

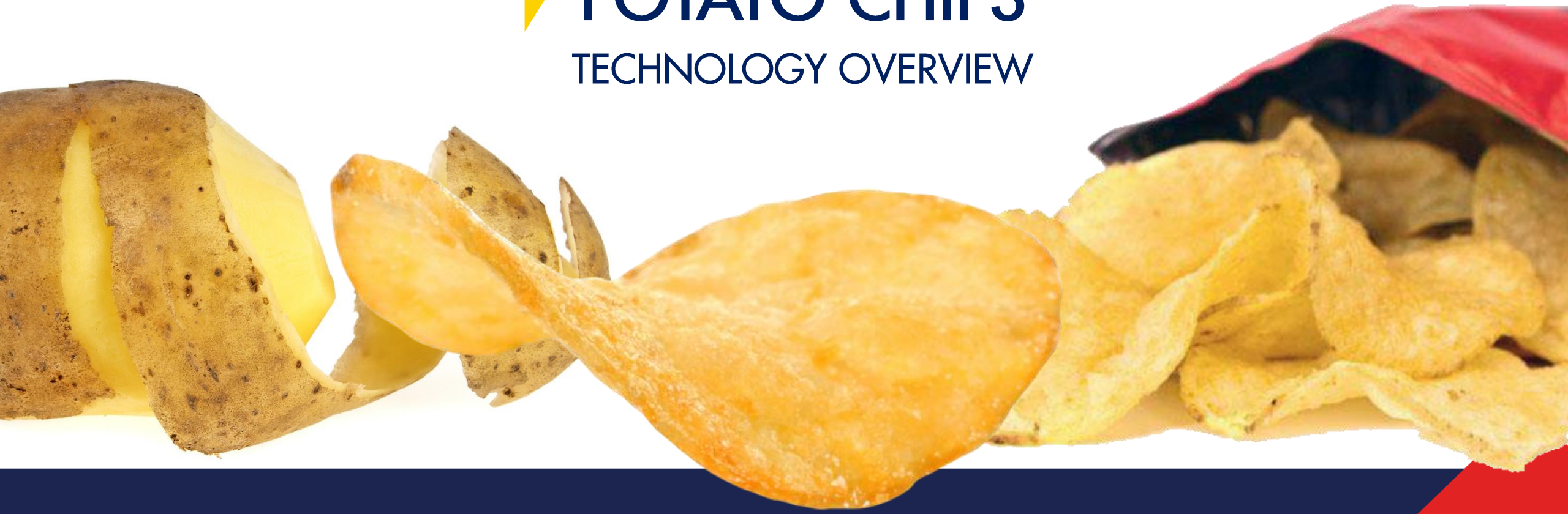


LEADERS
INNOVATE.



POTATO CHIPS

TECHNOLOGY OVERVIEW



POTATO CHIPS

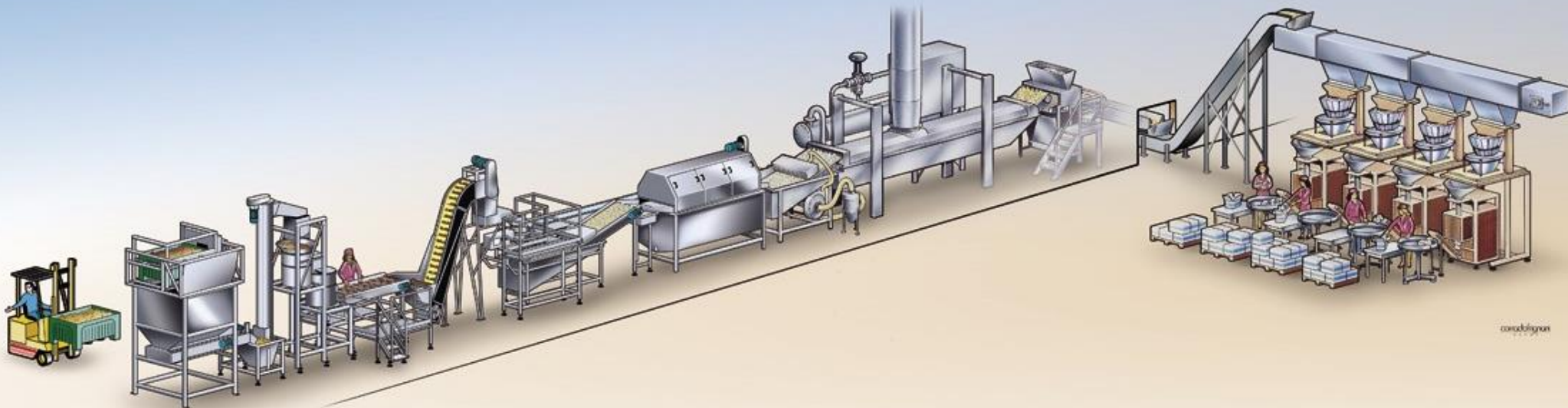


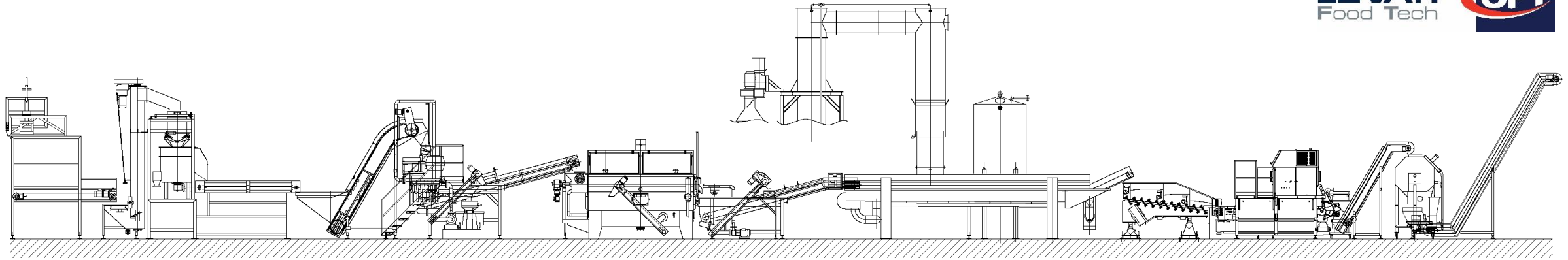
▶ CAPACITY RANGE

From 100 up to 2.000 KG/H
(OUTPUT)

