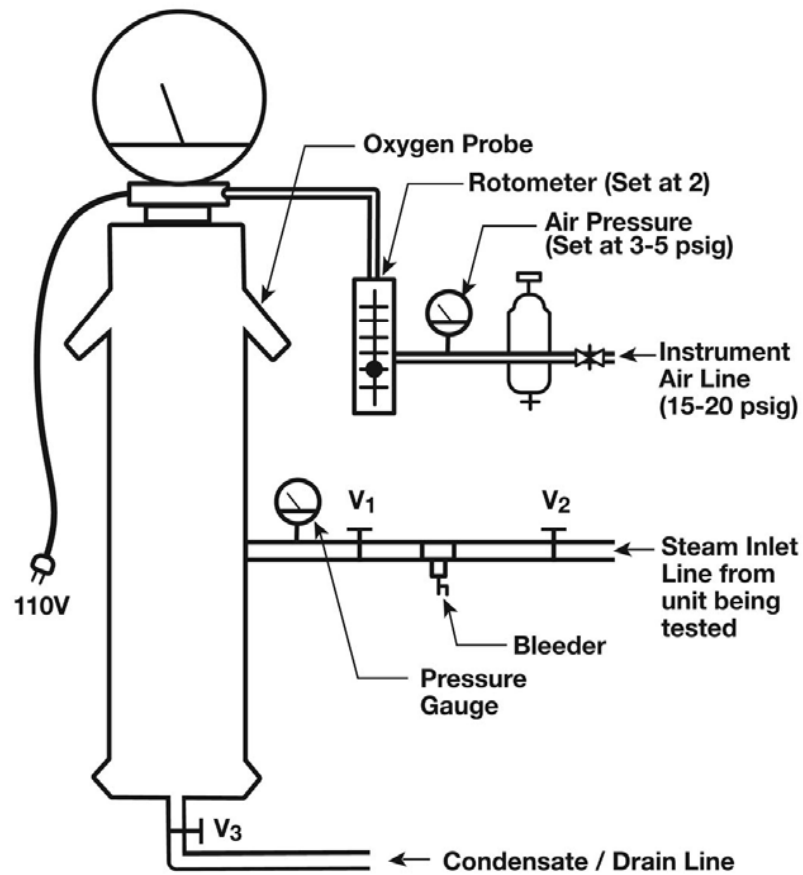
Rosemount Oxygen Analyzer, Oxymitter 4000



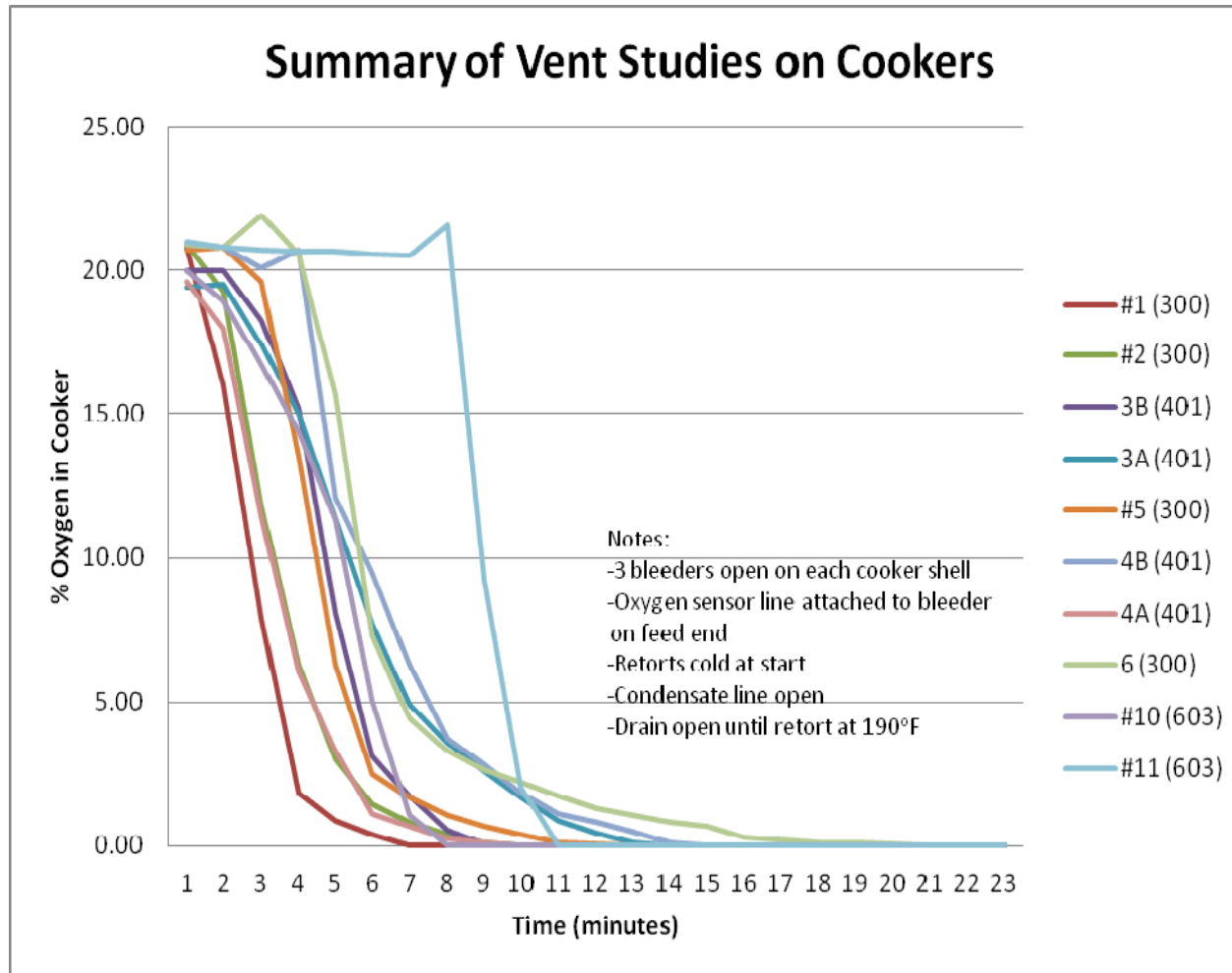
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Schematic

