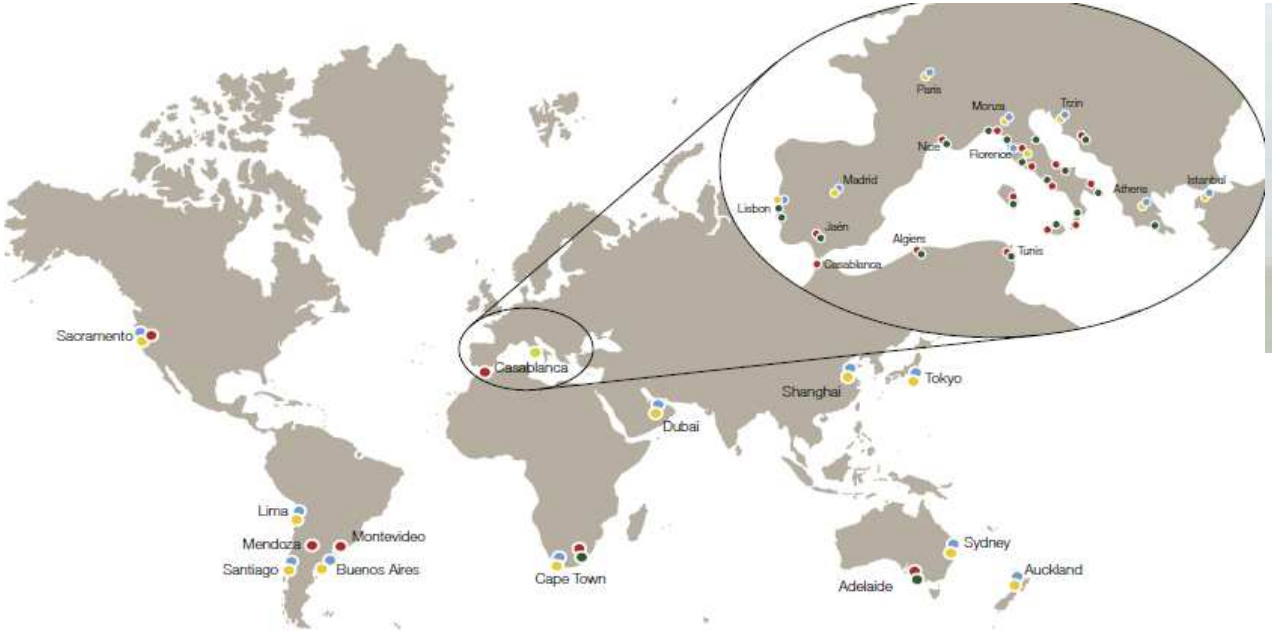
Olive waste management
Swim H2020

December 2017

Olive Oil Industry



PERFORMANCE AGREEMENTS

ALFA LAVAL

PERFORMANCE AGREEMENT

Business models

Batch production

- Mainly 3 phase,

- Small medium producers

- Italy, Greece, North Africa, ME

Focus on quality, premium price

Focus on quantity, cost saving

Industrial production

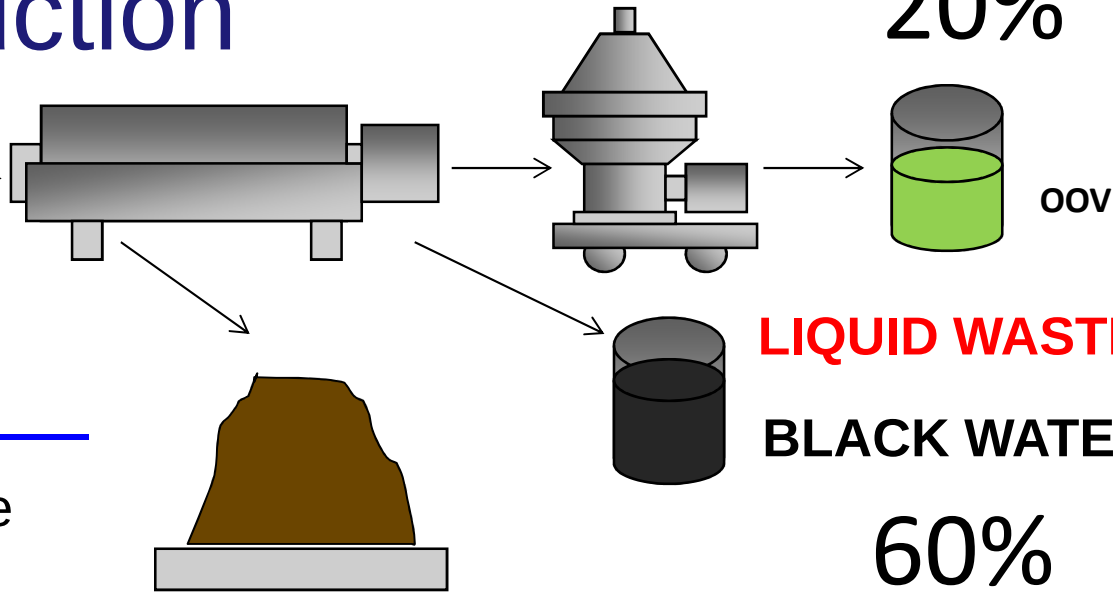
- Mainly 2 phase,

- Big producers

- Spain, Americas, Oceania

3 phase production

100 + 30%