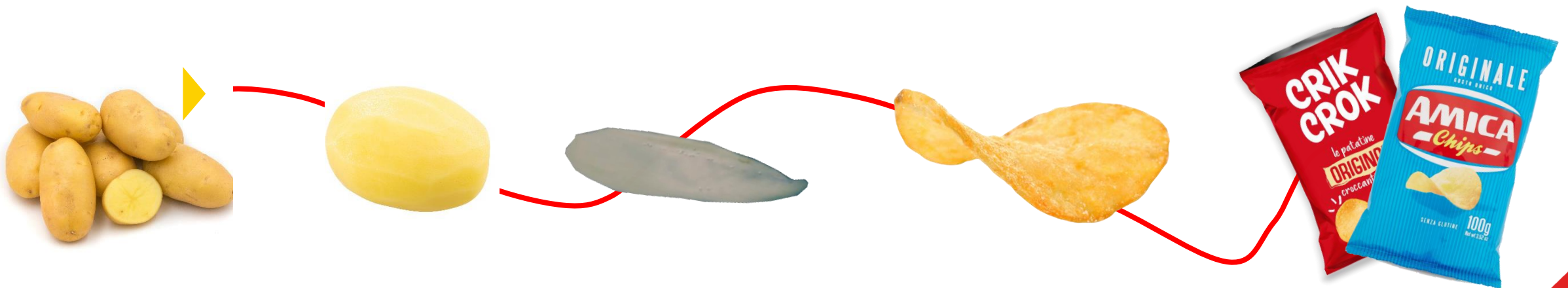
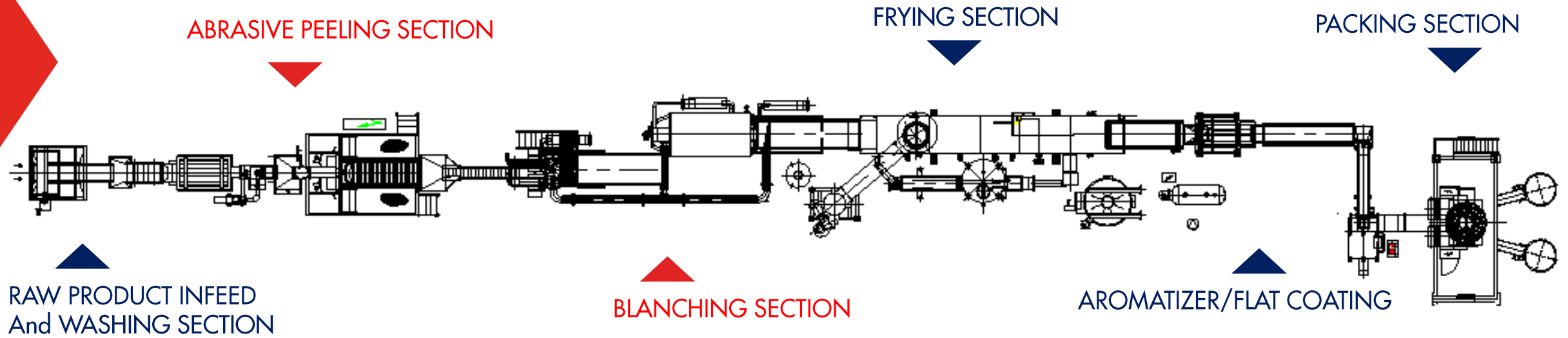


▶ 100% COMPLETE PLANTS and «TURN-KEY»
SOLUTIONS for POTATO CHIPS PRODUCTION





GENERAL LAYOUT OVERVIEW

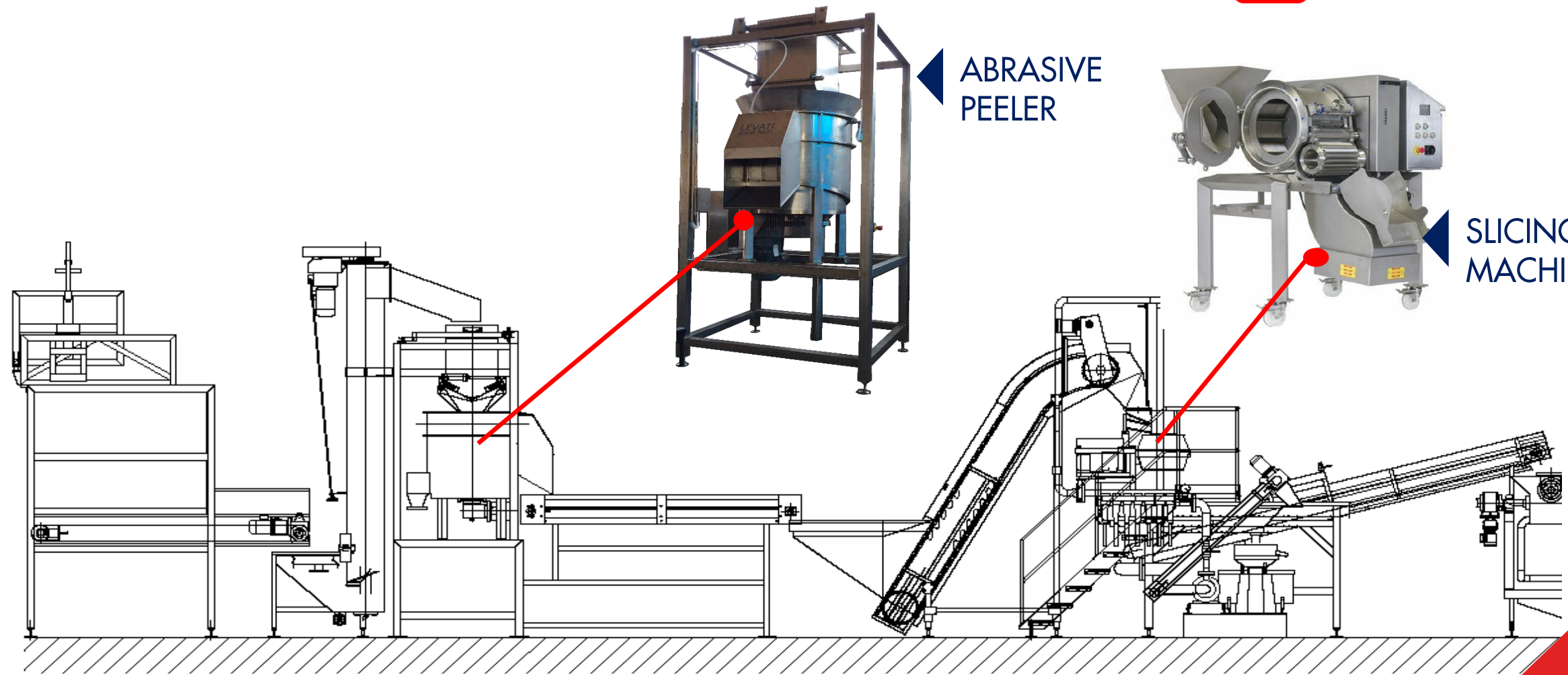




RAW PRODUCT INFEED, PEELING and SLICING

PLANT AND MACHINERY FROM RAW MATERIAL INLET UP TO CUTTING & SLICING

 Up to 6 T/H
RAW MATERIAL



ABRASIVE
PEELER

SLICING
MACHINE

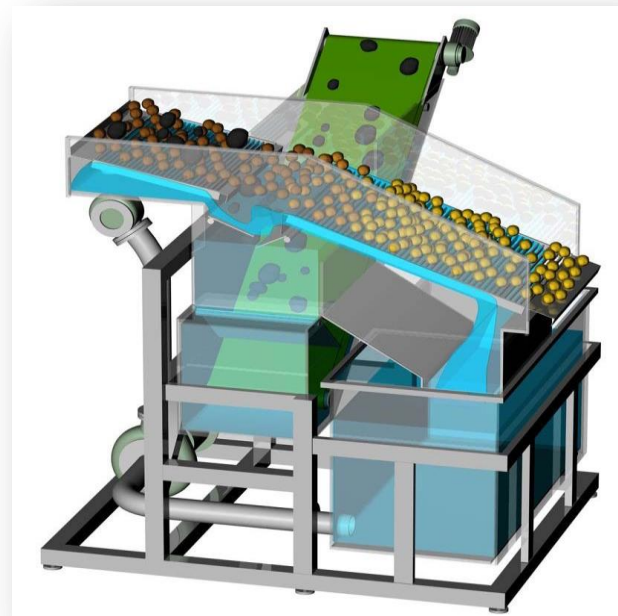
▶ LINE INFEED

- ❖ The silo assures the constant feeding of potatoes to the line.
- ❖ Completely made in stainless steel.
- ❖ Integrated crate unloader to ease the unloading of the potatoes crates.
- ❖ Possibility to feed the line by crates, bins and bags.
- ❖ Equipped with:
 - belt conveyor to extract the potatoes from the silo.
 - de-earth dry unit.
- ✓ SILOS ARE AVAILABLE WITH DIFFERENT CAPACITIES
- ✓ AS OPTION THE SILO CAN BE SUPPLIED WITH SCREW EXTRACTOR



▶ DESTONING

- ❖ Separation of stones is achieved by different specific weight.
- ❖ Potatoes are soaked in water in the receiving hopper
- ❖ The vertical screw will elevate the potatoes.
- ❖ The inclination of the screw is calculated so that only the potatoes can be conveyed while the stones that have an higher weight rolls back.
- ❖ A valve placed in the bottom of the receiving hopper allows the discharge of the water.