Oxygen Analyzer



Oxygen Reduction Results



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Summary of Test Results

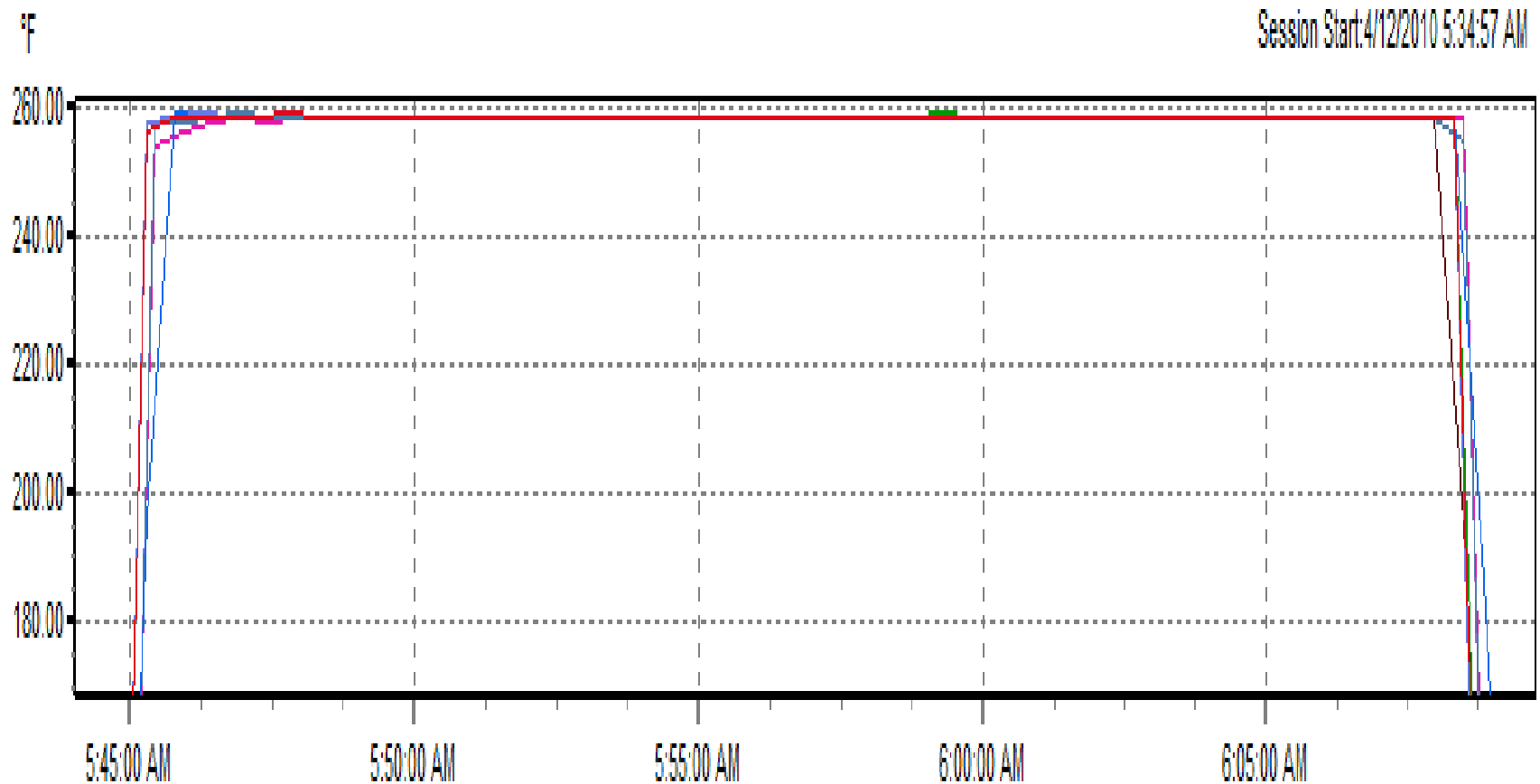
Cooker Lines	Cans	Time: O₂% ≤1%	Temperature range in retort (°F) after CUT to controlling temperature	Length of Shell (ft)
1	300x407, 47 step reel, 2.2 RPM	7 minutes	258.2-259.4°F (1.2°F) (MIG=258°F)	21.0
2	300x407, 47 step reel, 2.2 RPM	10 minutes	258.3-259.9°F (1.6°F) (MIG=258°F)	21.0
3a/b	401x411, 35 step reel, 4.5 RPM	3a: 10 minutes 3b: 9 minutes	253.5-254.8°F (1.3°F) (MIG=254°F)	33 / 33 ft
4a/b	401x411, 35 step reel, 5.3 RPM	4a: 5 minutes 4b: 10 minutes	254.1-255.9 °F (1.8°F) (MIG=254°F)	35/35 ft
5	300x407, 47 step reel, 2.7 RPM	7 minutes	250.2-251.9°F (1.7°F) (MIG=255.5°F)	28.6
6	300x407, 47 step reel, 3.3 RPM	12 minutes	258.0-258.7°F (0.7°F) (MIG=257°F)	34.0
10/11	603x700, 24 step reel, 1.8 RPM	10: 6 minutes 11: 10 minutes	249.8-252.1°F (2.3°F) (MIG=250°F)	33.6/33.6

