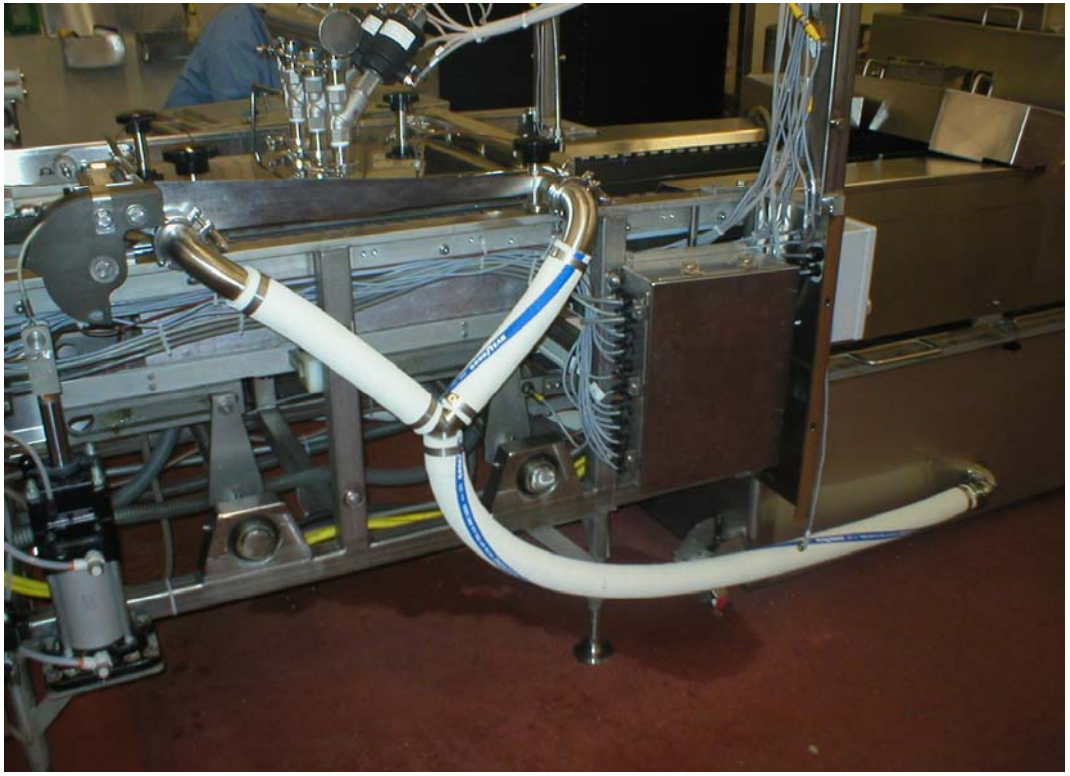
RapidPak Technology

Flash Pasteurization



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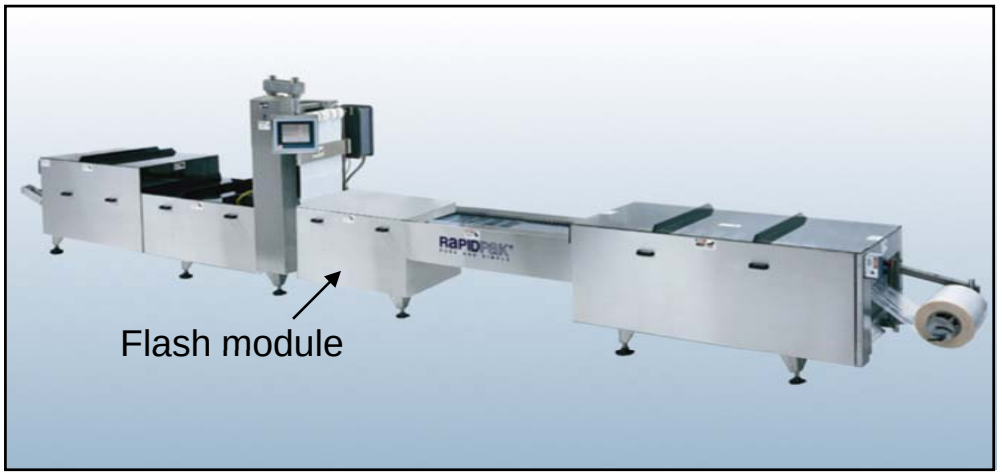