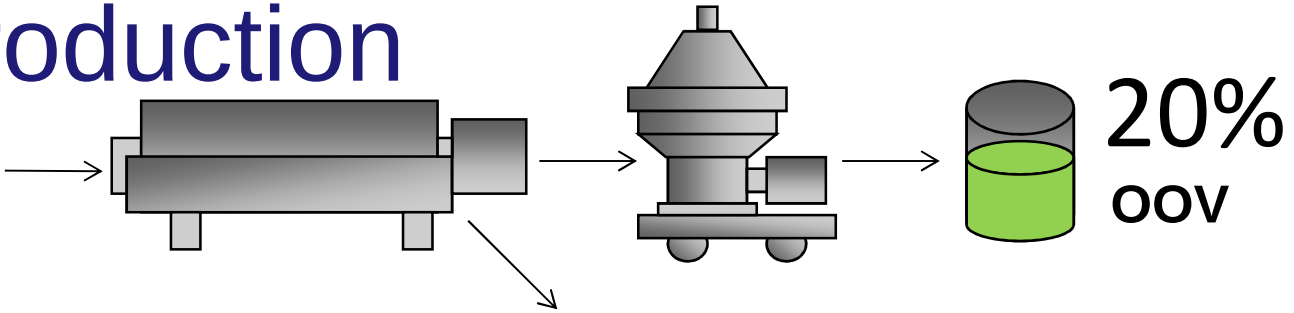


- Dry husk, easy to manage

- Black Water

2 phase production

100 %



- Less sub product

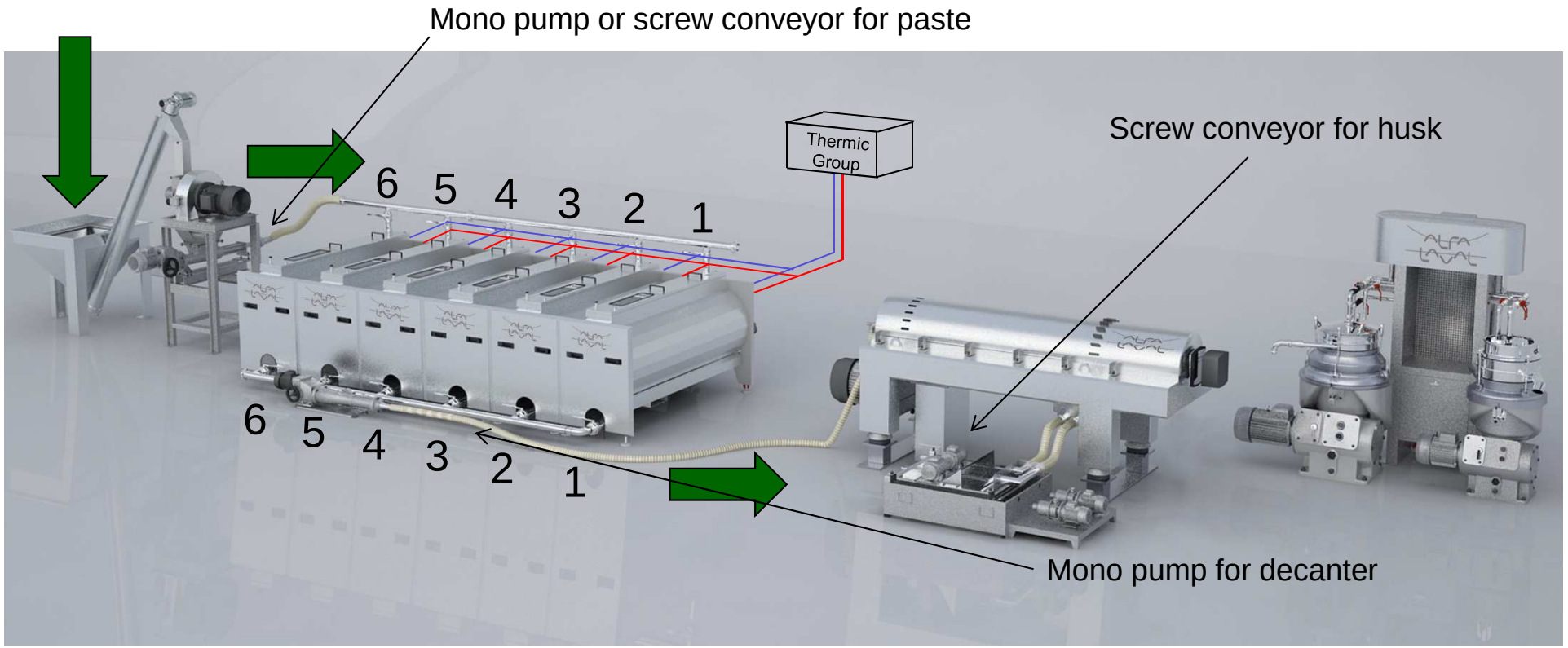
Wet husk

90%

SOLID/LIQUID WASTE

- Wet husk, difficult to manage

Batch plant outlook



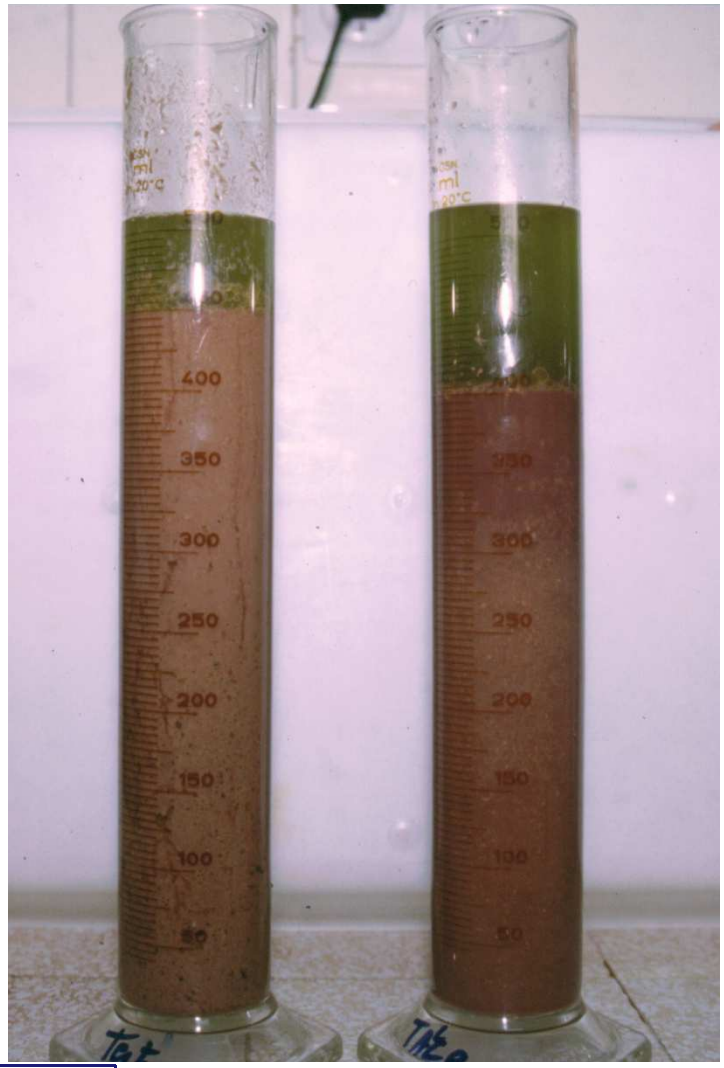
Washing

- Removing soil particles which can disturb separation and damage rotating parts
- Above a certain quantity the soil can affect the organoleptic properties of the oil
- Removing chemicals