PEELING SECTION

ABRASIVE PEELING

- ❖ Peeling in chips lines is always done by abrading the potatoes surface.
- ❖ The potatoes are discharged from the vertical destoner into the weighing hopper.
- ❖ Once reached the desired quantity the potatoes are discharged in the rotating drum.
- ❖ The sides and the bottom of the drum are lined with carborundum that abrade the potatoes skin.
- ❖ Entirely made in Stainless Steel.
- ❖ Supplied with spare drum and bottom.
- ❖ ABRASIVE/MECHANICAL PEELER can be supplied, according to the capacity required, in ONE or MULTIPLE UNITS.



From 500 KG/H
Up to 6000 KG/H



INSPECTION SECTION (MANUAL and OPTICAL)

MANUAL SORTING

Potatoes are sorted. The operators remove all the bad potatoes or clean the potatoes removing the defects (black dots, sprouts...) and release the wastes in the side pockets.

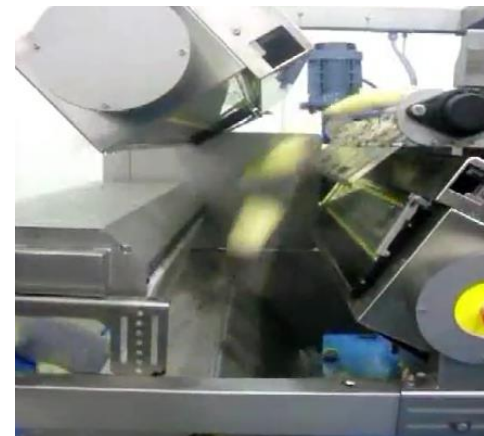


- The wastage are then conveyed from the return side of the belt to the feeding edge where they are collected in the wastage bin

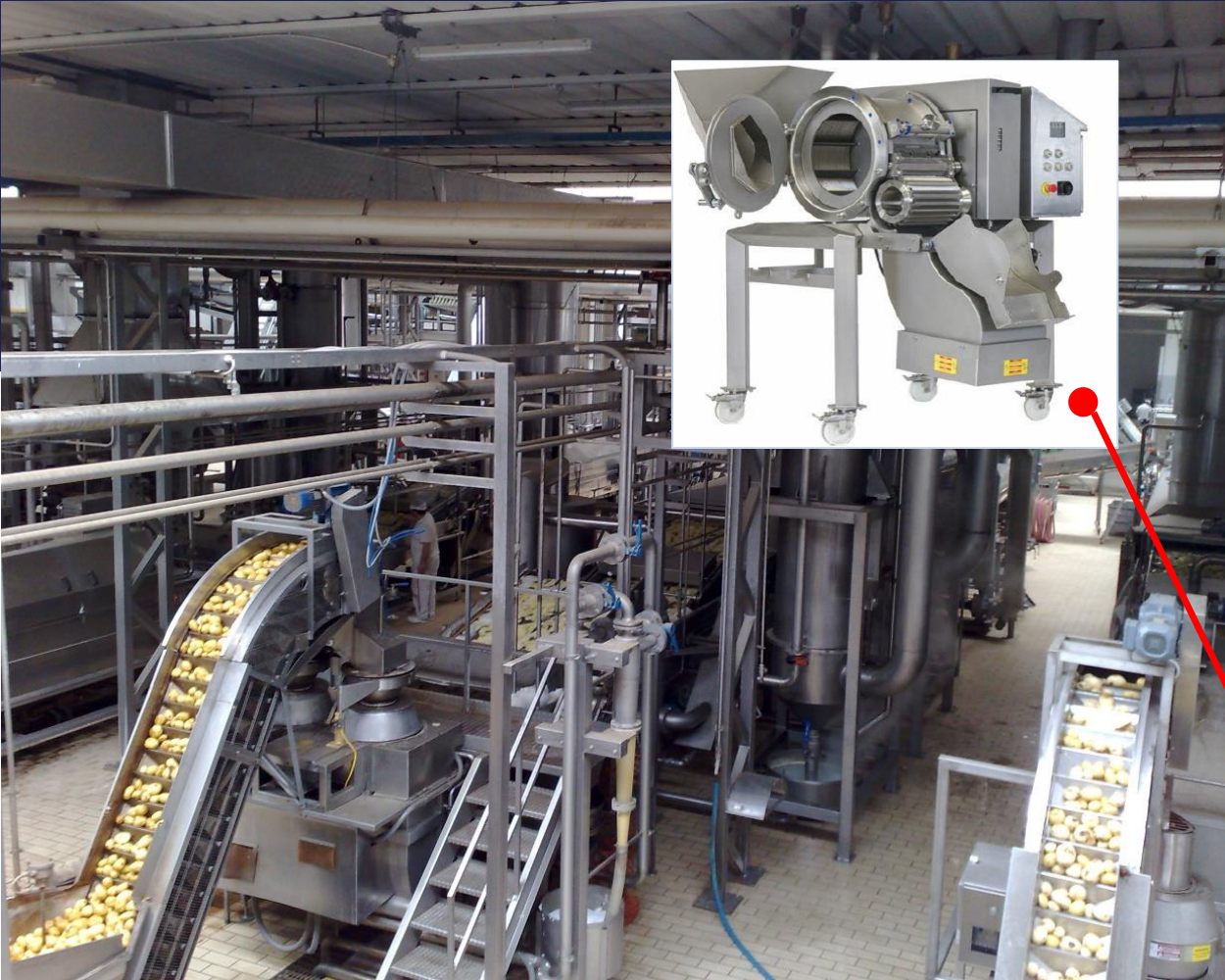
OPTICAL SORTING



- ❖ RAYTEC VISION, part of CFT GROUP, produce optical sorting system to be integrated on CFT lines;
- ❖ The optical sorting is available both for WHOLE PEELED or CUTTED products



SLICING & CUTTING



- ❖ It is important to feed the slicer machine continuously and constantly;
- ❖ The potatoes are therefore conveyed to a loading hopper with level control. Once the quantity of potatoes reach the desired level the elevator is operated and feed the slicer to allow a constant feeding of the slicer.
- ❖ The slicer can be equipped with blades for flat, crinkle or V-shaped cut and for sticks.



FLAT CUT



CRINKLE CUT



STICKS CUT

CUTTER and BLADES INTEGRATION
FROM MAIN INTERNATIONAL SUPPLIERS



URSCHEL®

▶ WASHING AND SCRABS REMOVING



◀ SCRAP WASHING

- ❖ Right after the slicing the slices must be washed to remove the starch and separate the scrabs.
- ❖ The washing is done in a special washer with cold water and air injection.
- ❖ The water pump ricycle the water through a belt filter to eliminate the scrabs.

