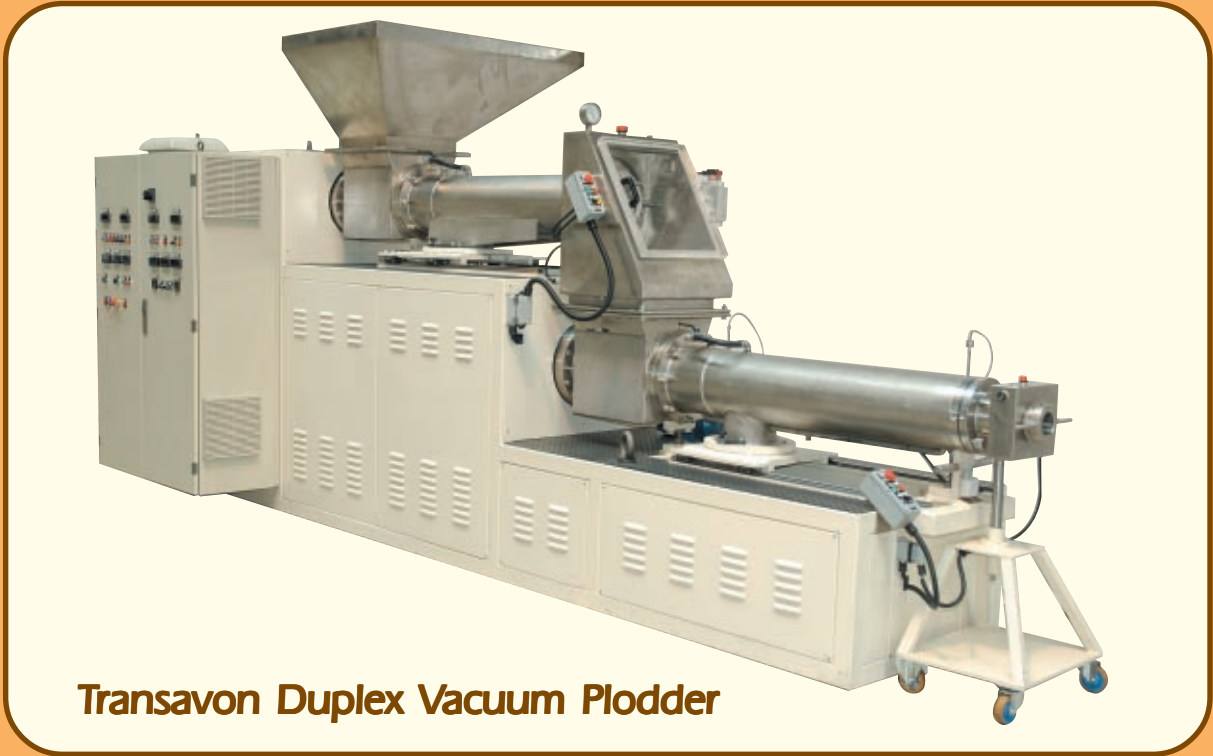




TRANSAVON PLODDERS

SOAP REFINING □ A NEW APPROACH



Transavon Duplex Vacuum Plodder



TRANSAVON PLODDERS

The first “mission” of the Transavon project has been to provide an equipment suitable to efficiently control the critical “process” of the translucent soap finishing.

The possible applications were:

1. Conversion of opaque soap noodles (pellets) into translucent soap.
2. Production of translucent extruded and stamped soap bars (tablets) using translucent noodles.

After successful operation of Transavon Plodders for translucent noodles and bars and extensive testing of various products the Transavon Plodders proved to be applicable for regular toilet soaps, soap/synthetic and synthetic products.

Plodders perform refining/homogenizing and compaction/extrusion functions to the soap. The refining capability of a plodder depends on the L/D ratio (length of the barrel L to screw diameter D), the processing pressure and the mesh size of the refining screens. Transavon Plodders have excellent refining capability compared with conventional refiner plodders.