Crushing

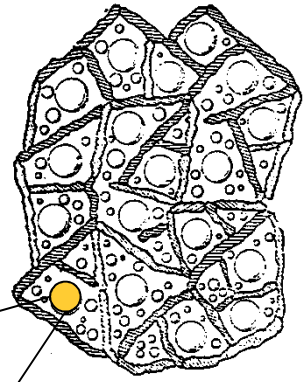
- Crush olives into paste in order to be ready for malaxing

Malaxing goals



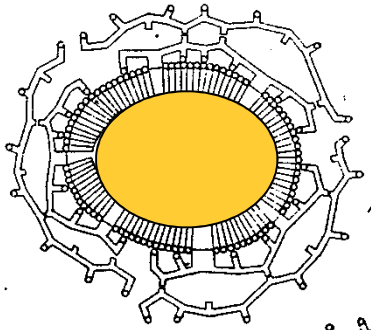
Brake Interaction oil – solids

(colloidal dispersion)



Brake Interaction oil – water

(emulsions)



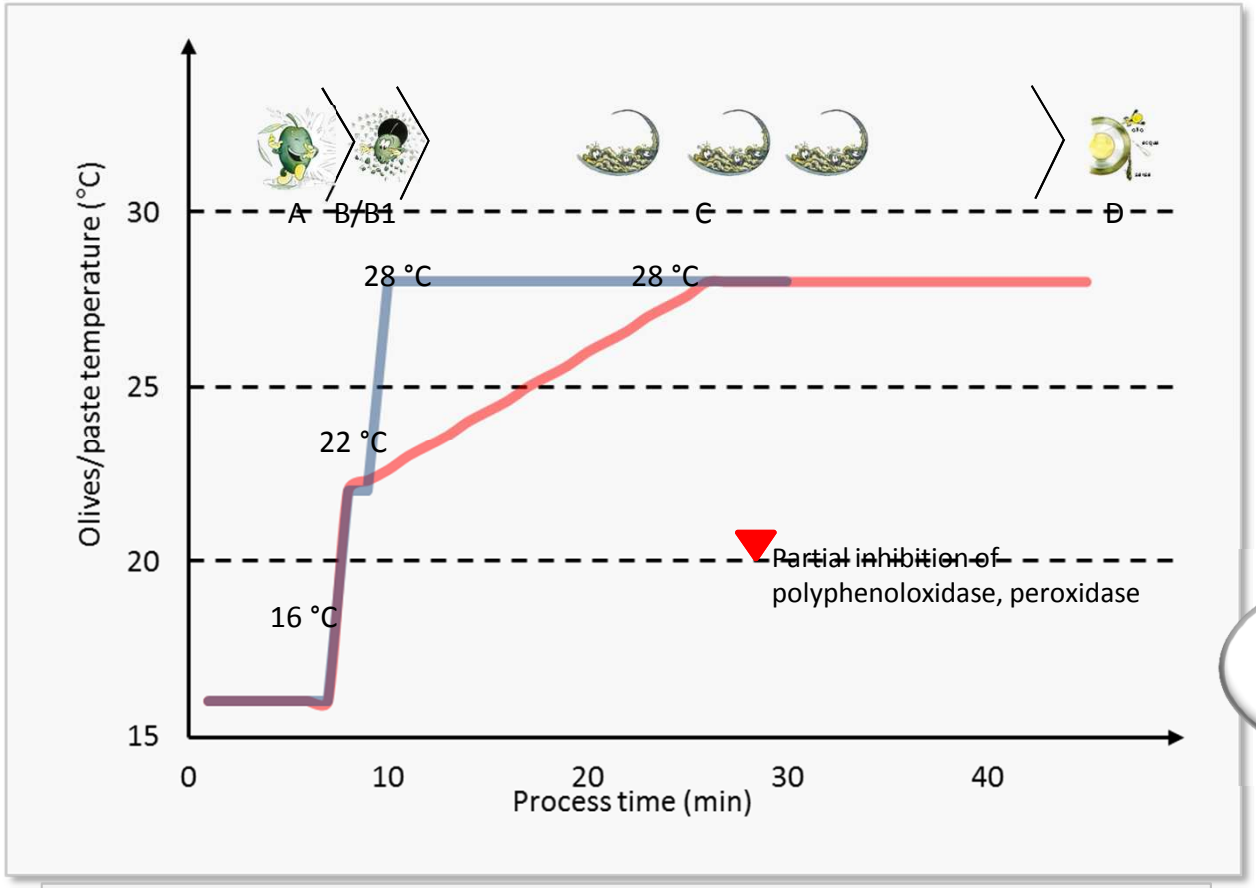
coalescence

Thermal Conditioning Module (TCM)