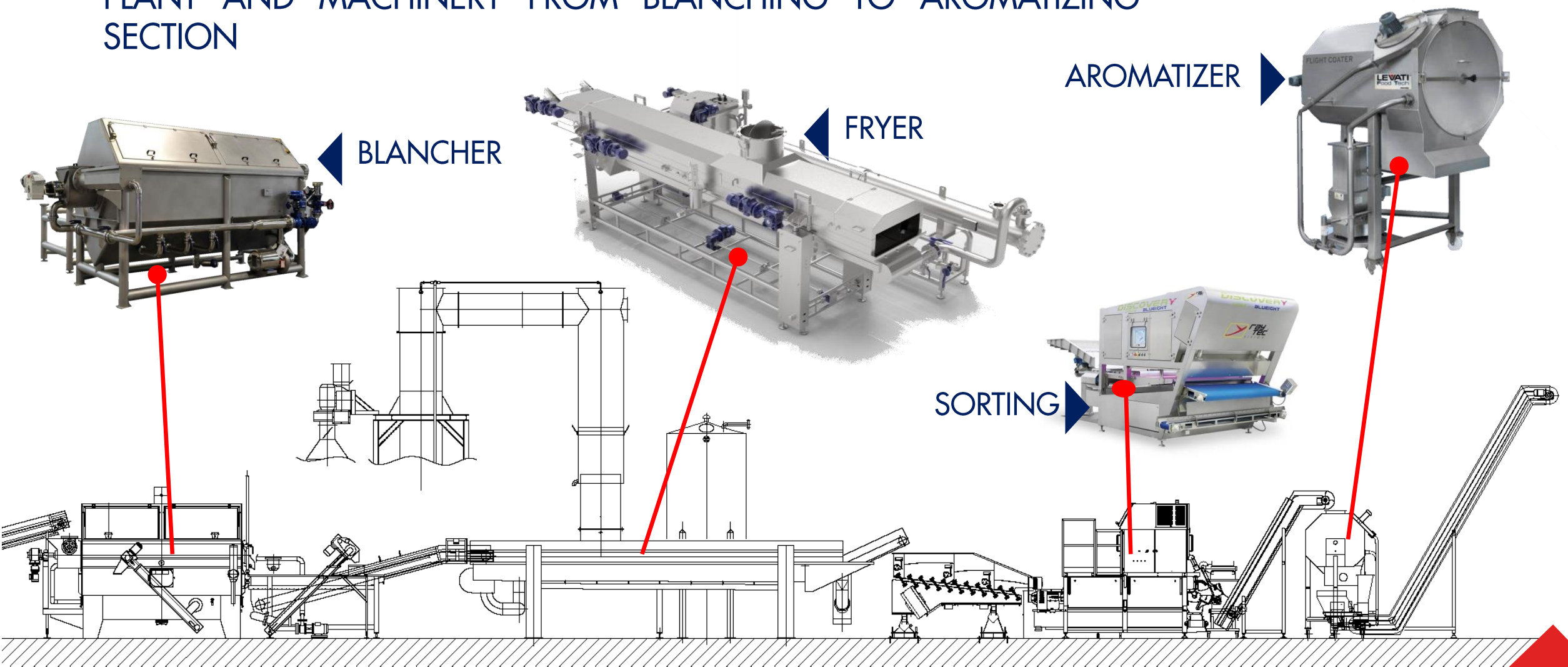


◀ BELT FILTER



BLANCHING, FRYING, SORTING and COATING

PLANT AND MACHINERY FROM BLANCHING TO AROMATIZING SECTION



▶ BLANCHING SECTION



- ❖ The “blanching” is performed to wash out the sugar from the slices.
- ❖ Completely made in stainless steel.
- ❖ The drum blancher assure an high performance washing of the slices.
- ❖ The machine is equipped with a screw in the bottom of the tank to remove the starch.
- ❖ High capacity water pump to recycle trough the belt filter.
- ❖ Direct injection of steam in the water



FINAL WASHING

- ❖ The slices are washed again with cold water to remove the starch remained
- ❖ In the receiving tank a special system using water stream and air distribute evenly the slices on the extraction belt surface preparing the inlet of the fryer.
- ❖ In the last part of the extraction belt an high capacity fan blow air on the slices removing the outside water.
- ❖ The air is sucked from the bottom of the conveyor creating a depression that keep the slices on the belt.
- ❖ Completely made in stainless steel.
- ❖ High capacity water pump to recycle the water trough the belt filter



WATER BY-PASS

- ❖ The washer scabs remover is by-passed when producing the sticks (that otherwise are eliminated by the mesh filter)
- ❖ The blancher is by-passed when the potatoes do not need the sugar washing (high quality potatoes).

▶ WATER RECYCLING



- ❖ In our plant we give the maximum attention to the water consumption.
- ❖ For this reason we have kept separated the hot water section from the cold waters.
- ❖ Therefore cold water can be recycled using special filters and hydrocyclones to separate the starch.
- ❖ The water recovering is about 30%-40%.
- ❖ The hot water (from the blancher) cannot be recycled because the cooked starch is diluted in the water.



▶ FRYING SECTION

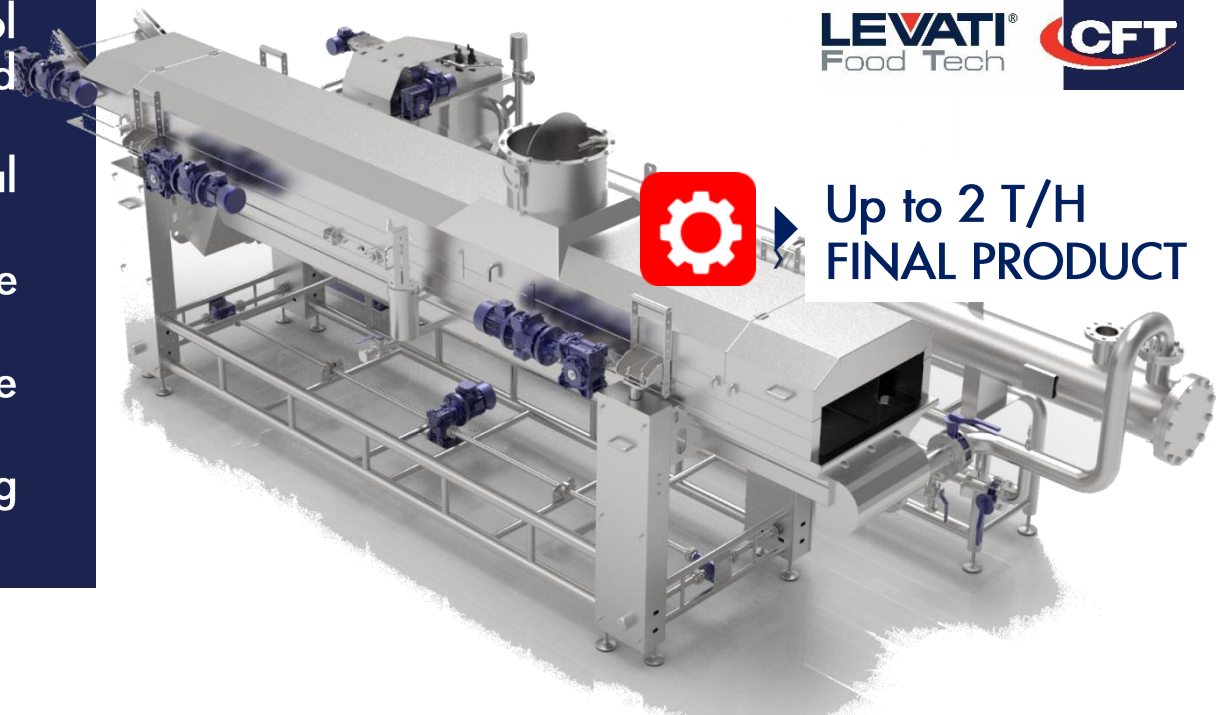
Frying is one of the most important section of the line;

Our fryer has been designed to obtain an high-quality product focusing on the key-factor:

