INNOVATIONS IN FRESH-CUT FRUIT PROCESSING LINES

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MISSION
To provide the most innovative tailor-made food processing solutions assisting processors in delivering to the consumers, value-added food products with superior safety, quality, convenience and affordability.

TURATTI GROUP IN A NUTSHELL

REMEMBERING PROF. ADEL KADER (1941-2012)

SUMMARY
✓ FRESH-CUT FRUIT TODAY
✓ CHALLENGES AND OPPORTUNITIES
✓ UNIT OPERATIONS
✓ PROCESSING BY FRUIT
✓ TRENDS
FRESH-CUT FRUIT TODAY
THE NEXT BIG THING!

Pros
- Convenience
- No waste, just fruit
- Healthy
- Variety

FRESH-CUT FRUIT TODAY
DEFINING FRESH-CUT FRUIT

Any fresh fruit or any combination thereof that has been physically altered from its original form, but remains in a fresh state, [...] it has been trimmed, peeled, washed and cut into 100% usable product that is subsequently bagged or prepackaged to offer consumers high nutrition, convenience and value while still maintaining freshness.

FRESH-CUT FRUIT TODAY
SETTING BOUNDARIES

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FRESH-CUT FRUIT TODAY
RETAIL AND FOODSERVICE

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FRESH-CUT FRUIT TODAY
CHALLENGES
- UNIT OPERATIONS
- PROCESSING BY FRUIT
- TRENDS

CHALLENGES
FOOD SAFETY

CHALLENGES
RAW MATERIAL SPECS
- Large Fruit Size
- Small Quantity of Seeds
- Firm-ripe
- Uniform

CHALLENGES
RAW MATERIAL VARIETIES

The quality of fresh-cut produce is related to an appropriate selection of cultivars.
CHALLENGES
MANUAL OPERATIONS
• Little level of Automation
• Some products are delicate
• Capacities are not high
• Peellers are not very fast
• R&D needed

FLAVOR AND NUTRITIONAL LIFE
Consumers usually judge the quality of fresh-cut fruit on the basis of appearance and freshness at the time of purchase (Kader, 2002).
But Flavor and Nutritional Life create a repeat sale.

UNIT OPERATIONS
FRESH-CUT FRUIT TODAY
CHALLENGES AND OPPORTUNITIES
UNIT OPERATIONS
PROCESSING BY FRUIT
TRENDS

UNIT OPERATIONS
HARVESTING AND PICKING
Appropriate handling of whole fruits during harvest and postharvest can significantly reduce the risk of contamination.
Once detached from the plant, fruits undergo a physiological response such as transpiration, respiration, and ripening.

UNIT OPERATIONS
THE “3 C”
• Keep Clean
• Keep Cold
• Avoid Cross-Contamination

UNIT OPERATIONS
HYGIENIC REQUIREMENTS OF THE MACHINES
Openable Fan
Slidable Air Ducts
UNIT OPERATIONS

LESS IS MORE

Utilizing hygienic design principles in production may result in the following benefits:

• Less rejected product.
• Less product placed on hold.
• Less product reworked.
• Less product destroyed.
• Less consumer complaints.
• Less quality controls.
• Less investigative swabbing expenses.
• Less pre-operational testing expense.
• Less chemical products and cleaning time.
• Lower potential for a recall of contaminated product.

UNIT OPERATIONS

“C” AS COLD - TEMPERATURE

Keeping the proper storage and processing temperature.

UNIT OPERATIONS

“C” AS CROSS-CONTAMINATION

Compartmentalization of each step of the process, especially the first, may help to prevent cross-contamination of the product throughout processing.

UNIT OPERATIONS

HYGIENIC REQUIREMENTS OF THE FACILITY

UNIT OPERATIONS

GENERAL

TYPE OF FRUIT

UNIT OPERATIONS

ARRIVAL OF RAW MATERIAL
FRUIT SELECTION
WASHING OF WHOLE FRUIT
SORTING AND CLEANING
WASTE MANAGEMENT SYSTEM
PEELING
CUTTING
WASHING AND TREATMENT
DEWATERING - DRYING
COOLING
MIXING - PACKAGING
STOCKING OF FINISHED PRODUCT

UNIT OPERATIONS

THE FUTURE TODAY

UNIT OPERATIONS
ARRIVAL OF RAW MATERIAL
• Fresh-cut fruits are highly perishable due to biochemical, physiological, and microbial changes and require refrigeration or chilled storage (Garcia and Barrett 2002).

QUALITY OF RAW MATERIAL
Factors affecting quality of fresh-cut fruit:
• Cultivar
• Pre-harvest cultural practices
• Harvest maturity
• Physiological status of the raw product
• Postharvest handling and cold storage
• Processing technique and equipments
• Sanitation
• Packaging

The quality of fresh-cut fruits depends directly on the quality of the raw material and other factors related to processing, storage, and distribution (Gorny et al. 1998b).