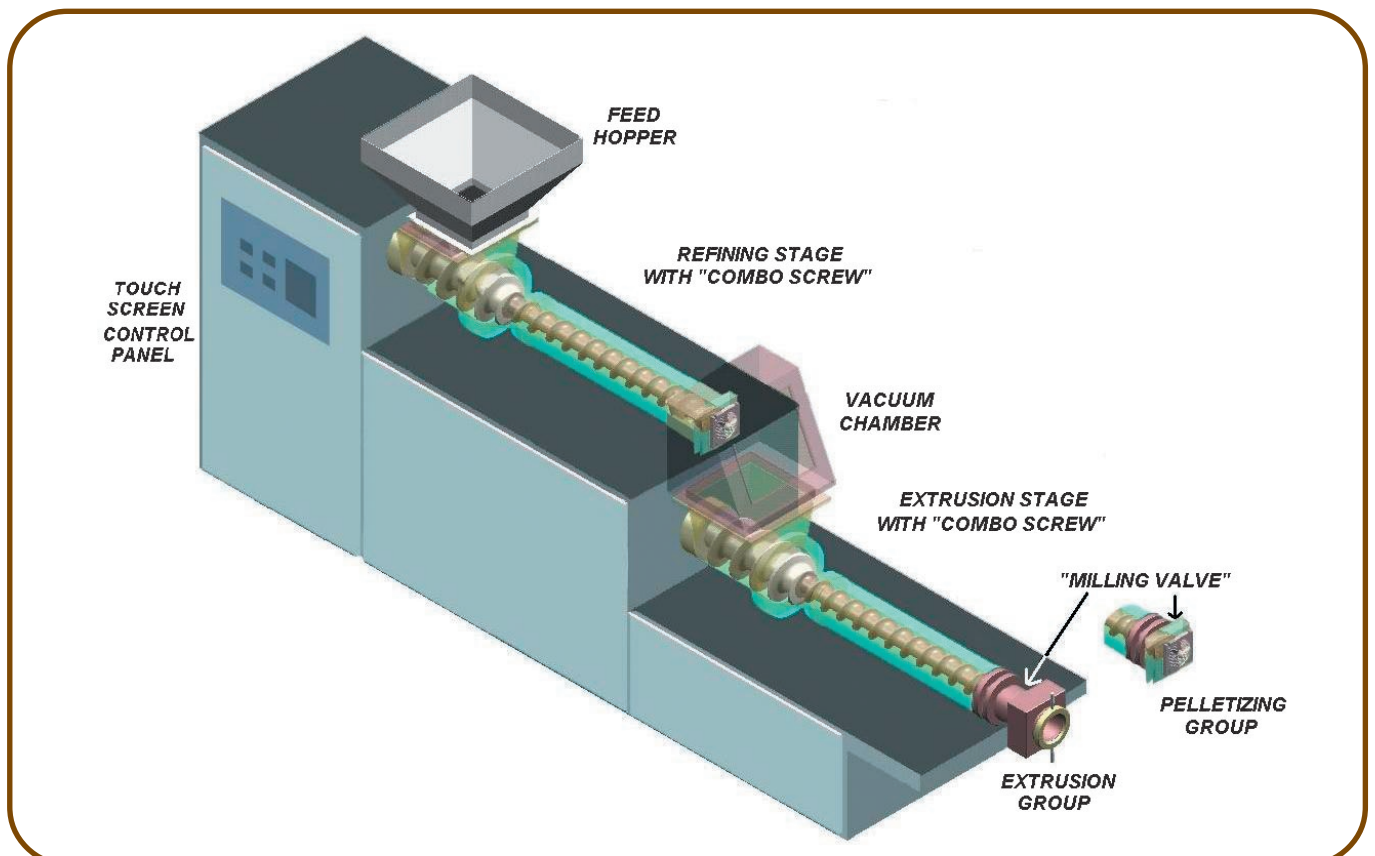
Each Transavon refining stage is equivalent to 1.5 of a conventional modern refiner.

Transavon plodders are offered in the same 3 main types as regular plodders, namely: *Simplex Refiner*, *Duplex Refiner*, *Duplex Vacuum Plodder*.