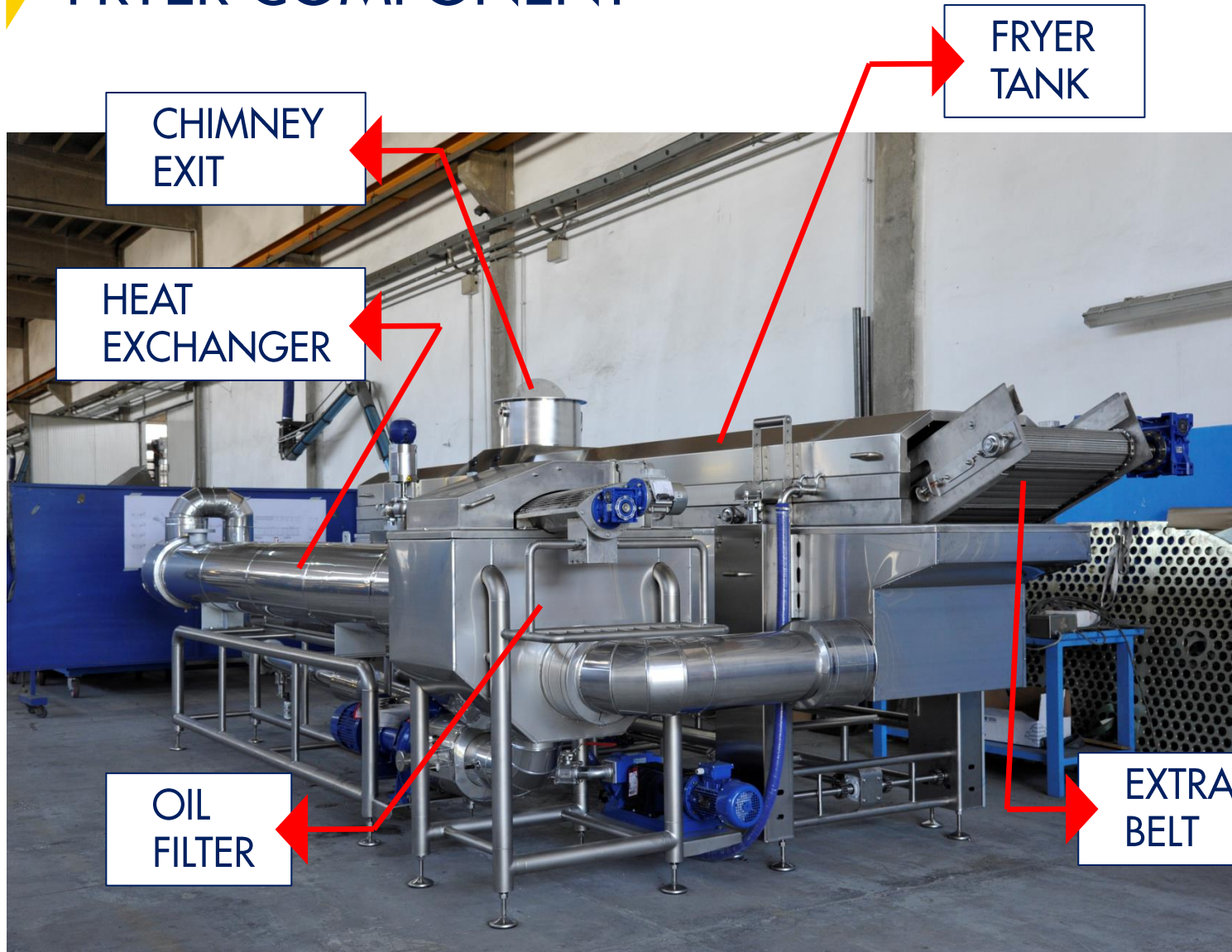
- ❖ Constancy of temperature. The high capacity pump and the design of the heat exchanger assure a $\Delta t = 10^{\circ} \text{C}$ (difference between the oil inlet temperature and oil outlet temperature).
- ❖ Low oil volume. In this way the turn-over value is kept at the minimum assuring a low acidity and low peroxide content.
- ❖ Multi-Point oil system. The oil in entered in the fryer from different point. We are then able to reduce the oil speed and adjust the oil temperature according to the quality of the potatoes to be fried.



- ❖ The hood chimney is equipped with a butterfly valve to control the fume flow, maintaining a steam "cover" on the oil to avoid the oxygen contact and the consequent oil oxidation.
- ❖ External heat-exchanger to heat the vegetable oil with thermal oil or high pressure steam;
- ❖ Second heat exchanger with cold water to cool the oil before pumping it in the overnight tank.
- ❖ Mechanical system to lift the conveyors and the hood to ease the cleaning And Maintenance
- ❖ Special scarper to clean the outlet edge of the fryer avoiding that deposits of particles crate a dangerous oil burning.



▶ FRYER COMPONENT



MECHANICAL OPENING
FOR CLEANING and
MAINTENANCE



FRYER EXECUTION

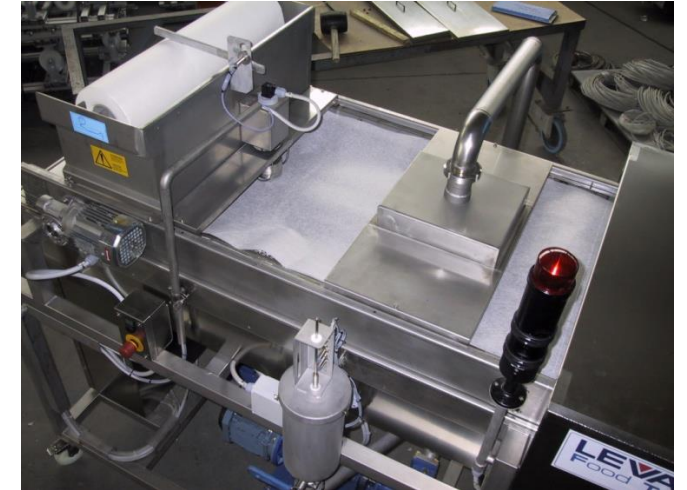
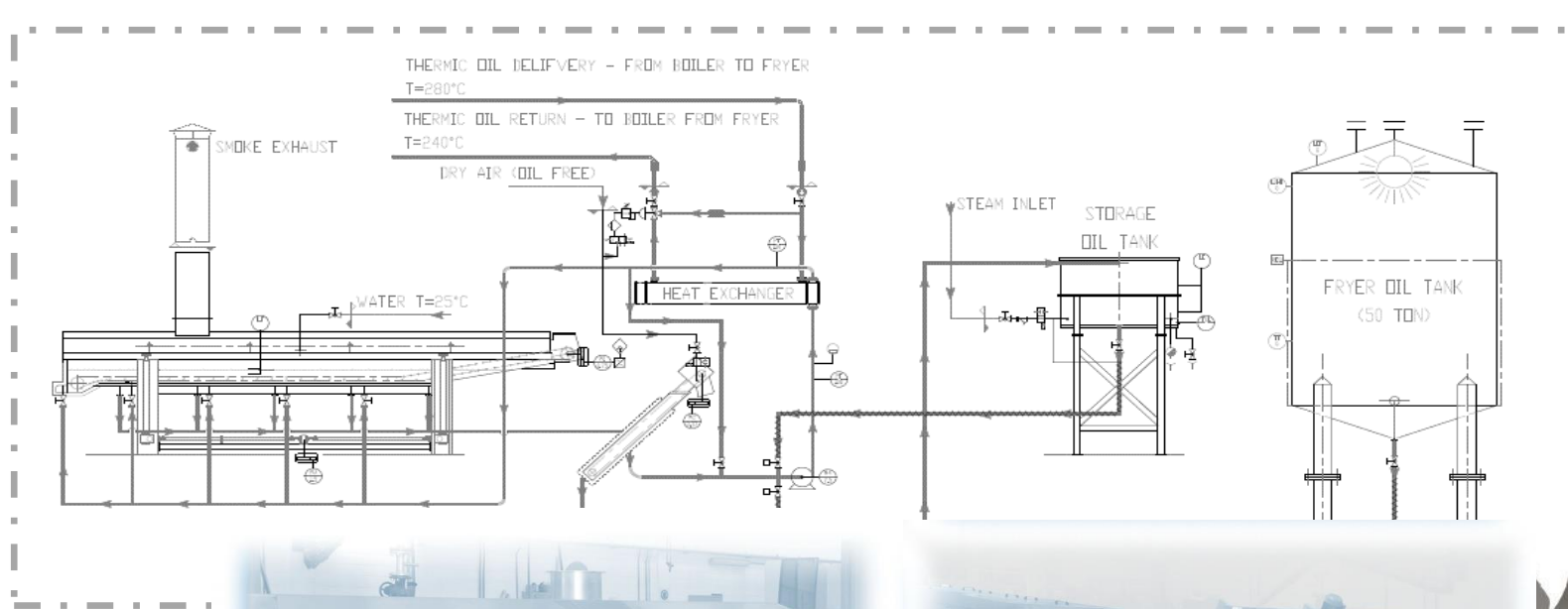
- ❖ Paddles conveyor to keep the slices immersed in the oil;
- ❖ Second over mesh belt conveyor to submerges the slices in the oil;
- ❖ Third inclined mesh belt conveyor to extract the slices from the frying oil.
- ❖ Fryer completely made in stainless steel
- ❖ Oil pump in stainless steel
- ❖ Heat exchanger with parts in contact with vegetable oil in stainless steel.