Project: Integrate a steam surface pasteurization (Flash) chamber into a hotdog packaging machine

Provides an effective kill step immediately prior to package sealing:

- Destroys bacteria, such as *Listeria monocytogenes* on product surface
- No negative effect on quality
- Easily integrates into existing plant layout

Co-Development Project

From research to commercialization…

ALKAR

- Thermal processing
- Pasteurization

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- Packaging machine design
- Bio-safety Class II Laboratory

USDA

- Original concept, research, and patents
- Research facilities and prototypes (ERRC)
- Process engineering,

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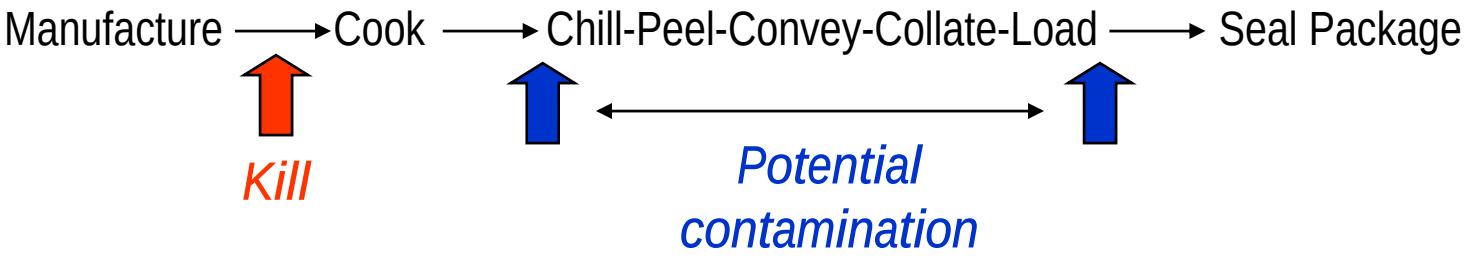
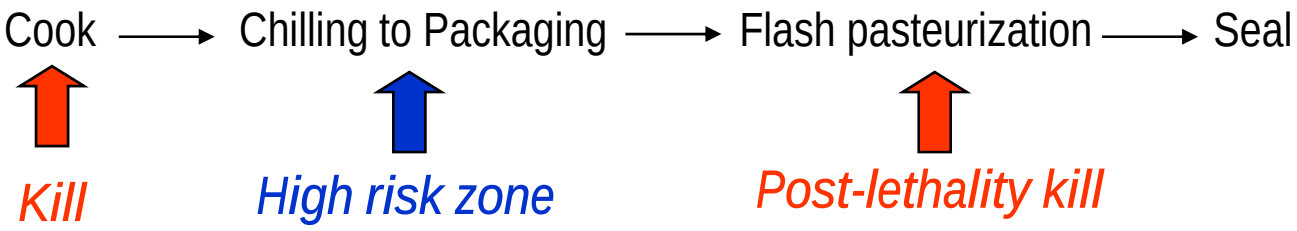
Defining the Problem

