



2018

# THE ALMOND CONFERENCE

ALMOND PASTEURIZATION: LANDSCAPE OF  
TECHNOLOGIES/EQUIPMENT (PART 1)

ROOM 306-307 | DECEMBER 5, 2018



# AGENDA

- **Tim Birmingham**, Almond Board of California, moderator
- **Cameon Ivarsson**, Napasol North America
- **Jochem Dekker**, Log5







## NAPASOL NORTH AMERICA

Saturated Steam Pasteurization

Dr. Cameon Ivarsson

[www.Napasol.com](http://www.Napasol.com)



# FROM 2009 ABC SYMPOSIUM TO SACRAMENTO 2019



*Since that first participation in Lodi in 2009 Napasol has successfully installed more than 30 pasteurization units*

- The **regulatory landscape** has changed pushing the nut industry to invest in food safety
- The sterilization science used in the Napasol process is **highly effective**, and **universally applicable to low moisture foods**
- **Validated Napasol pasteurizers (>5log) for nuts: Almonds, Walnuts, Pistachios, Cashews, Macadamia, Hazelnuts, Pine nuts, Brazil nuts, and seeds, spices and dry fruit**
- **TERP pending**

# UNDERSTANDING SATURATED STEAM



Saturated steam packs 4.6 times more heat than boiling water  
This heat =>5log kill when the steam condenses

*It takes 419kjoules to heat 1kg of water from 0°C to 100°C (212°F)  
It takes an additional 2257kjoules of energy to evaporate it into 100°C steam*



# PRINCIPLES OF OPERATION



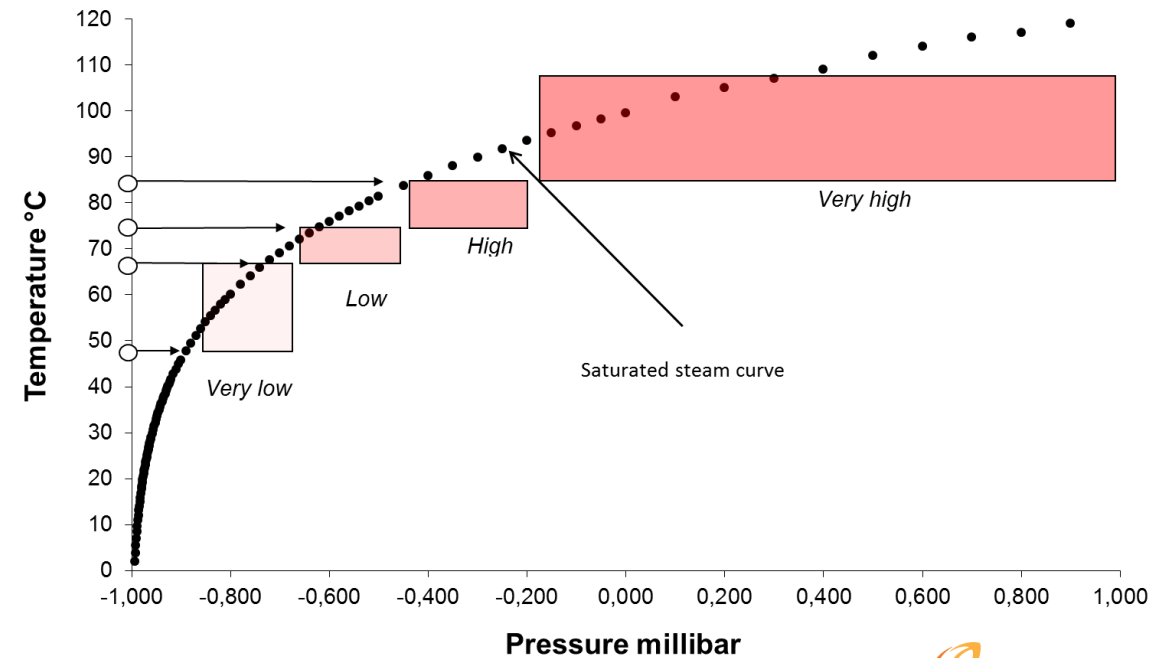
- **Temperature is controlled by pressure**

*at ambient pressure = 100°C (212°F)*

*in a partial vacuum e.g. -0.400 bars=85°C (185°F)*

- **Pressure is uniform**  
**in the autoclave = temperature is uniform**
- **Saturated steam is dry = product**  
**does not need drying**