FLUMES HEAT RECOVERY

- ❖ Recover the heat from the fume. It is possible to heat-up processing water to be used on the line saving energy costs.
- ❖ Reduce the emission and the frying smell by washing the fumes with "Scrabber Blu".

OIL CIRCULATION AND FILTRATION



PAPER
FILTER (OPT).

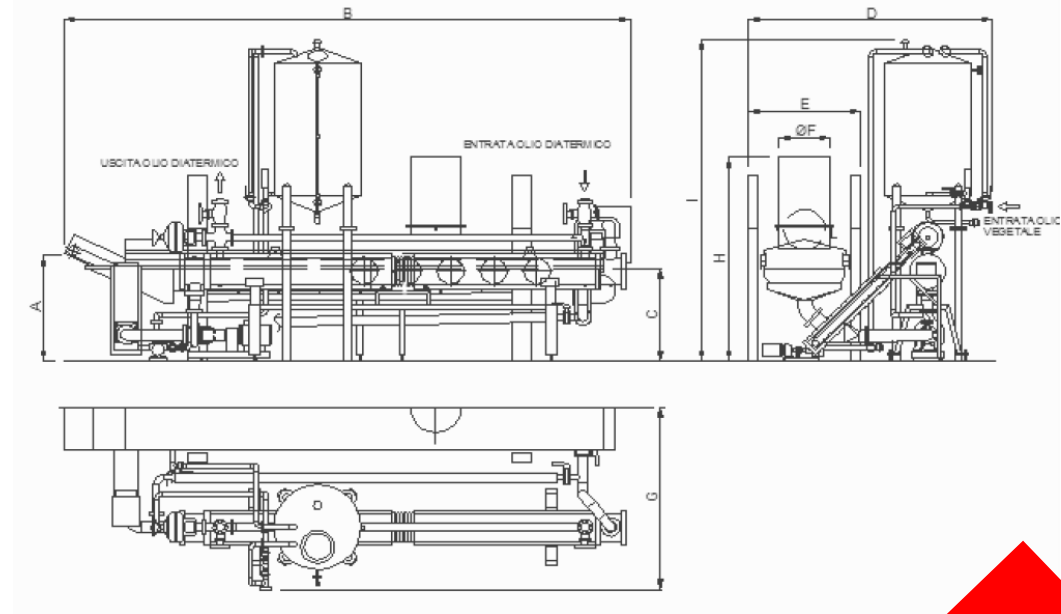
DRUM
FILTER
(STANDARD)





▶ DE-OILING

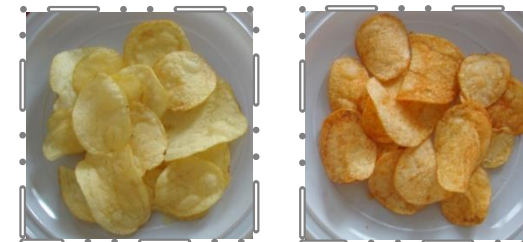
- ❖ The de-oiling shaking conveyor is placed after the fryer.
- ❖ The exceeding oil is collected in the heated trays and pumped back to the fryer.



SEASONING

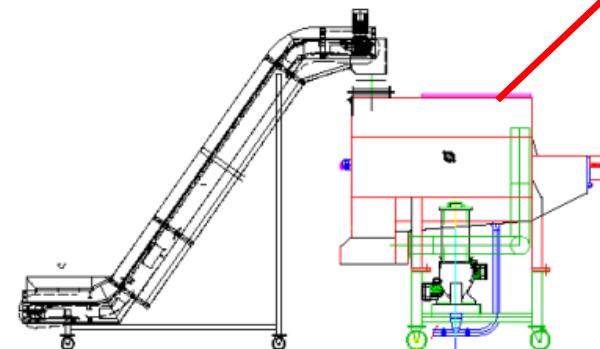
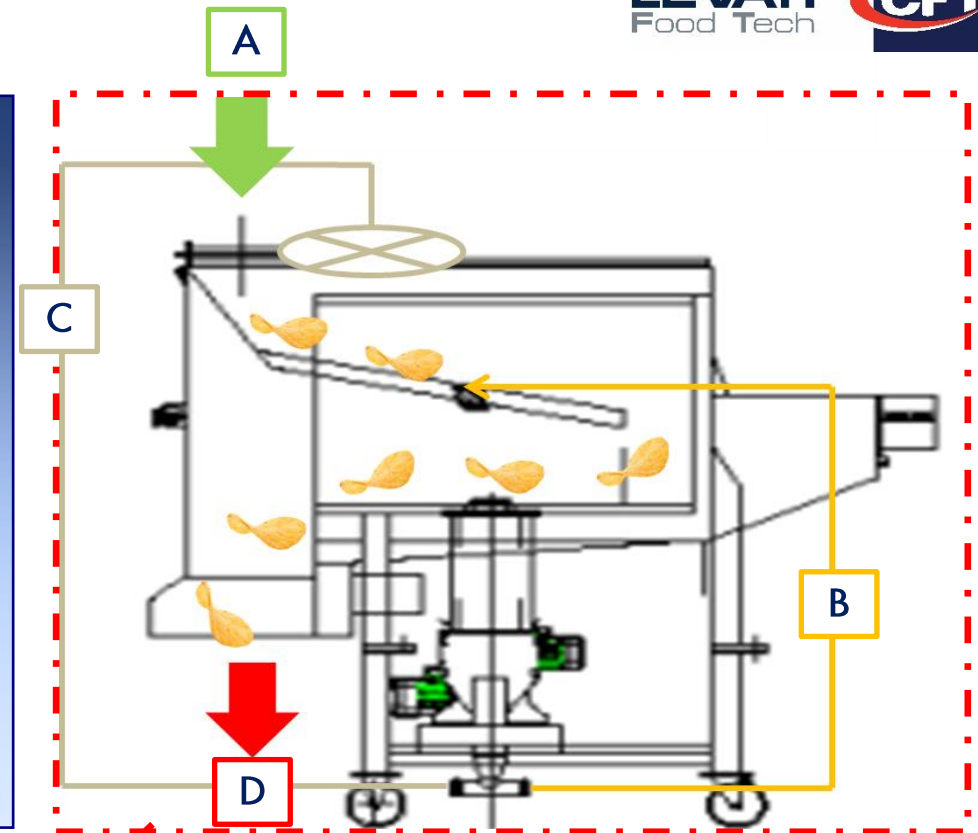


- ❖ After frying the slices are conveyed to a de-oling conveyor, than an eventual optical sorter than to our innovative FLIGHT COATER.
- ❖ The FLIGHT COATER has been studied to flavour homogeneously the product. The flavour is scattered by the special designed fan.
- ❖ The FLIGHT COATER is completely closed to prevent the spread of dust in the production room:
 - Savings of give-away flavours
 - Prevention of cross-contamination
 - Prevention of allergen concerns
 - Reduction of clean-up times.