- Shortcoming of Current Hotdog System

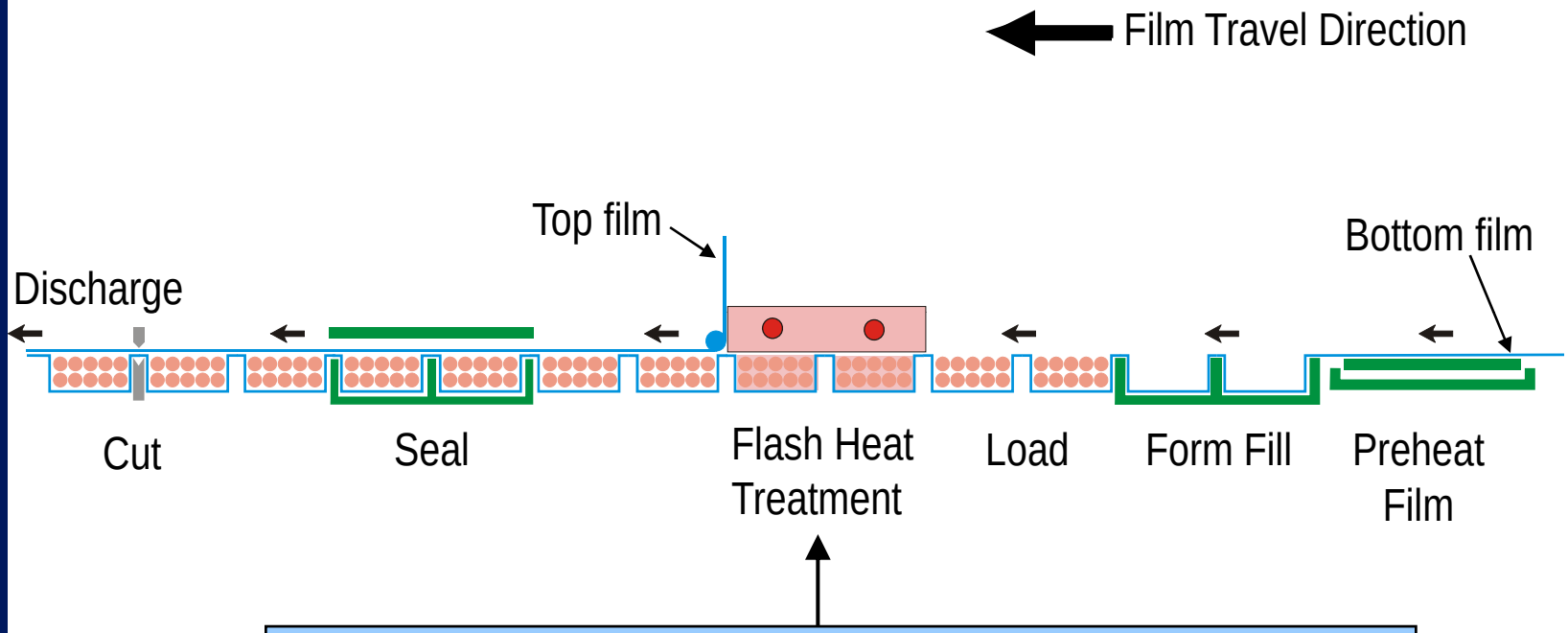


- Add a final Flash kill step



Flash Concept: *Surface pasteurize at the last possible moment before packaging*

Machine Configuration



Flash cycle time	= 1.5 to 2.0 seconds
Machine cycle rate	= 3 seconds / index