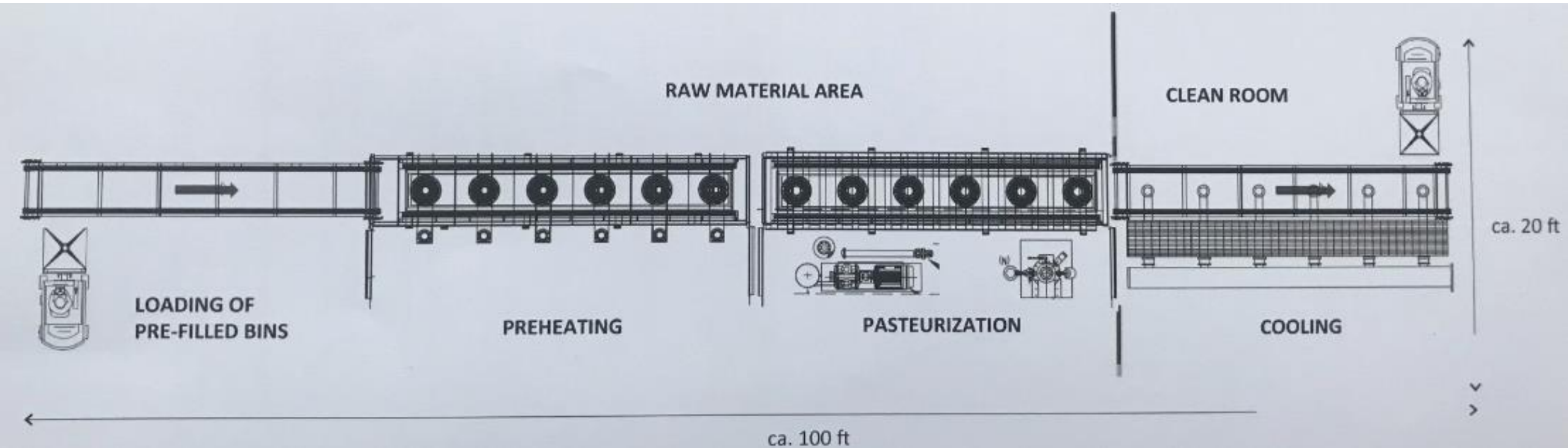
## Pasteurization temperature ranges





# PLANT LAYOUT

- Bins
- Preheater (hot air)
- Pasteurizer (vacuum and Steam)
- Cooler (cool air)