Increasing of oil quality and taste in terms of quantity of volatile compounds

Solution to make difference

- Improve process control
- Save energy
- Save production cost



Late harvest

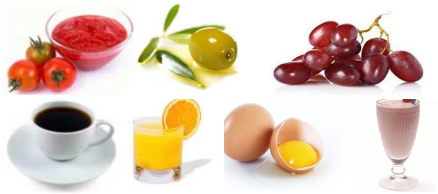
Heat the paste

Fast process

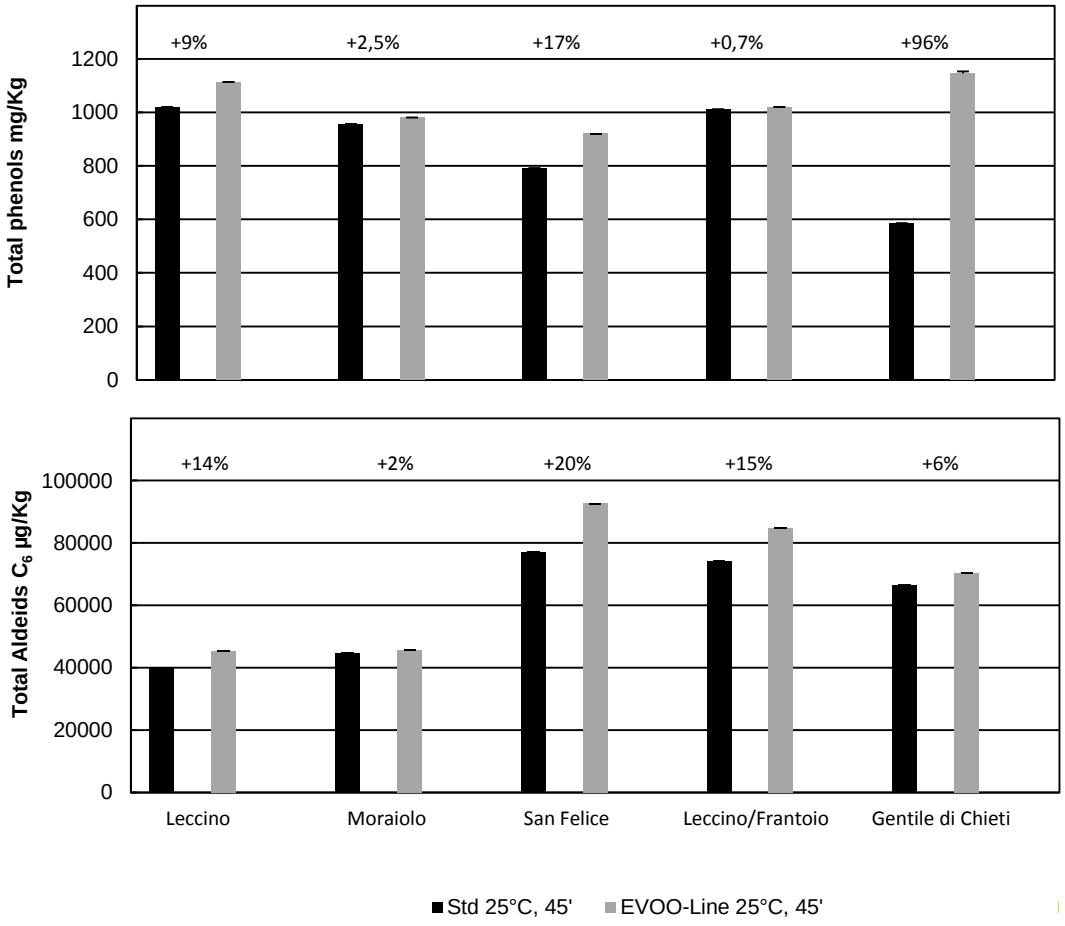
More phenols/volatile compounds

Example of trend of olive paste temperature during time and through extraction process steps. Comparison between traditional process (red) and innovative process with Alfa Laval Thermal Conditioning Module used for cooling (blue) .