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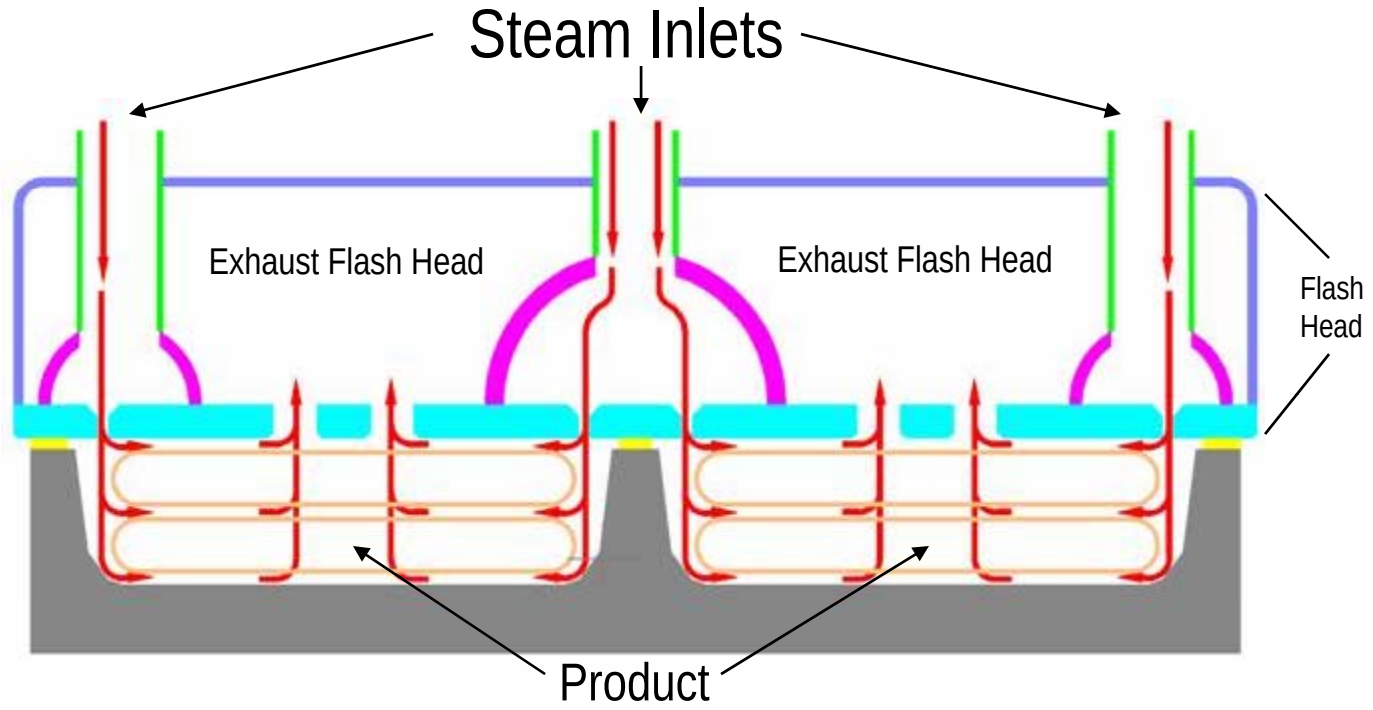
Flash Pasteurization Head



Steam Injection -- Flash Module

- Inject pressurized steam
- Maximum contact on most difficult area – ends
- 1.5 second cycle kills 2 to 3 logs of Lm