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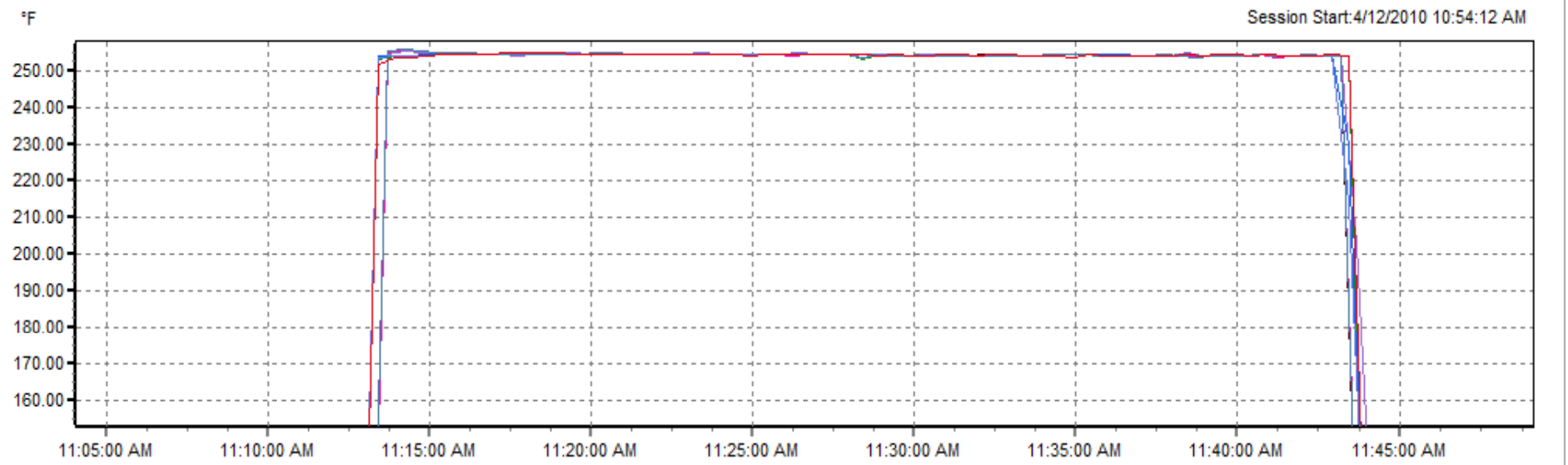
Temperature Distribution Results