Effect of paste conditioning on oil quality



Process Industry - FBO



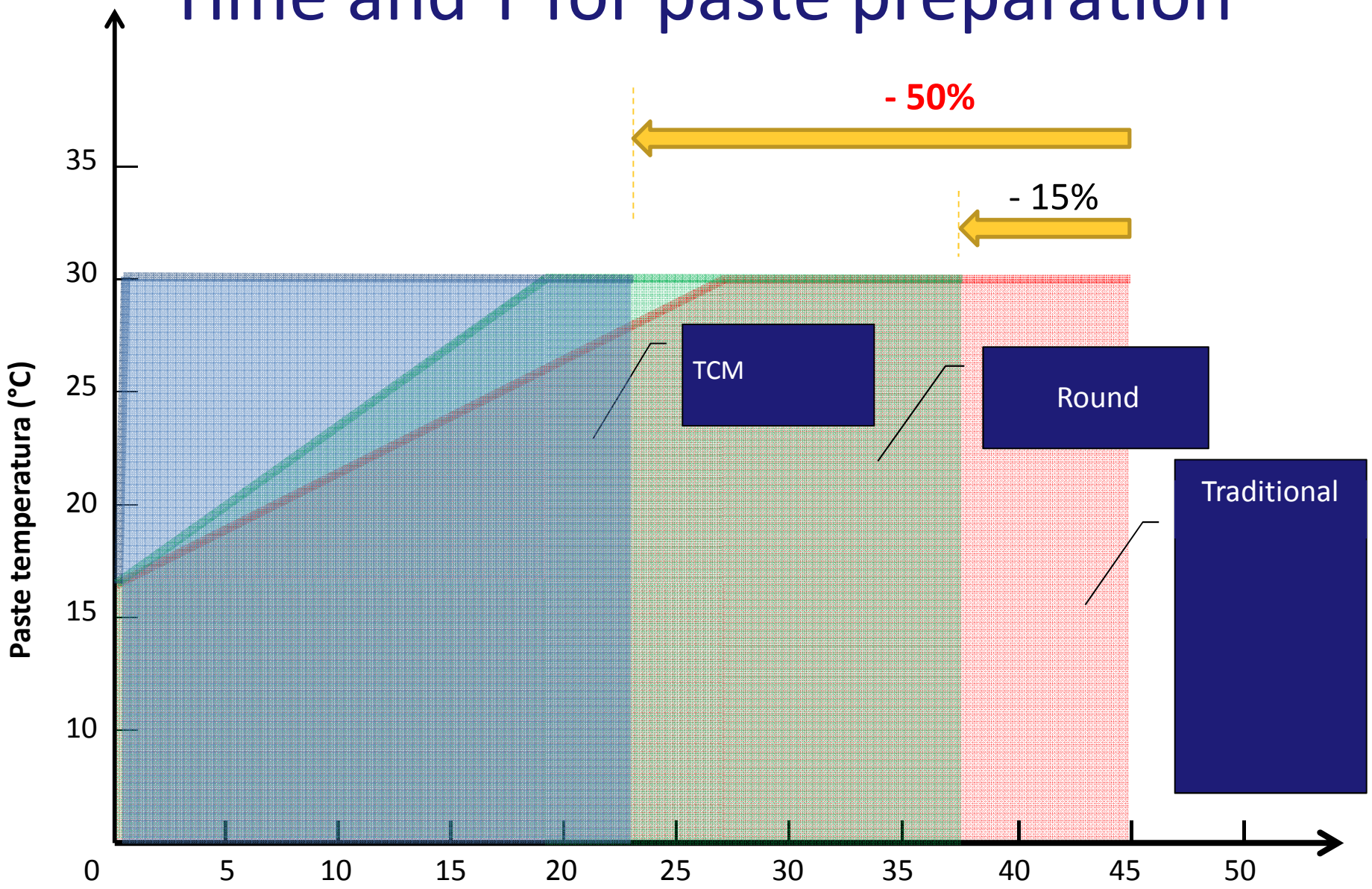
Servili et al., 2016

Up to 96% increase of phenol content

Up to 20% increase of aromatic compounds

No impact on yield

Time and T for paste preparation

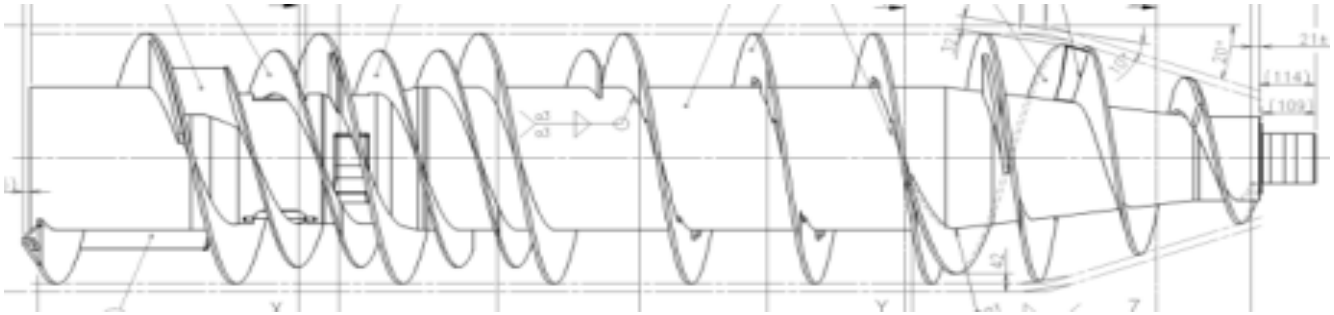


Pumping with hygiene

- Heavy Duty Construction
- Gentle acceleration
- Less Energy
- No stator maintenance
- Everything in Stainless Steel according to Food regulations

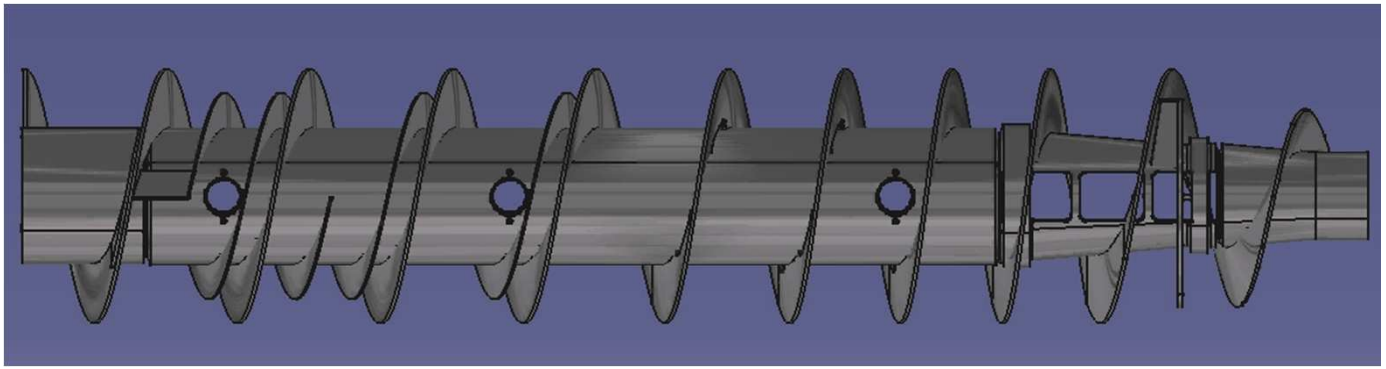
Unique design of our conveyors

- Axial flow along the conveyor body
- Better clarification and more stable process
- High differential speed



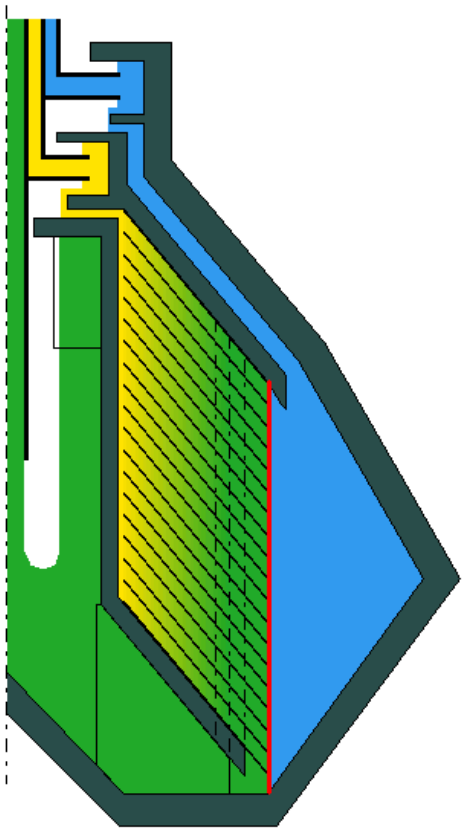
New 2-phase optimized conveyor

- New conveyor design developed for 2-phase market
- High capacity
- Good performance over a large feed range
- Low oil losses and a clean oil throughout full season