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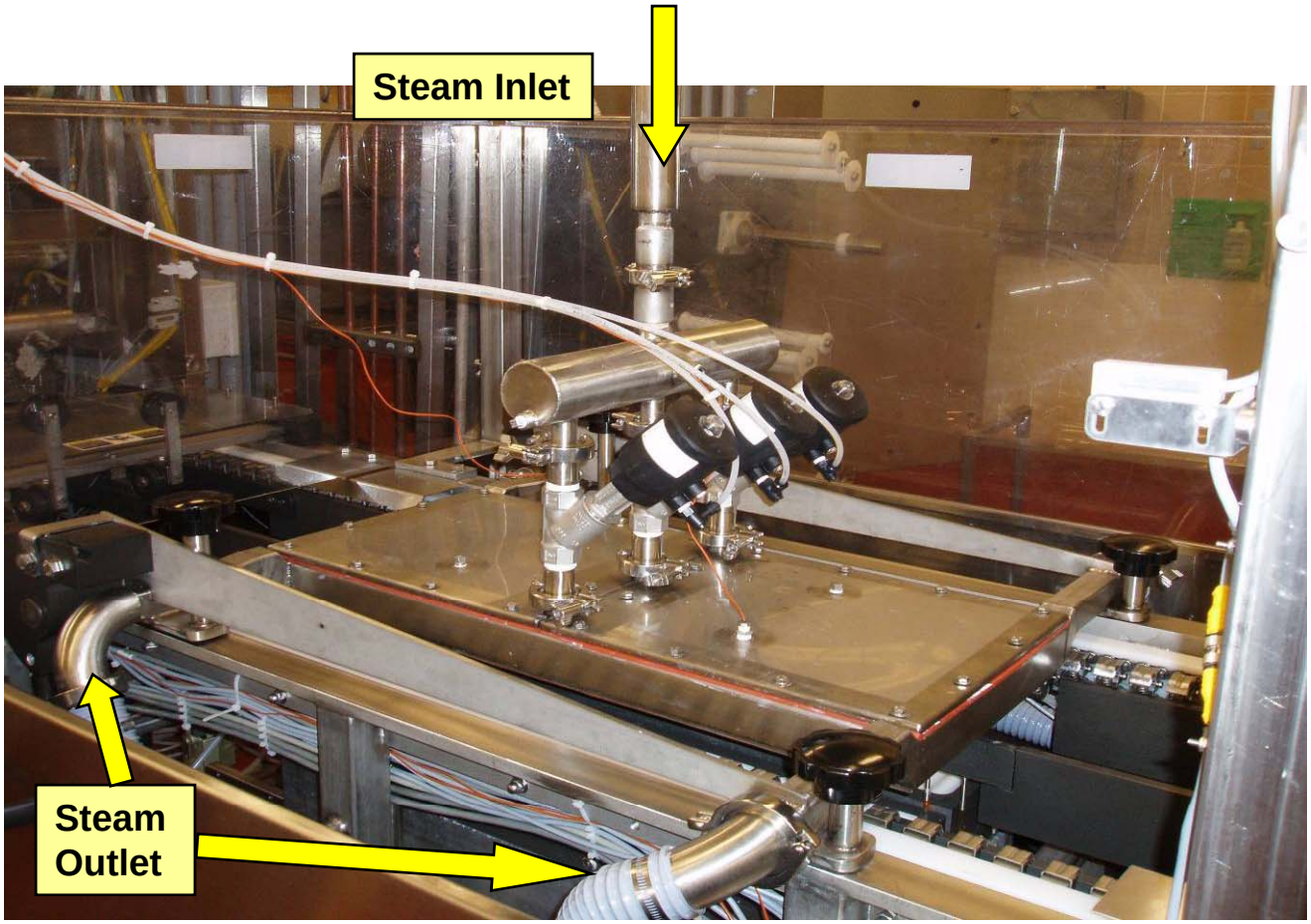
Flash Pasteurization Head



Flash Equipment – Top View

Development – Historical to Current

Flash Delivers:

- Food Safety Protection
  - > 2.0 log reduction signal and double layer
  - < 1.0 log growth at refrigerated temperatures
  - > 2.0 log reduction of spoilage bacteria, resulting in increased shelf life, on average of 20% to 30% increase
  - Alternative 1 when combined with antimicrobials
- Product
  - No significant difference on basic tastes between flash and non-flashed product
  - No significant difference on aromatics between flash and non-flashed product
  - No significant difference on aftertastes between flash and non-flashed product
  - No increase in measurable purge
- Machine
  - Use ordinary film / no increase in leakers
  - No loss of cycle rate
  - Minimal utility usage (250 lbs/hr steam, 2 gpm water)

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Development - Results

- All results confirmed in-house and by independent Deibel Labs
- Full-scale signal and double-layer machines
- Can use live Listeria to validate

