New engineering concepts (technologies) in tomato processing
Tomato paste components

- DNA
- Ribose
- Glucose
- Protein
- Amino Acid
- Amino Acids
- Sugars
- Water Loss
- Maillard Reaction (High Heat)
- New Flavors
- Brown Color
- 104 ºF (~ 40 ºC)

Revenue, energy, waste, costumer demands and satisfaction
Before 1962
All hand-harvested

1962 - First commercial harvester
Required 12 people to operate

NOW
Harvester
Single operator

NEW TECHNOLOGIES!

- Mineral fertilizers and improved soil and pest management
- Transplanting and drip irrigation
- Mechanical harvesting and improved tomato varieties

Abundant migrant labor force and flood irrigation

Harvest Area (1,000 acres)

Yield (tons/acre)
Assessment of Tomato Quality

Mechanized Harvest

California Processing Tomato Inspection Program

Random Sampling Inspection
Example 1. Automated Inspection System for Processing Tomatoes (AIS-PT)

Processing Tomato Advisory Board
In association with
The University of California, Davis
Department of Biological Systems Engineering
(Lead PI: Professor David Slaughter)
TOMATO QUALITY ASSESSMENT

PHYSICAL

• Cleanliness
• Disease or decay
• Size
• Weight
• Color
TOMATO QUALITY ASSESSMENT

CHEMICAL

- Color
- pH
- Soluble Solids
  - Titratable Acidity
  - Bostwick consistency
- Juice/Serum Viscosity

AIS-PT
OPERATIONS OVERVIEW

1. Blender
2. Analysis Chamber
   a) Colorimeter
   b) pH Meter
   c) Refractometer
3. Valve/Pumps
   a) Air vacuum
   b) Water Pump
   c) Flowmeter
4. Logic Controller & Touch Panel
5. Waste stream
MAJOR COMPONENTS

1. Blender
2. Analysis Chamber
3. Valve/pumps
4. Logic Controller & Touch Panel
5. Waste stream
COMPARISON: OLD vs NEW (AIS-PT)

Reduced from **3 min** to **1 min**

**Grading Time**

- **560** lifting events vs **420** events per shift
- **15 MILLION** lb difference!
- **½ million** lifting events
- **2 million** vs **½ million** lifting events per shift

**Worker Safety:**
- **Efficiency Worker Safety:** lifting events per shift
- **Consistency:**
  - Sampling and system cleaning is inspector independent
  - More analyses points recorded

**Efficiency**
- **140** load inspections vs **420** inspections per shift
Example 2. Desiccant-based drying/dehydration system with continuous flow of both hygroscopic materials and product.
Different drying conditions

Average temperature (°F) 04/16/2015 – 04/15/2018

Left: Isometric view of the proposed system
Right: Cross sectional view of the system

Drawing courtesy: Jedediah Roach
THANK YOU!

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