- Very good process performance: Between 1 and 2 % reduction in oil loss on dry basis (from 8 % loss to 6 %)
- Gentle oil treatment leading to high quality oil



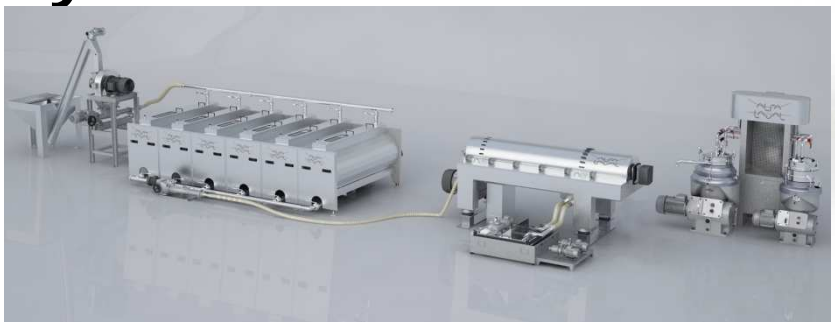
Final separation

- Final impurity in the olive oil < 0,1%
- Minimum waste of dilution water (10% of the oil flow)
- Absence of emulsion and easy cleaning



Process control

- Automatic charge and discharge
- Total process monitoring
- Traceability



Packaging

Filling speed	up to 200 c.p.h. (120 c.p.h. average value based in the product infeed pressure and the efficiency of the operator)
Filling accuracy	± 0,5% on the filled value
Filling range	3-20 liters; 200 liters (optional kit);
Material in contact with the product	Stainless steel Aisi 316L
Power requirements	220V 50 HZ – Consumption 1kW
Air (filtered and oil free)	8 Bar - Consumption 6 Nm3/h
Heigh	1550 mm
Width	1200 mm
Length	580 mm
Shipping weight of filler*	120 Kg