# INDUSTRIAL PLANTS

6 Bins US



2 X 4 Bins Germany



2 Bins China





# PRODUCT FLOW

- BACTERIA VIDEO

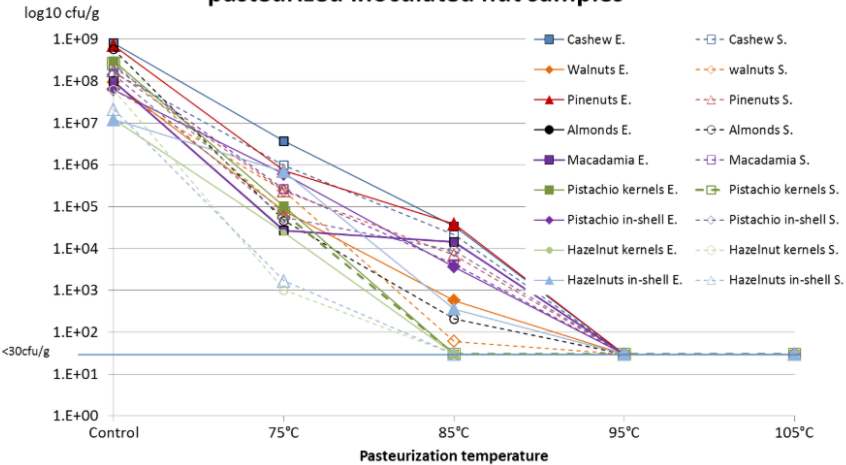


Bacteria

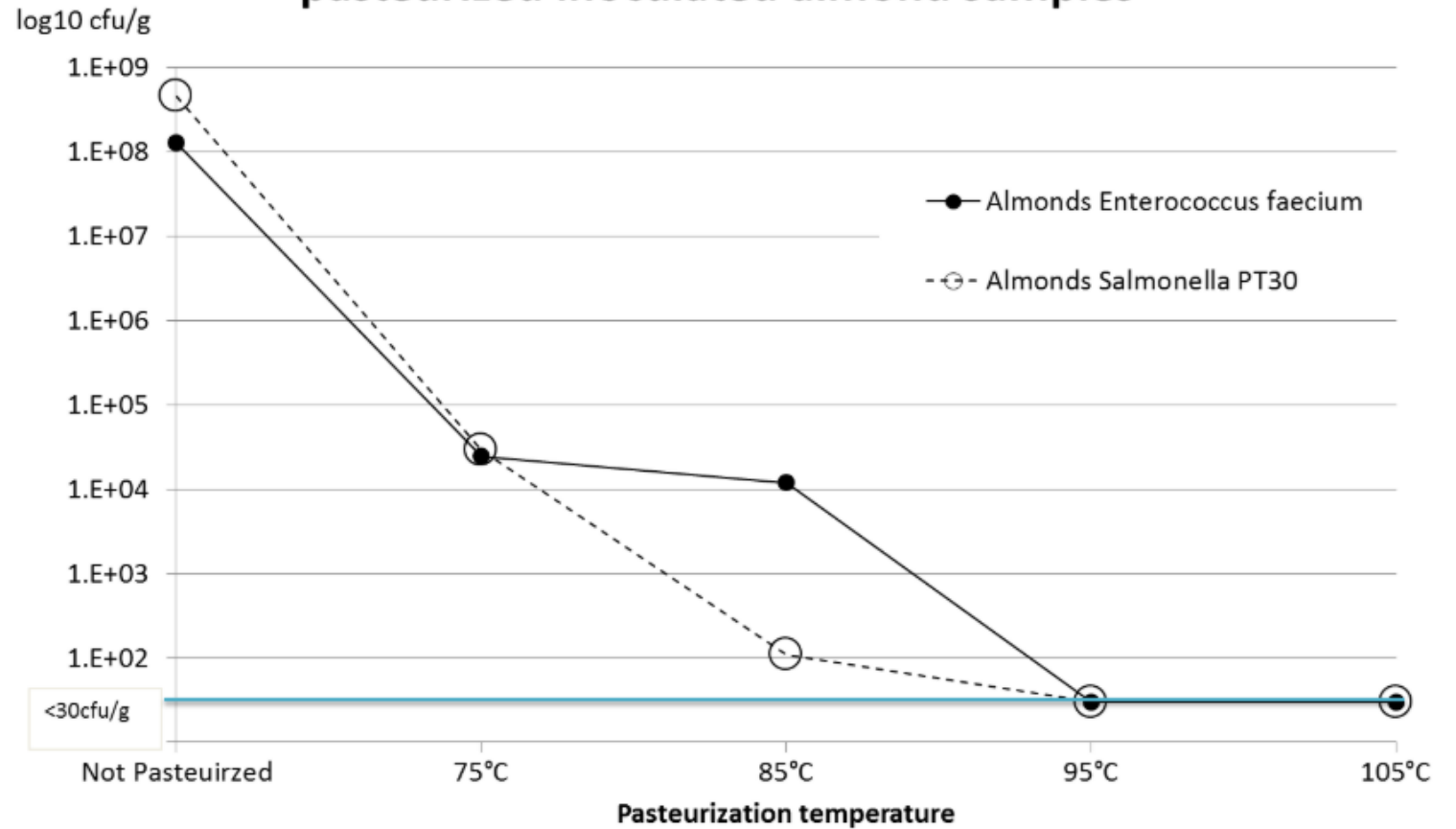
# VALIDATING THE USE OF E. FAECIUM AS A SURROGATE

- Research comparing the resistance of the two microorganisms in the Napasol process

Salmonella PT30 (S) and Enterococcus faecium (E) levels in pasteurized inoculated nut samples



Salmonella PT30 and Enterococcus faecium levels in pasteurized inoculated almond samples



# VALIDATION AND LOG REDUCTION



Lab #	Description	Trial Date	Replicate 1 (cfu/g)	Replicate 2 (cfu/g)	Minimum (cfu/g)	Minimum log cfu/g
3603-1	Control - Not treated	08/15/2018	50,000,000	58,000,000		
3603-2	Control - Not treated	08/15/2018	70,000,000	50,000,000		
3603-3	Control - Not treated	08/15/2018	50,000,000	50,000,000		
					50,000,000	7.70