The Duplex versions are available with two Transavon stages or combinations of a conventional plodder stage and a Transavon stage.

A PC-based logic process software control optimizes the variables in real-time. All Transavon Plodders are equipped with Variable Frequency Drives for wide screw rpm variation, Soap Pressure and Temperature Gauges; Automatic Cooling Water Controllers (Turboflow) units are seldom used.

Two novel features make the Transavon a unique plodder: the “COMBO-SCREW” and the “MILLING VALVE”.



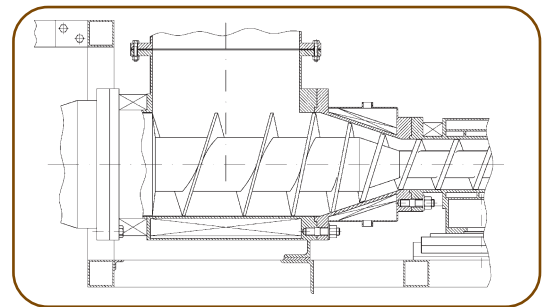
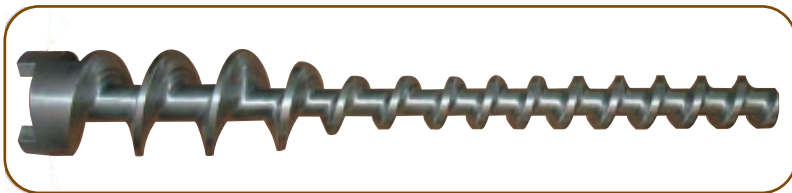
COMBO-SCREW

The *Combo-Screw* innovative design with two different diameters and an intermediate conical section optimizes the two main functions of plodder screws (worms):

1. Optimal soap infeed in the open section – This is obtained with a larger diameter short screw.
2. Maximum homogenization and compression in the closed section – This is achieved with a small diameter and a 9:1 L/D screw. This allows a constant and gradual increase of the soap pressure up to *100 bars* when required.

Other benefits of the *Combo-Screw* are:

- ❑ The soap quantity processed is rather small due to the relatively small screw diameter allowing quick reaction to the change of process parameters.
- ❑ The heat exchange between soap and cooling water is optimized and for some products the soap temperature during passage in the plodder barrel can even be decreased, a feature that is usually only obtained with the use of roll-mills.
- ❑ The high screw revolutions per minute (up to 50 rpm) gives to the soap a continuous shear effect and helps chemical and physical homogenization.
- ❑ Soap back-flow is drastically minimized.
- ❑ Screw cleaning is a simple operation thanks to the special “back extraction” system.



MILLING VALVE □ SOAP PRESSURE CONTROL DURING PRODUCTION

The *Milling Valve* is a unique feature of the Transavon Plodders. The device consists of two sliding slotted plates positioned downstream the screw. Adjustment to control the soap output can be made even during production. By controlling the soap passage, it is possible to adjust the soap processing pressure, thus the energy transferred to the soap by shear effect and the degree of refining.

Due to the special design of *Milling Valve*, when it is adjusted for a tight soap passage, the gap can be reduced down to 0.1 mm. The soap exits in very thin flakes. This milling effect eliminates or greatly reduces the dry specks (roughness, grit) present in some soaps.

The milled soap is then immediately re-compacted and it is ready to be pelletized or extruded depending by the downstream device: a drilled refining/pelletizing group or an extrusion cone.



NO MILLING
(Wide passage)



MILLING
(Tight passage)



TRANSAVON SOAP FINISHING LINES

Soap finishing is the transformation of soap noodles (pellets) into formulated stamped soap bars (tablets). The goal is to refine/homogenize and compact the product with optimum physical and chemical features.

Soap finishing consists of several working stages: pre-refining, mixing, refining and extrusion, stamping and packaging.

A line with less refining stages (i.e. one Simplex Refiner and one Duplex Vacuum Plodder) is indicated to produce a limited variety of soaps (i.e. lightly coloured toilet soaps).

Lines with more refining stages (additional Three Roll-Mill) can produce soaps with large amount of additives and, in certain controlled conditions, synthetic products and translucent soaps.