By-products treatment

7 Διαχείριση υγρών αποβλήτων (κατσίγαρος) με τις μονάδες BlueVap και AlfaFlash

Η μονάδα θερμικού διαχωρισμού BlueVap, χρησιμοποιείται για συνεχή επεξεργασία αποβλήτων έπειτα από την έκθλιψη τριών φάσεων. Μετατρέπει τα υγρά απόβλητα σε καθαρό νερό, κατάλληλο για διοχέτευση σε αποχετευτικές εγκαταστάσεις, και σε ξηρά κατάλοιπα που αναμιγνύονται με τον ελαιοπυρήνα (δείτε σελίδα 5). Αυτή η εύχρηστη μονάδα δεν έχει απαίτηση ατμού, ή ψυκτικού νερού κατά την λειτουργία της, και καλύπτει ανάγκες επεξεργασίας έως 1,000 ή 2,500 λίτρα/ώρα. Διατίθεται επίσης και η μονάδα AlfaFlash για μεγαλύτερες ανάγκες δυναμικότητας, καθώς και για επεξεργασία με ατμό, ή κάποια παρόμοια επεξεργασία.

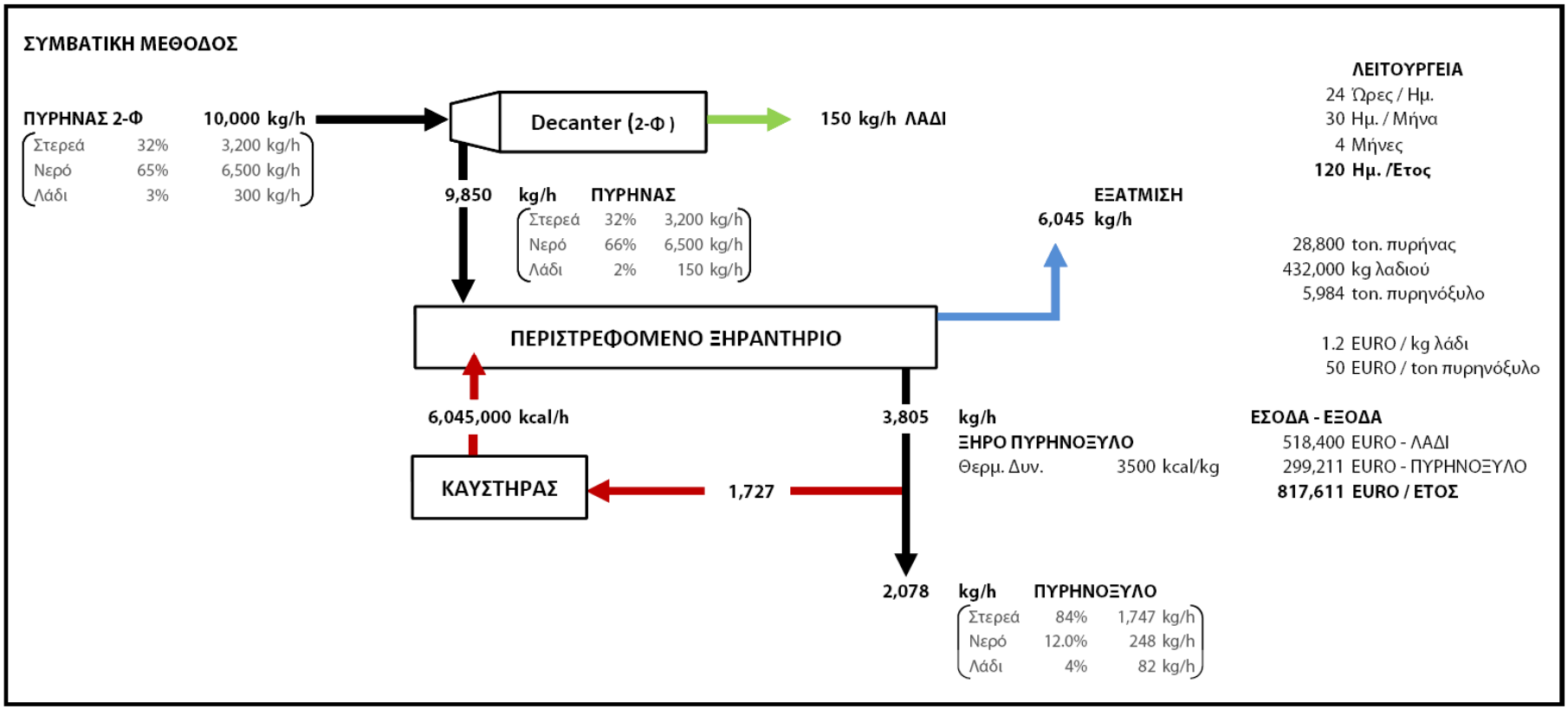
Olive Oil mill waste streams

- 2 – phase husk √
- 3 – phase husk √
- Black water √

Secondary extraction plant

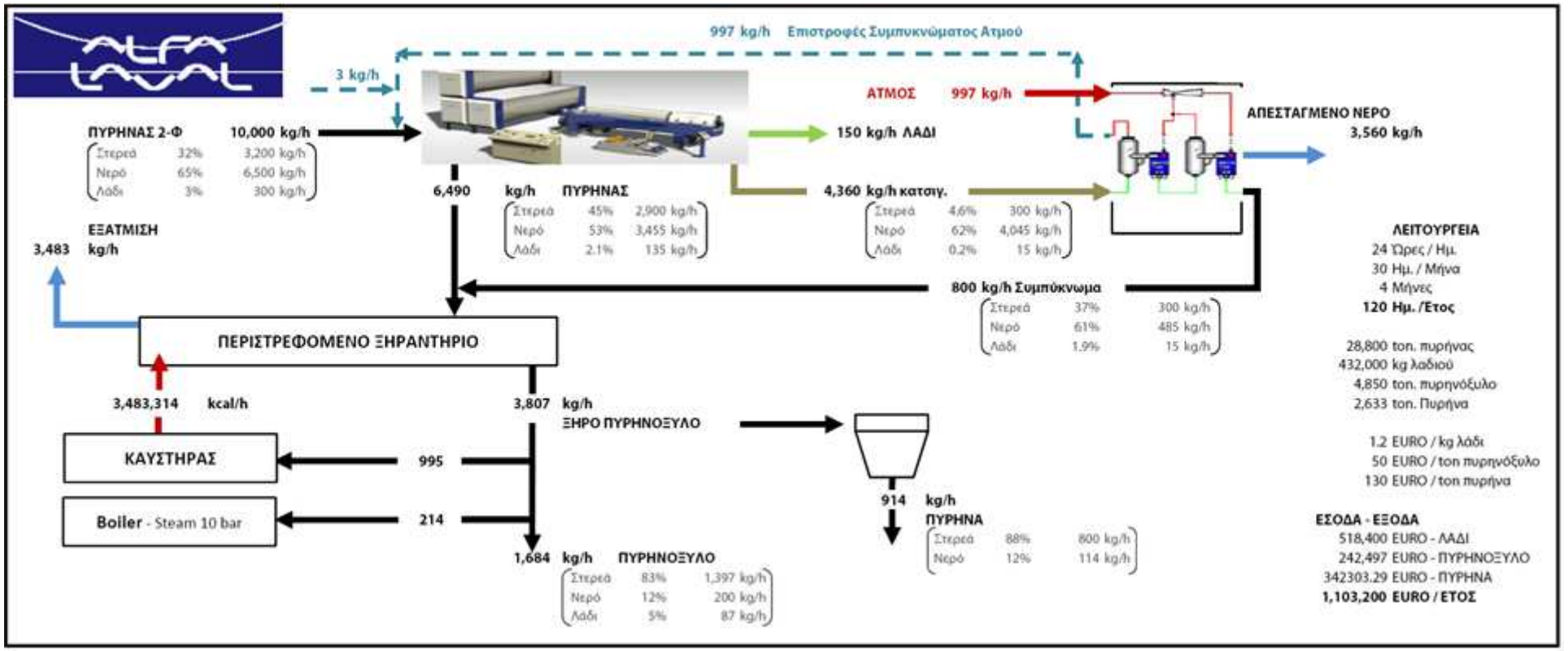
- Reception of Olive oil waste streams
- Design for 3 phase husk
- Difficult to handle environmentally

Conventional Method



- Hexane extraction problems - agglomerates
- Dryer with special design - caramelization
- High steam consumption

Alfa Laval solution



- Function with 2 and 3 phase husk
- Better procedure of the secondary extraction plant
- Dryer water reduction – Air pollution reduction
- Water production for irrigation
- Energy reduction

Secondary extraction Alfa Laval

- Treatment of wet husk 240 ton/day.
- Hust outcome of: 50-55%
- Oil Recovery: 45 - 50% of total

Recommended waste recovery process:

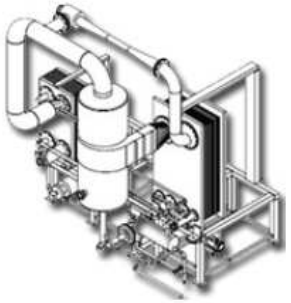
Two-phase process

65% - 70%
Moisture pomace

Storage pond, holding one season of pomace

Three-phase re-run

Black water



Evaporation

80% irrigation water → **Irrigation quality water** – i.e. "clean" water for irrigation or entry to local environment

20% concentrate → **A small quantity of concentrate to be properly disposed.** Only 10% of the total pomace produced during the first extraction

55% moisture pomace → **Dry pomace, to be composted or further dried.** To be cleanly burned for cogeneration or solvent extraction of the remaining oil

olive oil → **Olive oil to be refined as commercial olive oil**

Example of an existing plant

This facility collects the pomace of multiple large mills in the area. The pomace is stored in an open air pond, and re-processed year around.

The pomace is "re-malaxed" and "re-run" in a three-phase process with an Alfa Laval decanter

The black water is concentrated by an Alfa Laval "AlfaVap"