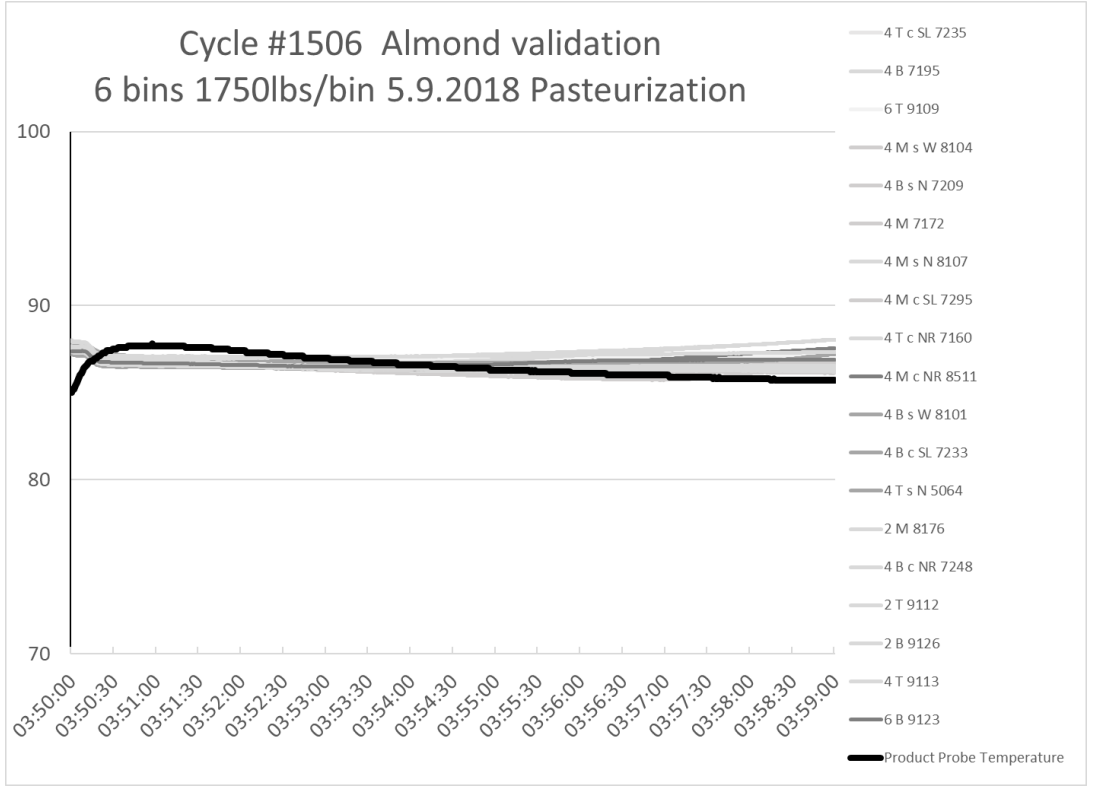
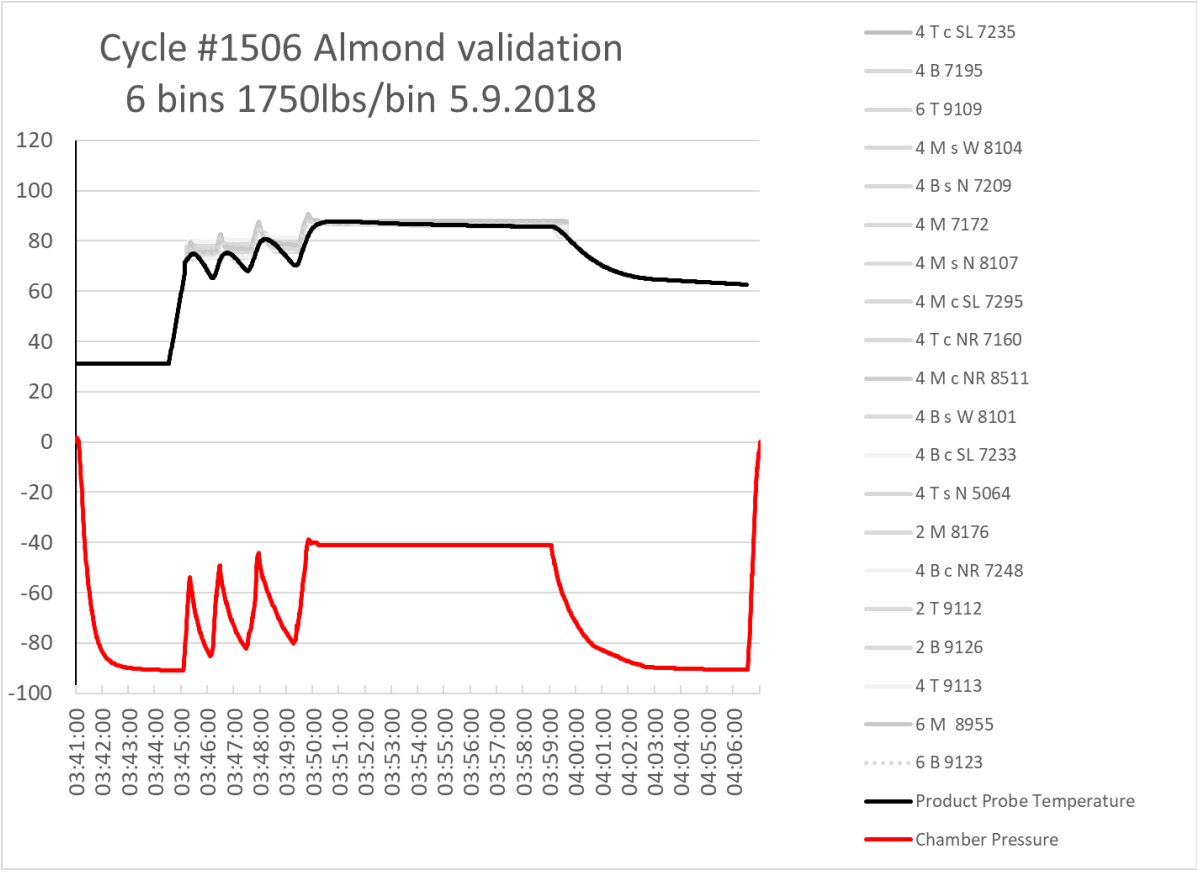
Lab #	Sample/Treatment	Trial Date	Replicate 1 (cfu/g)	Replicate 2 (cfu/g)	Avg. Log Reduction	Min. Log Reduction
3603-4	Run 1 Bin #1 Top	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-5	Run 1 Bin #1 Middle	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-6	Run 1 Bin #1 Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-7	Run 1 Bin #1 North Right Corner Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-8	Run 1 Bin #1 North Left Corner Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-9	Run 1 Bin #1 South Right Corner Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-10	Run 1 Bin #1 South Left Corner Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-11	Run 1 Bin #2 North Right Bottom Corner	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-12	Run 1 Bin #2 Middle	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-13	Run 1 Bin #2 South Left Bottom Corner	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-14	Run 1 Bin #3 South Right Top Corner	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-15	Run 1 Bin #3 Middle	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-16	Run 1 Bin #3 North Left Top Corner	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-17	Run 1 Bin #4 South Center Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-18	Run 1 Bin #4 Middle	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-19	Run 1 Bin #4 North Center Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-20	Run 1 Bin #5 East Center Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-21	Run 1 Bin #5 Middle	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-22	Run 1 Bin #5 West Center Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-23	Run 1 Bin #6 Top	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-24	Run 1 Bin #6 Middle	08/15/2018	< 10	< 10	> 6.70	> 6.70
3603-25	Run 1 Bin #6 Bottom	08/15/2018	< 10	< 10	> 6.70	> 6.70