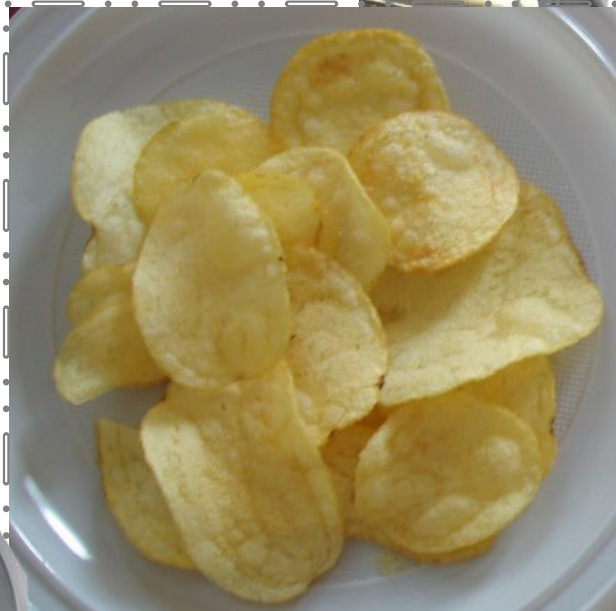


▶ FLIGHT COATER

- ❖ The front door and the product funnel are removable without tools, to access the treatment chamber for fast and thorough cleaning operation.
- ❖ Pre-arranged for C.I.P.
- ❖ The drum can be taken off the chamber for washing.
- ❖ The drum rotation system is mounted at the outside of the treatment chamber, easing the sanification and maintenance procedures.
- ❖ Possibility to have drums specially designed and easily changeable for different products.
- ❖ Special product discharge funnel with outer intake manifold.



- A** ▶ PRODUCT INLET
- B** ▶ AROMA INJECTION/DOSIFICATION
- C** ▶ AROMA BLOWING/SPREADING
- D** ▶ PRODUCT OUTLET



▶ "CHIPS" CONCEPT

This presentation is meant to describe the potato chips or crisps technology.

Crisps is the term used in United Kingdom only. For the sake of consistency we will use the American term chips.

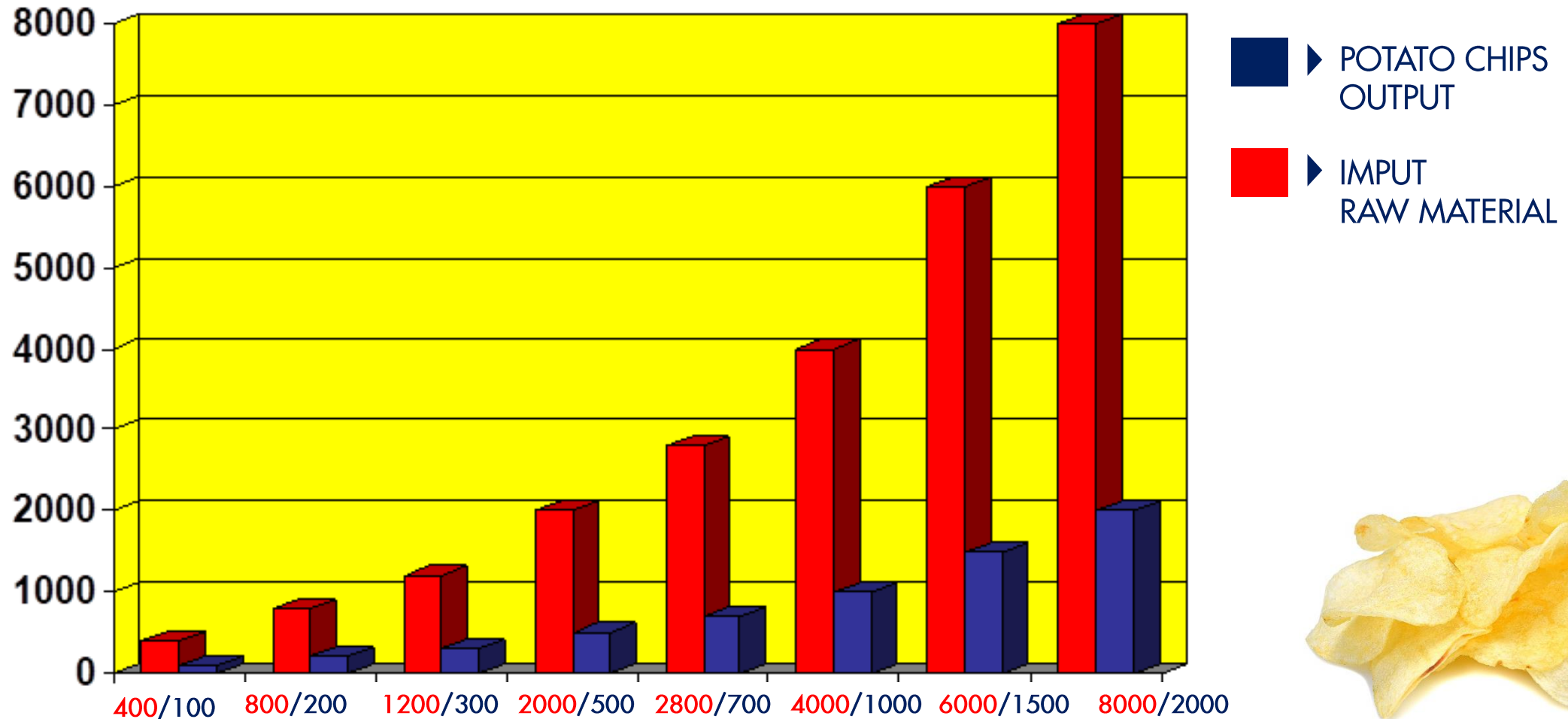


CFT/LEVATI designs and supplies all the process equipment in a full turnkey package:

- The process equipment are fully integrated
- Only one company bears the responsibility for the whole project
- Consistent MMI for the whole line: easier and complete management of the line.
- One technologist will assist the factory manager to start the production and establish the production protocol
- All the pieces of equipment are manufactured in Stainless Steel.
- Special design of the oil heating system to enhance and guaranty the oil quality (acidity and peroxide).
- Option for install the heating recovery system from fryer.
- Specially designed water recovery systems.



CHIPS LINE – PLANT CAPACITIES



RAW MATERIAL

The potatoes arrive to the line usually in crates, sometimes in bags or big bags
Potatoes variety: **Agria, Sante', Lady Rosetta, Saturna, Superba, Hermes, Emergo ...**

Earth, sand: $\leq 3\%$
Optimal potato diameter: **40 to 60 mm**
Dry matter contents: $\geq 20\%$
Potato with lower dry-matter contents, may be processed reducing the output line capacity.
Reducing sugar contents: $\leq 0,25\%$

FINAL PRODUCT

Chips with flat cut, crinkle cut or sticks
Moisture content: **1,5-2%**
Oil content: **32 ÷ 38%**
approx.
Dry matter content: **60 ÷ 63%**
approx.
Flavour content: **5% ÷ 6%**
Salt content: **0,5%**

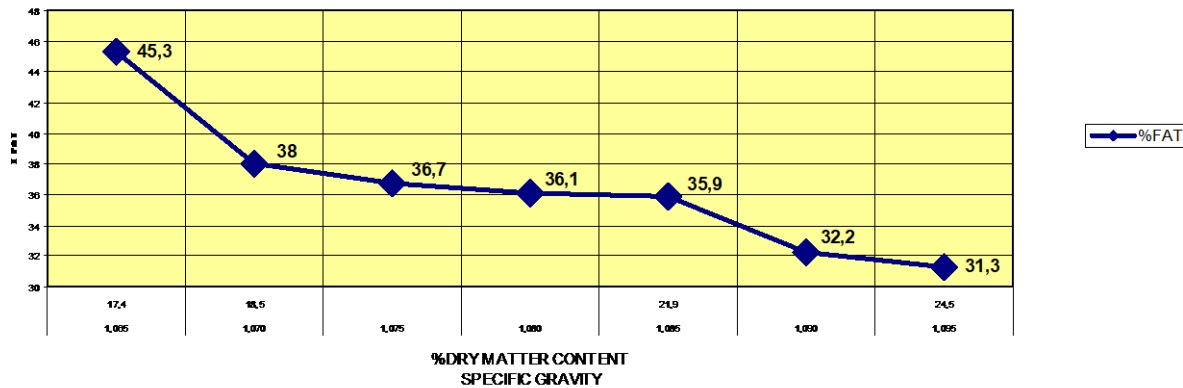


The chips quality is influenced from the following key factors mainly related to **POTATOES VARIETY**.