The pomace out of the three-phase process is further dried

And then burned for power cogeneration

Concentrate for disposal

Water

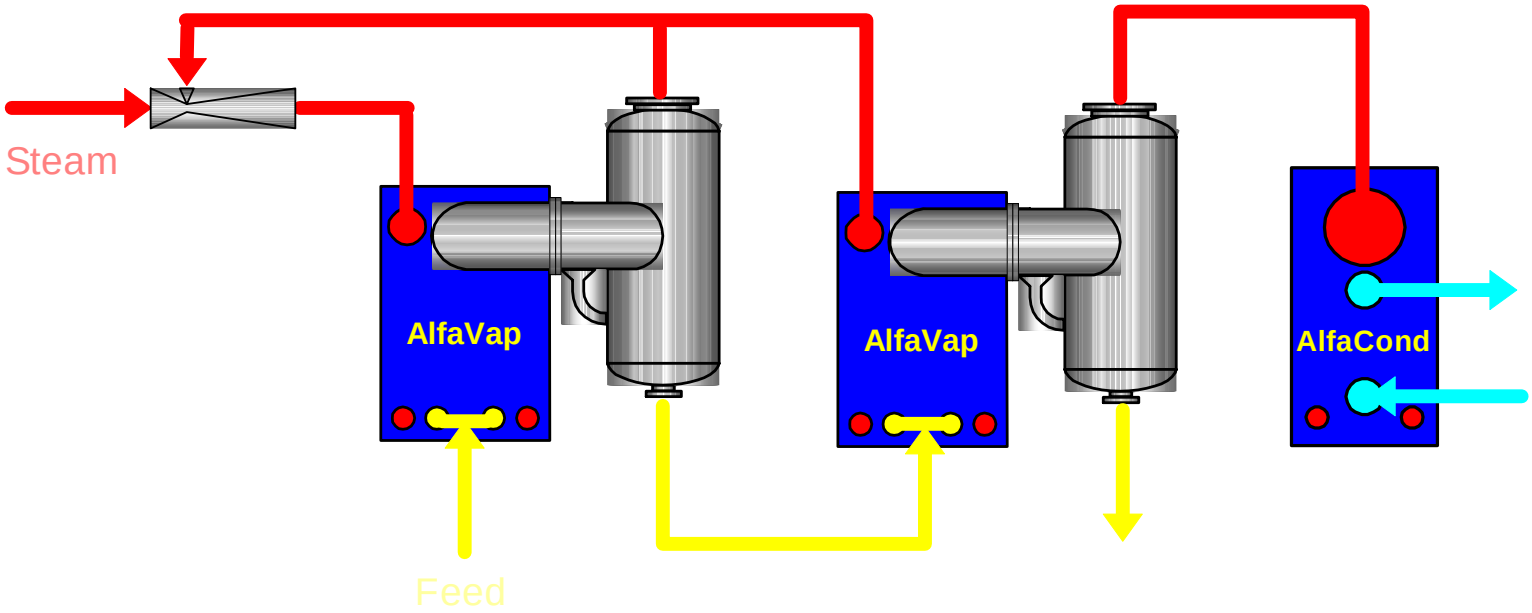
Power

Benefits

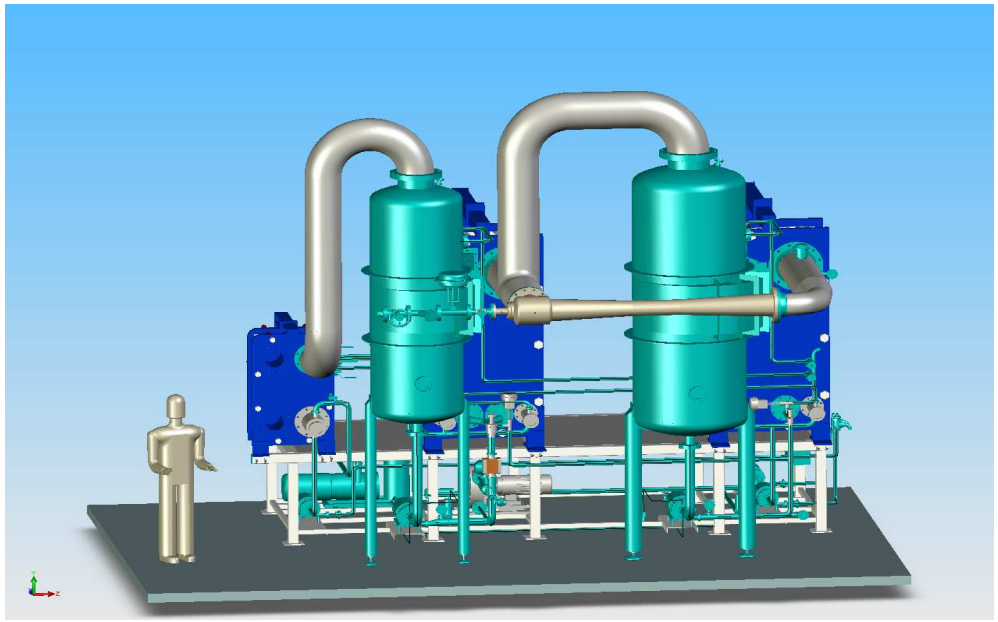
- Elimination of problems in extraction with hexane
- Lower emissions of dryer by half
- Lower energy consumption
- Small foot print
- Easy payback

Evaporation / Condensation of black water

AlfaVap with TVR 2 phase system

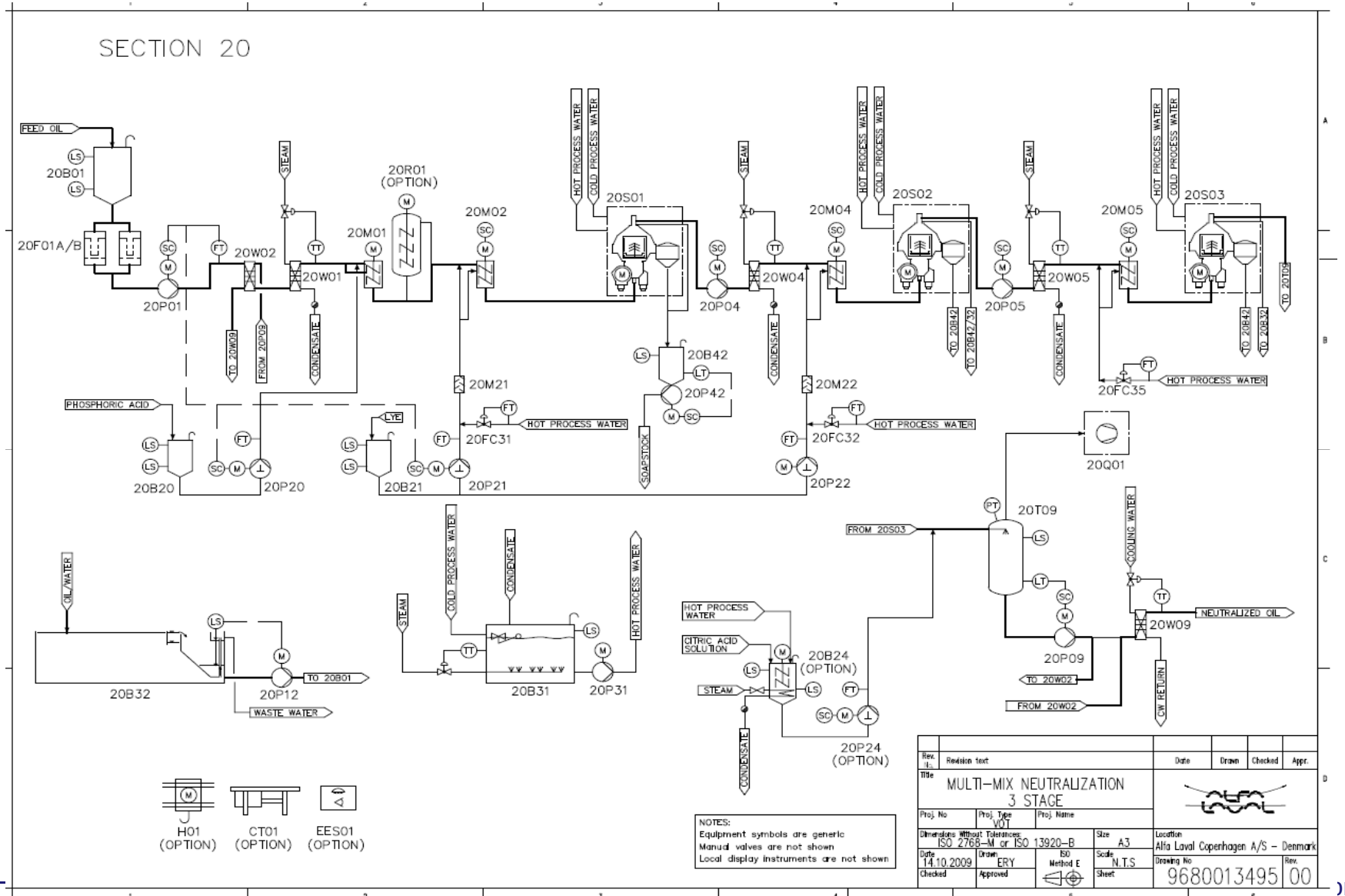


Evaporation / Condensation of black water



from left to right: Black water, clear water (condensate) and concentrate

Recovered oil refinery



Thank you!