The Transavon family of plodders make it possible to use them in four types of combinations with minimum space requirement, minimum power and utility consumption.

Four Types of Transavon Finishing Lines

SPECIAL - Multi-Product Line with Pre-Refining

Standard Simplex Refiner + Mixer + Transavon Duplex Vacuum Plodder

TOTAL - Multi-Product Line without Pre-Refining

Mixer + Simplex Refiner + Transavon Duplex Vacuum Plodder

STANDARD – Standard Transavon Line

Mixer + Transavon Duplex Vacuum Plodder

ECO - Economical Transavon Line

Mixer + Simplex Refiner + Transavon Simplex Plodder



Transavon
Simplex Refiner



Screw Extraction System

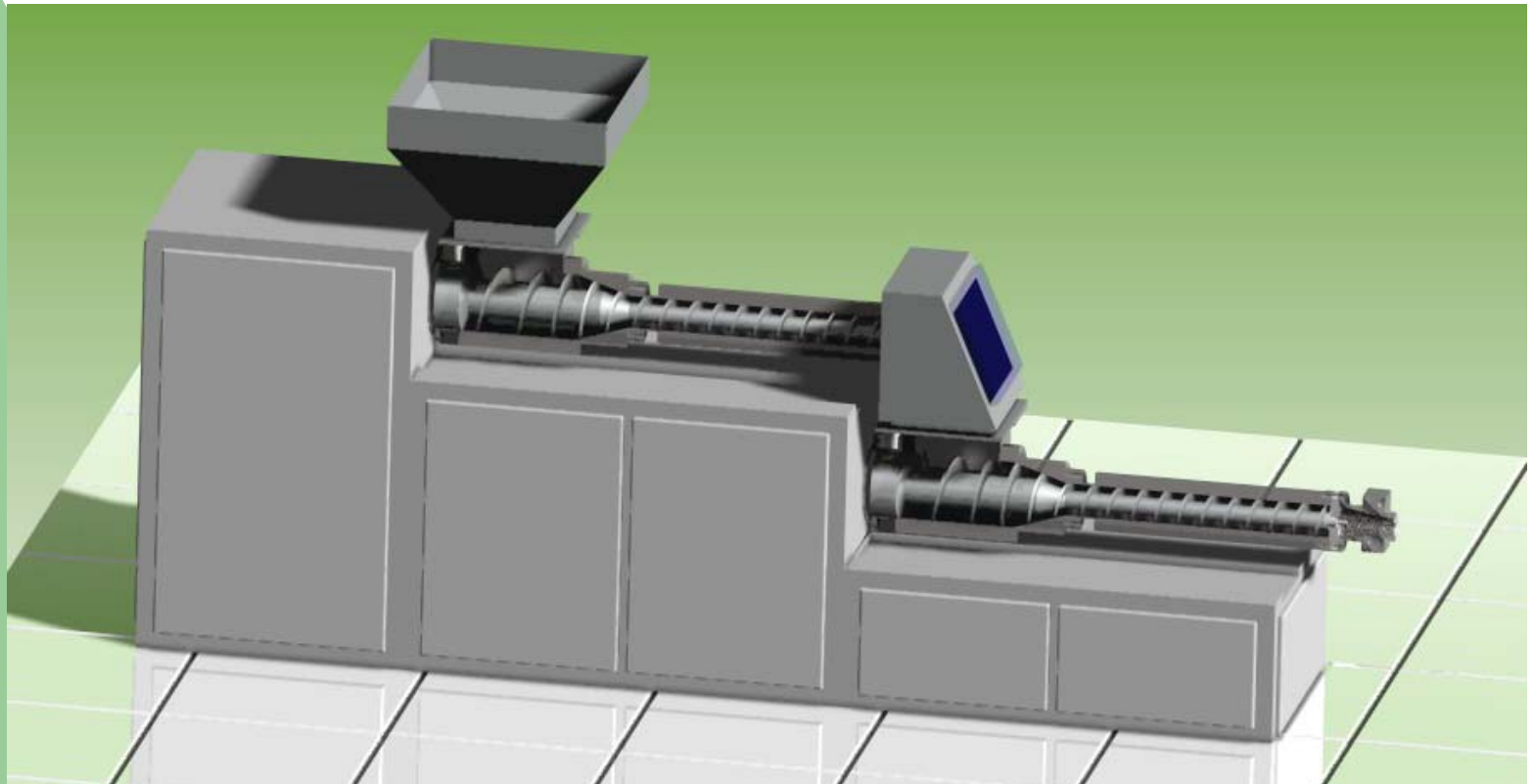


Standard Transavon Line

COMBO SCREW DIAMETER (mm)	L/D RATIO	OPAQUE SOAP PRODUCTION CAPACITY (Kg/h)	INSTALLED POWER PER STAGE (kW)
160 > 100	9:1	300	7,5
200 > 130	9:1	800	11 to 15
250 > 150	9:1	1500	22 to 30
300 > 180	9:1	2200	37
350 > 220	9:1	3000	45 to 55

>> TRANSAVON <<

**A NEW APPROACH TO
TOILET SOAP FINISHING**



TOILET SOAP FINISHING LINES

AMALGAMATION

REFINING

EXTRUSION

CUTTING

STAMPING

Soap finishing is a mechanical cold *process* which transforms soap noodles (pellets) into formulated stamped soap bars (tablets). The final product should be refined, homogeneous and compact. *Refining* is the core step of soap finishing.

CONVENTIONAL EQUIPMENT FOR REFINING

- ▶ Double-Arm Sigma Mixer -> Amalgamation + Refining
- ▶ Simplex/Duplex Refiner -> Refining
- ▶ Roll Mill -> Refining (Milling)
- ▶ Duplex Vacuum Plodder -> Refining + Extrusion

There is a variety of combinations to form a soap finishing line thanks to the use of different optional equipment and/or different combination of the same equipment.