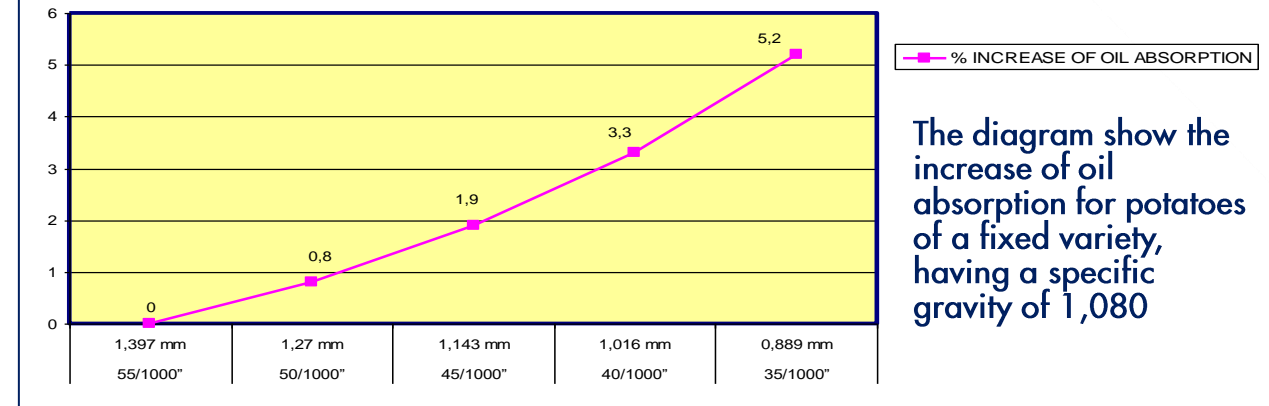
- ❖ Various potatoes cultivars are available for chips processing depending on the cultivation area.
- ❖ Dry matter and sugar content as already mentioned. In particular the sugar content is a value influenced not only from the cultivation area, temperatures, weather factors. The storing temperature and time have a big influence as well.
- ❖ During the storing at 7°C, the starch contained in the potatoes is gradually modified in sugar.
- ❖ Therefore it is important that the potatoes are gradually reconditioned keeping them in a conditioned room at 17° for a time depending on the sugar content.

CHIPS LINE – PLANT CAPACITIES

% FAT vs DRY MATTER



% INCREASE OF OIL ABSORPTION vs SLICE THICKNESS



The diagram show the increase of oil absorption for potatoes of a fixed variety, having a specific gravity of 1,080

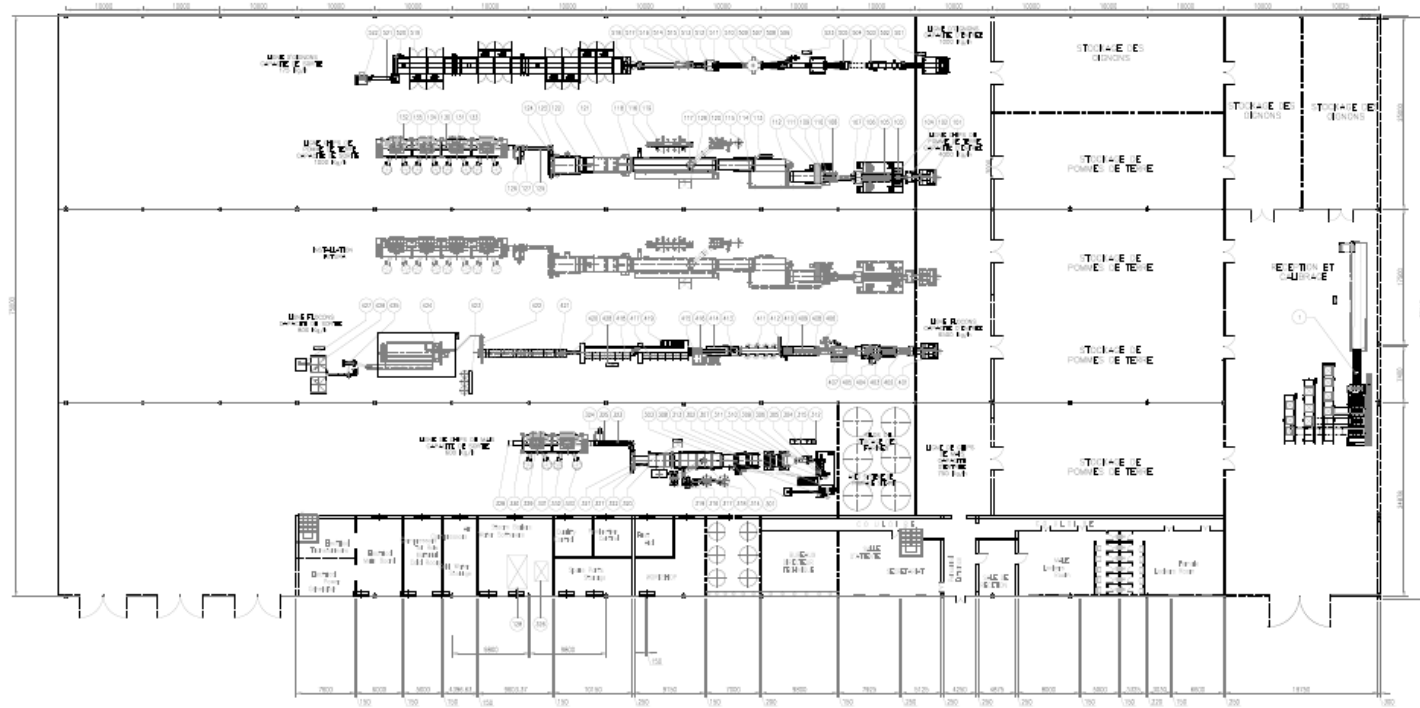
The oil content in the chips assures the consistency and taste of the finished product. The ideal fat content in chips is normally between 32% and 37%. The oil absorption is mainly influenced by (in order of importance):

1. Dry matter content in the potatoes (higher is the dry matter content, lower is the oil absorption).
2. Slice thickness. Thinner are the slices, higher is the oil absorption.
3. Uniformity of the cut thickness.
4. Smoothness of the cut

Frying oil temperature and consequently oil frying time;

- ❖ The optimal frying temperatures are 180° C Inlet/170° C Outlet.
- ❖ In order to limit the oil absorption is better do not fry at a temperature lower than 165° C.
- ❖ Potatoes with an high sugar content (> 0,25%) may require a lower temperature with increase of oil absorption.
- ❖ Slice drying before frying Potatoes variety.
- ❖ Make-up of the slices with hot water, sodium clorate or other chemical additives.

TURN-KEY SOLUTION



Code	Description	Quantité	Unité	Remarque
001	Machine à laver	1	unité	
002	Machine à éplucher	1	unité	
003	Machine à trancher	1	unité	
004	Machine à cuire	1	unité	
005	Machine à refroidir	1	unité	
006	Machine à emballer	1	unité	
007	Machine à stocker	1	unité	
008	Machine à contrôler	1	unité	
009	Machine à nettoyer	1	unité	
010	Machine à sécher	1	unité	
011	Machine à conditionner	1	unité	
012	Machine à emballer	1	unité	
013	Machine à stocker	1	unité	
014	Machine à contrôler	1	unité	
015	Machine à nettoyer	1	unité	
016	Machine à sécher	1	unité	
017	Machine à conditionner	1	unité	
018	Machine à emballer	1	unité	
019	Machine à stocker	1	unité	
020	Machine à contrôler	1	unité	

ETUDE
PRELIMINAIRE



THANK YOU!



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