Pathogen Testing Lab

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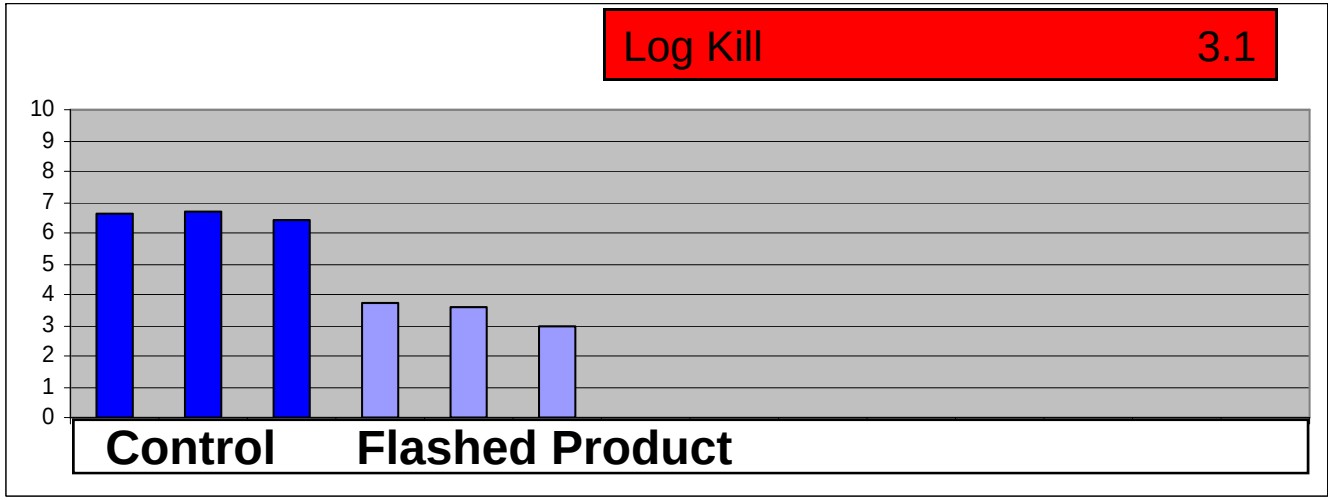
Actual Lab Results – Single Layer

Number	SAMPLE	CFU	Dilution		
1	Control 1	4	6		6.60206
2	Control 2	5	6		6.69897
3	Control 3	24	5		6.380211
4	Sample 1	5	3		3.69897
5	Sample 2	4	3		3.60206
6	Sample 3	1	3		3.00000