Basic lines, specialized lines and all-purpose lines can be designed depending on the specifications of the soap(s) to be produced.

SOAP REFINING

- ▶ REFINING is a combination of intimate homogenization and filtering of the soap.
- ▶ REFINING STAGE (RS) - It is defined to be a processing stage giving one unit of refining, i.e. one Simplex Refiner.
- ▶ The product must be amalgamated (mixed) before being refined.
- ▶ Reduction of dry specks (granulometry) or complete elimination is the main task of the refining stage.
- ▶ Even if physically different, the refining performed by a Refiner (by fiber compression) and by a Roll-Mill (by fiber stretching) are described by number of RS

LIMITATION OF PRESENT DEFINITION OF "REFINING STAGE"

RS as commonly defined is not a precise parameter for the following reasons:

- ▶ Different Simplex Refiners have different features (L/D ratio, installed kW, etc.)
- ▶ Mechanical conditions and maintenance determine sensible differences in the performances (i.e. a worn-out screw reduces the refining)
- ▶ The use of screens with different mesh sizes gives different refining results.
- ▶ In Roll-Mills, different gaps between rolls determine differences in the refining action.

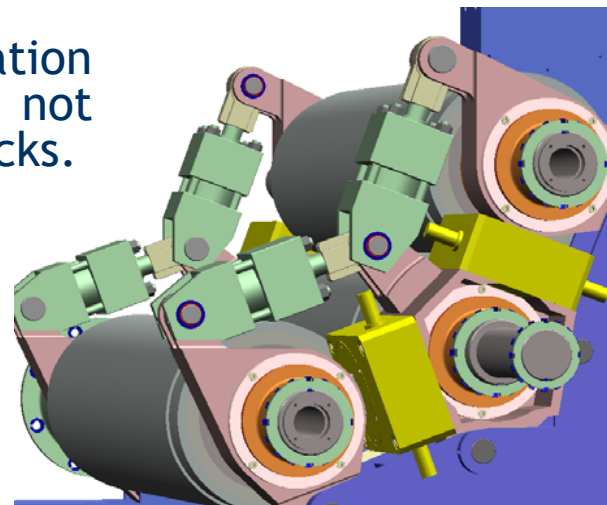
SOAP MILLING

MILLING GIVES PLASTICITY TO SOAP thanks to the mechanical actions given to the soap fibers:

- ▶ **STRETCHING.** The different speeds of the rolls make the fibers slide with shear effect.
- ▶ **LAMINATION** to thin flakes with elimination or reduction of granulometry of any not homogenized ingredient or any dry specks.