# CYCLE DEVELOPMENT

- Temperature Distribution in the 6 bin load



# PRESERVING THE RAW CHARACTERISTICS OF NUTS

>5log reduction with the following additional benefits:

- Preheat and pasteurization **temperatures are low** = no roasting or cooking effect
- The Napasol process does not wet the nuts = **no need for a drying** step
- Maintains the **raw characteristics** of the nuts: Flavor, color, moisture
- **No mechanical damage** transporting the product = transport in bins from preheater to cooler
- The product is never in contact with the line = **minimal downtime for cleaning**
- **Uniform distribution of heat** = reliability of validation
- **Batch** = perfectly documented traceability



# THROUGHPUT

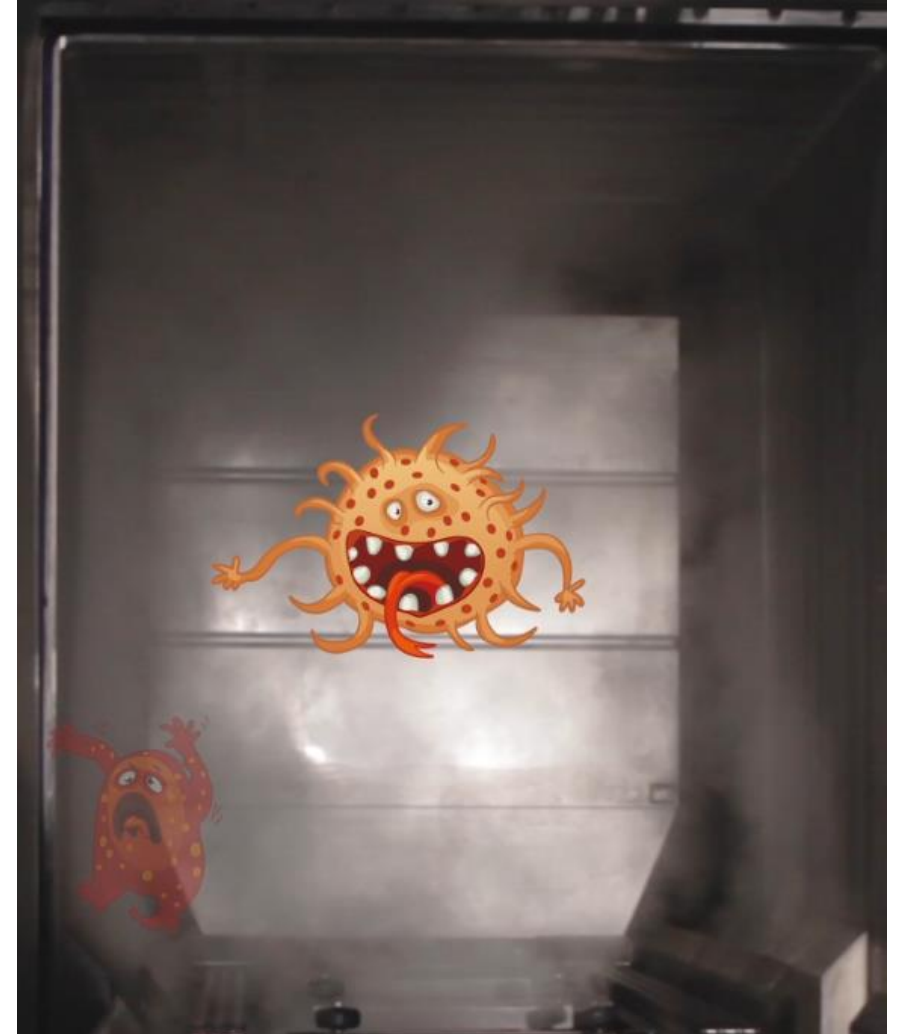


Model	Number of Bins			
	1	2	4	6