300 Diameter Can



Temperature Distribution Results

401 Diameter Can

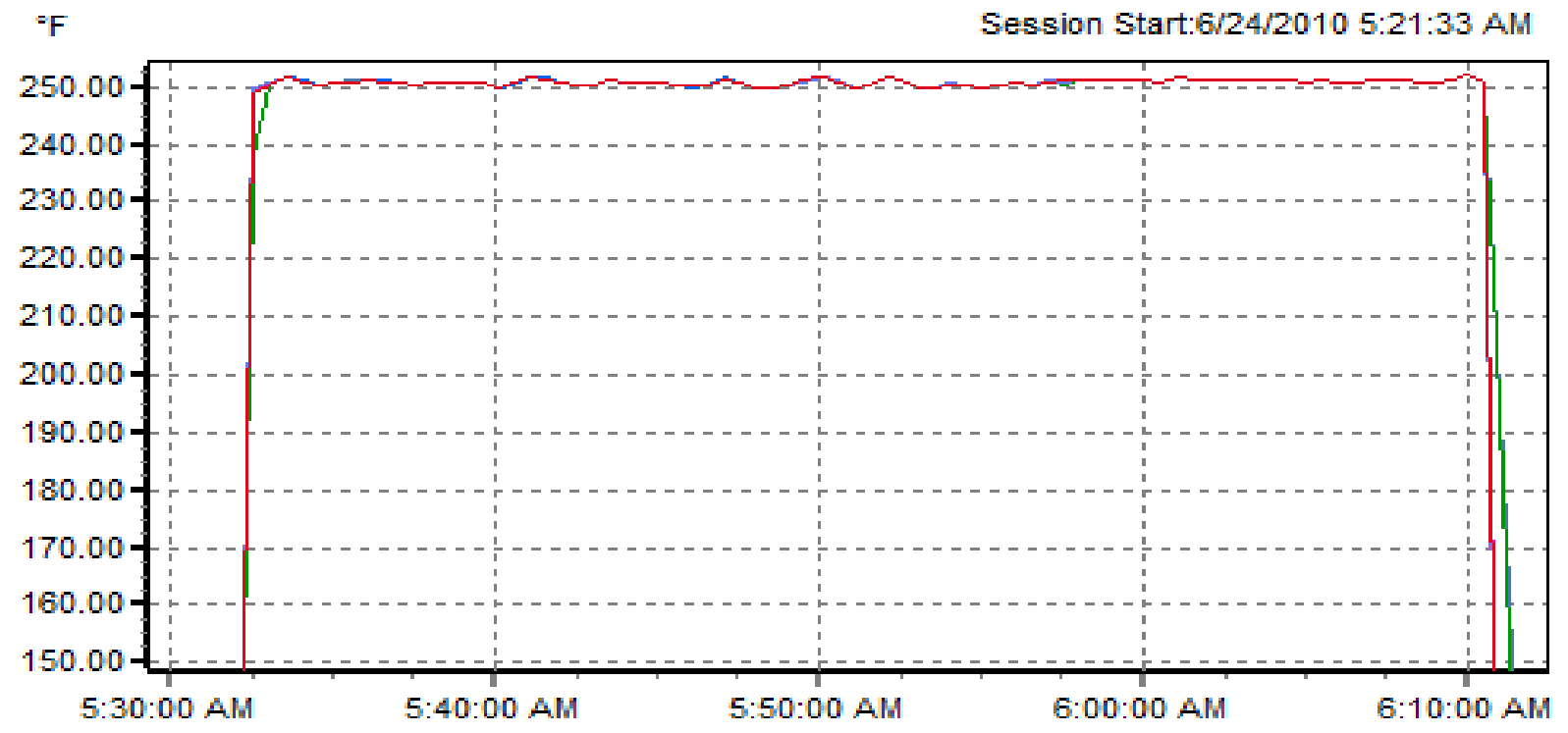


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Temperature Distribution Results

603 Diameter Can



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New Venting Through Bleeders Procedure (1)

- Vent valves closed
- 3-3/16" bleeders open (ends and middle of retort)
- Condensate line open
- Turn on reel

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New Venting Through Bleeders Procedure (2)

- Set controller to 240°F or higher for 15 minutes
- Drain open until retort temperature 190°F or greater.
- Set retort temperature to processing temperature
- Once retort reaches processing set temperature, cans can be fed into retort

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Conclusions

- McCall Farms has adopted the new procedure of venting through the bleeders and is very satisfied that their objectives have been met... less noise and less steam usage.
- Any new lines will be tested individually.

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A red banner with a white globe in the background. The globe shows the Americas. The banner has a white curved line at the bottom.

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Thank you!