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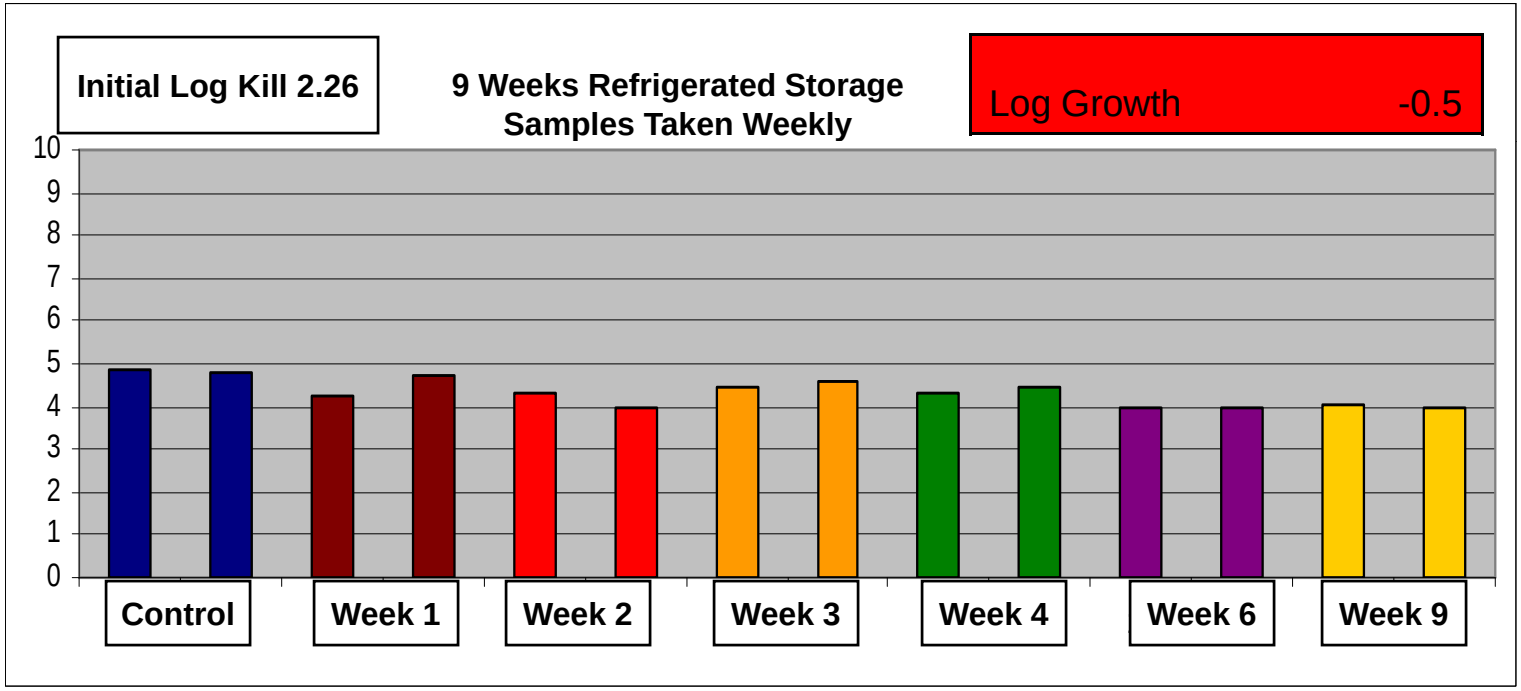
Storage Studies – Double Layer

* Inhibit Growth Over Refrigerated Shelf Life



Flash

Results to Date

Flash Pasteurization Process

Results Summary

Hot Dogs	Log reduction of *Listeria monocytogenes* (inoculation = 10^6)
Single Layer 28 mm, 6 hot dogs / pack	2.0 – 3.0
Double Layer 23 mm, 8 hot dogs / pack	2.0 – 3.0
Triple Layer 22mm, 12 hot dogs / pack	2.0 - 3.0

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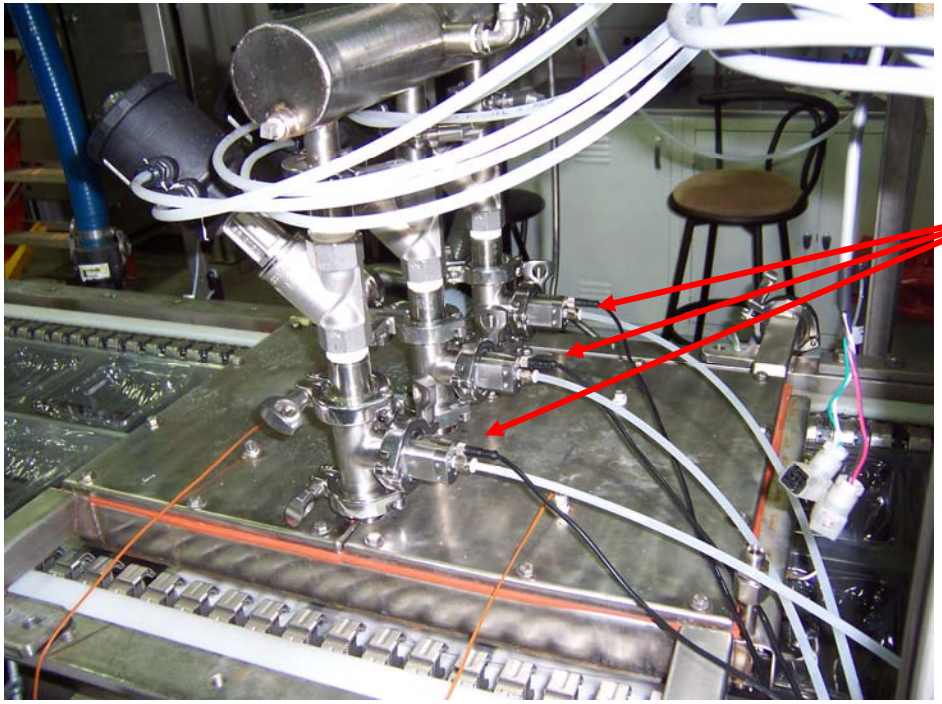
Flash with Antimicrobial Injector