Tons/h	1'200	2'400	4'800	7'200
lbs/h	2'600	5'200	10'400	15'600



# EXHIBITOR AT THE ABC CONFERENCE SINCE 2009

- Thanks
- Visit our Booth #416 for more information

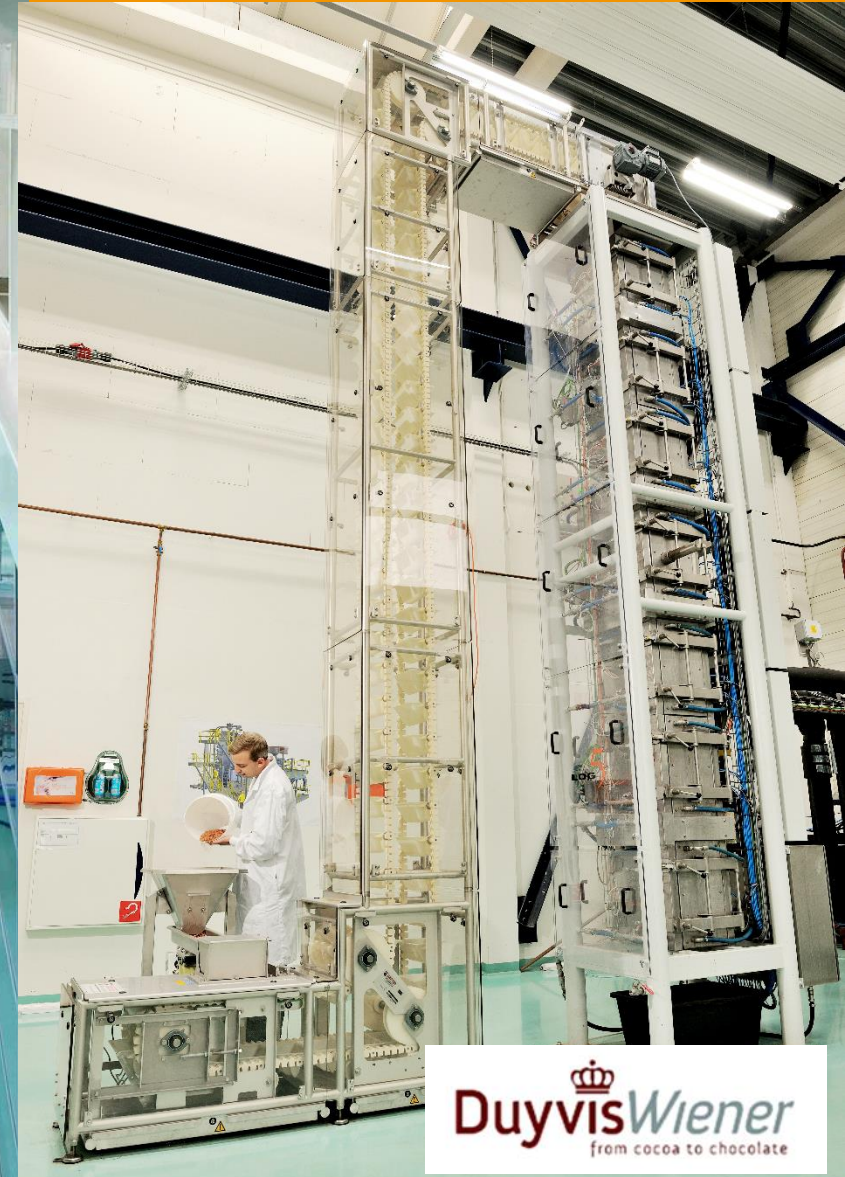




# Pasteurization

Almond Pasteurization - Landscape of technologies/equipment

- Jochem Dekker (replacement for Gerhard Knol)
- Part of Royal Duyvis Wiener group
  - leading manufacturer of cocoa & chocolate processing equipment
  - Roasting, grinding, pressing, mixing, sterilization equipment
- Log5 developed a high quality pasteurization system :
  - Design, and build, an improved pasteurization system
  - For raw nuts & seeds as a better alternative to the solutions on the market (Steam, PPO, Vacuum steam).
  - Use a new principle with potential to create safe product AND maintain product quality.