SURFACE DISINFECTION
• Avoid Cross-Contamination
• Remove pesticide residues, plant debris, and other possible contamination
• Microorganisms responsible for quality loss and decay
• Fermentative species of yeasts such as Kloechera and Hanseniaspora occur naturally on the surfaces of fruits and are capable of causing fermentative spoilage (Barnett et al. 2000).

SURFACE DISINFECTION
• Hot Water
• Steam
• Water with Sanitizers
UNIT OPERATIONS
SURFACE DISINFECTION
- Hot Water
- Steam
- Water with Sanitizers

UNIT OPERATIONS
WASTE MANAGEMENT

UNIT OPERATIONS
PEELING
- Manual
- Mechanical
- Enzymatic

UNIT OPERATIONS
CUTTING AND SLICING
The potent sources of contamination in fresh-cut fruits are cutters and slicers, which provide inaccessible sites for harboring microbes, particularly bacteria. The presence of cut surfaces provides an increased surface area for contamination and growth and allows microbial infiltration of the tissues.

UNIT OPERATIONS
CUTTING AND SLICING

UNIT OPERATIONS
CUTTING AND SLICING
Minimal processing operations alter the integrity of fruits, with negative effects on product quality, such as browning, off-flavor development and texture breakdown. Also, the presence of microorganisms on the fruit surface may compromise the safety of fresh-cut fruit.
UNIT OPERATIONS
WASHING AND TREATMENT

Edible coating may be defined as a thin layer of material that covers the surface of the food and can be eaten as part of the whole product. Therefore, the composition of edible coatings must be conform to the regulation that apply to the food product concerned (Guilbert et al., 1995; Vargas et al., 2008).

UNIT OPERATIONS
DEWATERING

The excess water or juice it may be an excellent medium for the growth of microorganisms. Moreover, some enzymatic reactions can be accelerated leading to a rapid degradation of the fruit flavor and/or appearance. A good drainage is also important to avoid cross contamination throughout the processing line.
PROCESSING BY FRUIT
APPLE

• Segment Shape Quality and Yield (Tunnel or Seed Removing)
• Segment Shelf-Life and Packing (Drops to Bagging Machine)
• Surface of the Apple (Rotating Knife)

PROCESSING BY FRUIT
APPLE

- Coating and Dewatering

PROCESSING BY FRUIT
APPLE

- Surface Quality
- Machine must be coupled with raw material selection (narrowing opportunities)
- Hand Peel better looking (but low capacity)
- Packaging is a big problem

Credit: Dr. Giovanni Gallerani – Mace’
The principle of enzymatic peeling is based on the digestion, through an enzymatic preparation, of the pectic substances existing in the cell wall of plants. The efficiency rate of enzymatic peeling is influenced by the morphological characteristics of citrus fruits, the correct vacuum application and the incubation time, as well as by the type and concentration of enzymatic solution, and temperature, among others. Temperature range between 35 and 40°C.

PROCESSING BY FRUIT
CITRUS

Cylindrical type or by blade
Cutting
Packaging

PROCESSING BY FRUIT
PINEAPPLE

Manual cutting or by Machine

PROCESSING BY FRUIT
MELON

Knife peeling machine (generally the same for pineapple)
Need to sterilize surface very accurately to avoid cross-contamination
Different varieties and shelf-life

Credit: Dr. Giovanni Gallerani – Mace'
PROCESSING BY FRUIT WATERMELON

• Different firmness and texture
• Therefore mechanical peeling and cutting are not consistent

Credit: Dr. Giovanni Gallerani – Mace' 

PROCESSING BY FRUIT KIWI

Manual

• Different firmness and texture
• Manual Peeling Expensive

Machine

PROCESSING BY FRUIT GRAPES

Destemming

Ca’ del Bosco - “Spa delle Uve”: First worldwide plant for the sorting, washing and dewatering of the grapes addressed to the winemaking

PROCESSING BY FRUIT GRAPES
PROCESSING BY FRUIT

**Grapes**

**Nectarines**

**Pears**

**Pomegranate**

- Shelf-Life: 14 Days
- Equipment: 10-15 Fruit per Minute
- 180 Kg.-H. of Arils
PROCESSING BY FRUIT STRAWBERRY

Turatti: Patented Max. FRAZER

- Equipment: 240 Berries per Minute
- 380 Kg.-H. of product

PROCESSING BY FRUIT BLUEBERRY

- Shelf-Life: 21 Days
- Closed Pipe System and Dewatering

PROCESSING BY FRUIT MANGO

- Mango pulp is very perishable
- Short shelf life
- Lack of consistency in availability, quality and ripeness stage
- Manual and Mechanical peel

PROCESSING BY FRUIT TROPICAL

Fresh-Cut Technology was developed for:
- Jackfruit
- Durian
- Pomelo
- Mangosteen
- Dragon Fruit
- ...
TRENDS

HYGIENIC DESIGN

Safety for the consumers and the employees

- Increase Food Safety
- Reduce Cleaning Time
- Reduce Maintenance Time
- Increase Effective Production Time
- Optimizing Performances
- Reduce Costs

AUTOMATION - Examples

- Reduced Labor
- Better Quality

Hygienic design is a profit issue!