- Flash and antimicrobials work together to increase log kill
- Surface apply steam and antimicrobials
- Cost savings – pull antimicrobials out of the product
- One control system to control Flash and antimicrobial (log data)

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Double-Layer Flash Machine

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Single-Layer Machine

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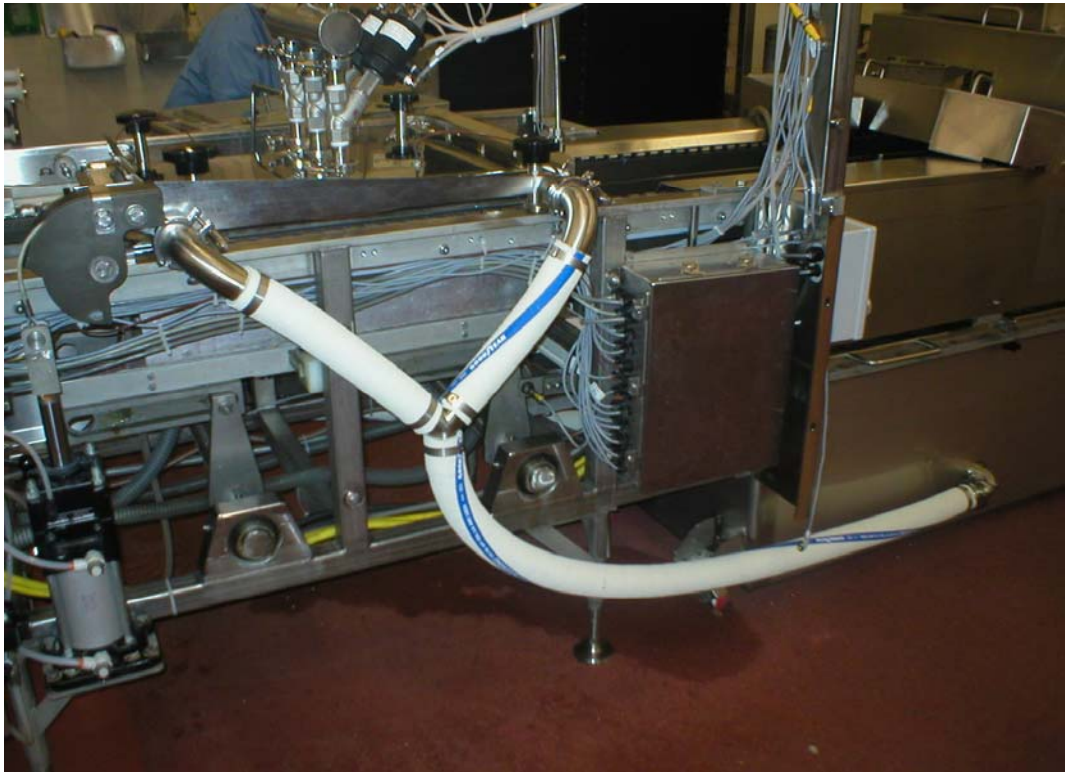

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