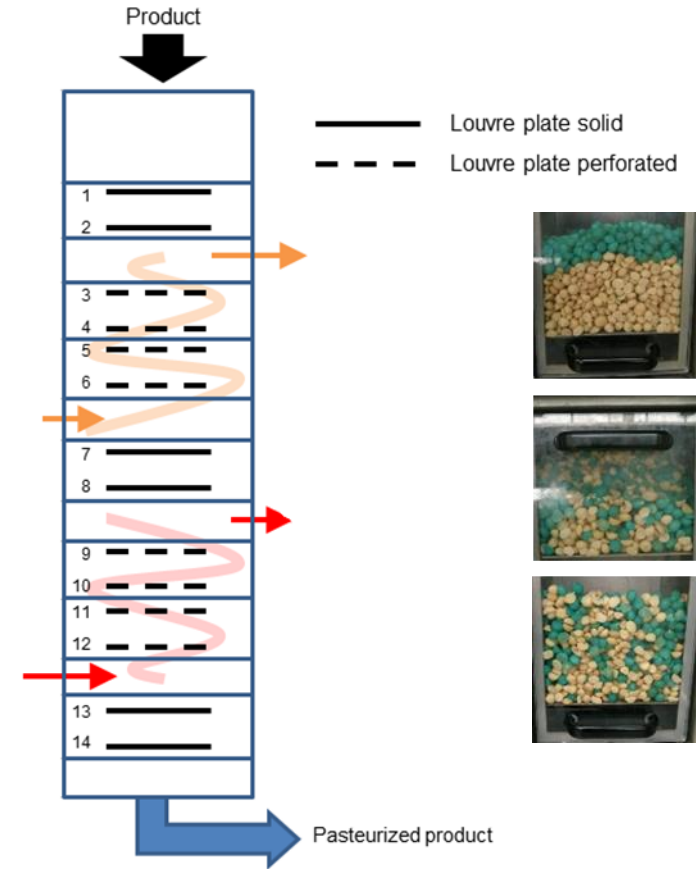


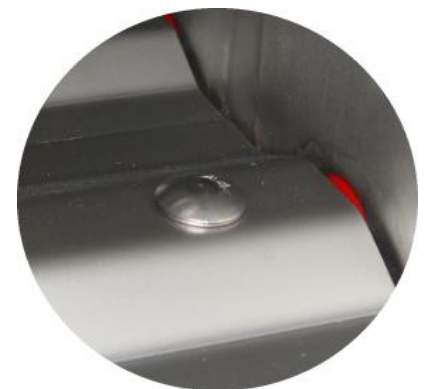
## Design criteria:

- **No change to product**
  - Taste, texture, skin, visual appearance, oil quality, damage : similar to raw untreated
  - Gentle processing
  - High yield
  - Non-chemical
- **Low operational costs**
  - Treatment cost
  - Utilities
  - Maintenance
  - Operators
  - Easy to clean
- **Handle wide variety nuts & seeds**
  - Fragile
  - Small, big
  - fragile and robust nuts
- **Uniform & gentle treatment**
  - Water (condensation!) is friend and foe
  - Consistent temperatures
  - Gentle air temperatures
- **Straightforward validation process**
  - Continuous
  - Stable, repeatable conditions
  - Process conditions at all locations the same
  - Independent of product size
  - Pilot can predict in small scale behavior large unit

# How did we combine this into our equipment?

*acp*<sub>w</sub> : water activity controlled pasteurization









## 1. Critical parameters

- Capacity
- Time
- Temperatures
- Relative humidity treatment air
- Flow

## 2. Use pilot database trials Log5

## 3. Define lowest values

## 4. Run enough repetitions per session

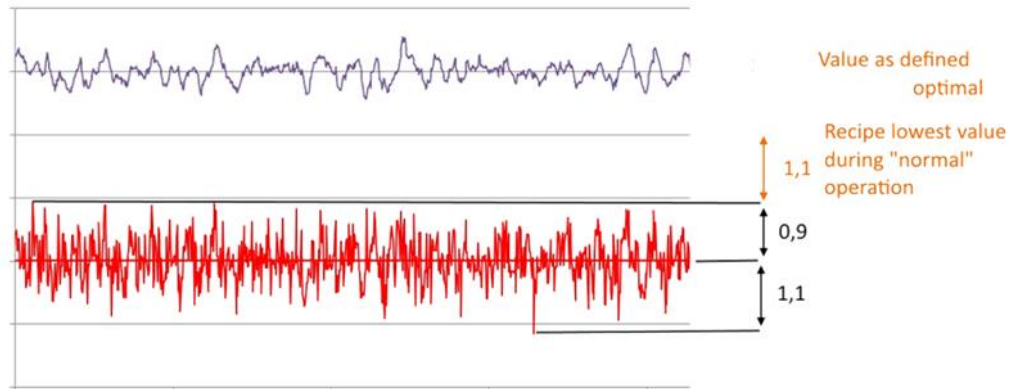
## 5. Correct & optimize if needed

## 6. Safeguard production process

- Data logging
- Automatic actions
- Protocols
- Calibration



- Guidelines for optimal flexibility after validation :
  - Knowledgeable process authority
  - Proper definition critical control parameters (=control)
  - Highest value process during validation = alarm value during normal operation
  - Monitor and act automatically based on recipe
  - Process parameters small bandwidth = quality



- Due to our small variations in our process (design & continuous) we can achieve maximum product quality with TERP safety approval
- Schedule ~ 2 sessions / 1 month for validation

## Design criteria:

- ✓ **No change to product**
  - ✓ Taste, texture, skin, visual appearance, oil quality, damage : similar to raw untreated
  - ✓ Gentle processing (drops)
  - ✓ High yield
  - ✓ Non-chemical (Retail acceptance)
- ✓ **Low operational costs**
  - ✓ Treatment cost
  - ✓ Utilities
  - ✓ Maintenance
  - ✓ Operators
  - ✓ Easy to clean
- ✓ **Handle wide variety nuts & seeds**
  - ✓ Fragile
  - ✓ Small, big
  - ✓ fragile and robust nuts
- ✓ **All product should be treated uniform**
  - ✓ Water (condensation) is the enemy
  - ✓ Consistent temperatures
  - ✓ Gentle air temperatures
- ✓ **Straightforward validation process:**
  - ✓ Continuous
  - ✓ Stable, repeatable conditions
  - ✓ Process conditions consistent
  - ✓ Product size independent
  - ✓ Pilot plant reflects results of industrial size units

## Food and drink magazine

(<http://www.fooddrink-magazine.com/sections/producers/2243-chs-sunflower>)



### Sales Manager Wes Dick :

*“We spent about two-and-a-half years researching equipment and found only one manufacturer that would give 5-log reduction or more without drastically changing the sunflower itself,” Dick says. “Log5 gave us log reduction and its equipment holds the characteristics of the sunflower. We tested the equipment, ordered it and installed it in our Fargo, N.D. facility.”*



### Bill Morecraft, SVP Global Ingredients, Blue Diamond :

*“Food safety and high quality standards are top priorities for Blue Diamond Growers. As a leader in almond innovation, we use Log5 state of art technology for all of our pasteurization needs. Log5 achieves a minimum 4 log Salmonella reduction without compromising almond texture and skin quality. Log5’s advanced technology is effective, environmentally friendly, eliminates the need for chemical treatment, and better preserves the quality of each Blue Diamond almond kernel, delivering a superior ingredient to our global brand and food service partners.”*



- Pasteurization is here to stay in the (tree) nut & seed industry
- Retailers continue to demand pasteurization to protect their brand
- Pasteurization at the source (single nut processors) due to increasing allergen concerns
- Consumers know that (raw) nuts are healthy :
  - Demand through major retailers natural solutions (non-chemical)
  - Available technology will push demand for high quality natural pasteurized Almonds
  - Unwanted side effects of high roast (acrylamide, ..) will push pasteurization in combination with roasting





## More information?

**Gerhard Knol**    [gknol@log5.com](mailto:gknol@log5.com)  
**Tom Velthuis**    [tvelthuis@log5.com](mailto:tvelthuis@log5.com)  
**Jochem Dekker**    [jdekker@kocotek.com](mailto:jdekker@kocotek.com)

# What's Next

**Wednesday, December 5 at 12:00 p.m.**

- Luncheon Presentation – Hall C  
Speaker: David Deak

*Luncheon is ticketed and is sponsored by Moss Adams*



MOSSADAMS



## **Silent Auction**

Start your holiday shopping at our Silent Auction in Hall A+B - all proceeds go towards CA FFA scholarships!

Wednesday & Thursday until 3:00 p.m.

## Buy Your Golden Ticket at the FFA Booth

100 GOLDEN TICKETS WILL BE SOLD

★ ★ ★ ★ **GOLDEN TICKET** ★ ★ ★ ★

Throughout the conference 100 golden tickets will be sold. One lucky person will win and get their choice of one item from the live auction.

**MUST BE PRESENT AT THE GALA DINNER TO WIN.**

**Visit the FFA silent auction booth to purchase  
a golden ticket and learn more!**

The golden ticket winner will be drawn prior to the live auction.