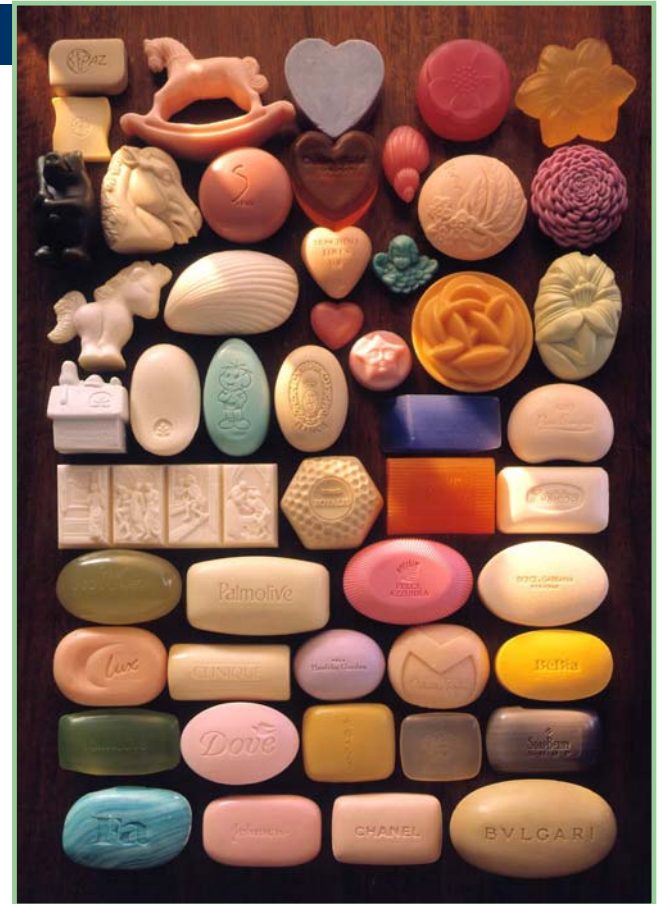
Roll-Mills

- ▶ need more maintenance
- ▶ produce soap dust
- ▶ have reduced refining when old



SOAP VARIETIES

- ▶ “AGED” NOODLES
- ▶ FULLY VEGETABLE SOAPS
- ▶ “SWING” SOAP
- ▶ TRANSLUCENT
- ▶ SYNTHETIC & COMBO
- ▶ HIGHLY ADDITIVATED



>> **TRANSAVON** <<

SOAP REFINING – A NEW APPROACH

First mission of the Transavon project: efficient *process* control for translucent soap finishing:

1. Conversion of opaque soap noodles into translucent soap.
2. Production of translucent soap bars using translucent noodles.

After the success in translucent soap applications and extensive testing of various products, the Transavon Pladders proved to be applicable for regular toilet soaps, synthetic and “combo” products.



INITIAL PROJECT REQUIREMENT: MORE PROCESS CONTROL

Soap refining is a process. The more the product is difficult to process, the more important is the fine tuning of the process parameters, specially soap pressure and temperature.

To optimize the process of “transparentization” of opaque noodles (the initial goal for Transavon), we focused on the following characteristics:

1. TO ALLOW HIGH SOAP PROCESSING PRESSURES
2. TO ALLOW IN-LINE SOAP PRESSURE ADJUSTMENT
3. TO INCREASE REFINING CAPABILITY
4. TO INCREASE SOAP HOMOGENIZATION
5. TO ALLOW POWERFUL SOAP TEMPERATURE CONTROL
6. TO ALLOW FINE SOAP TEMPERATURE CONTROL

TRANSAVON SIMPLEX REFINER

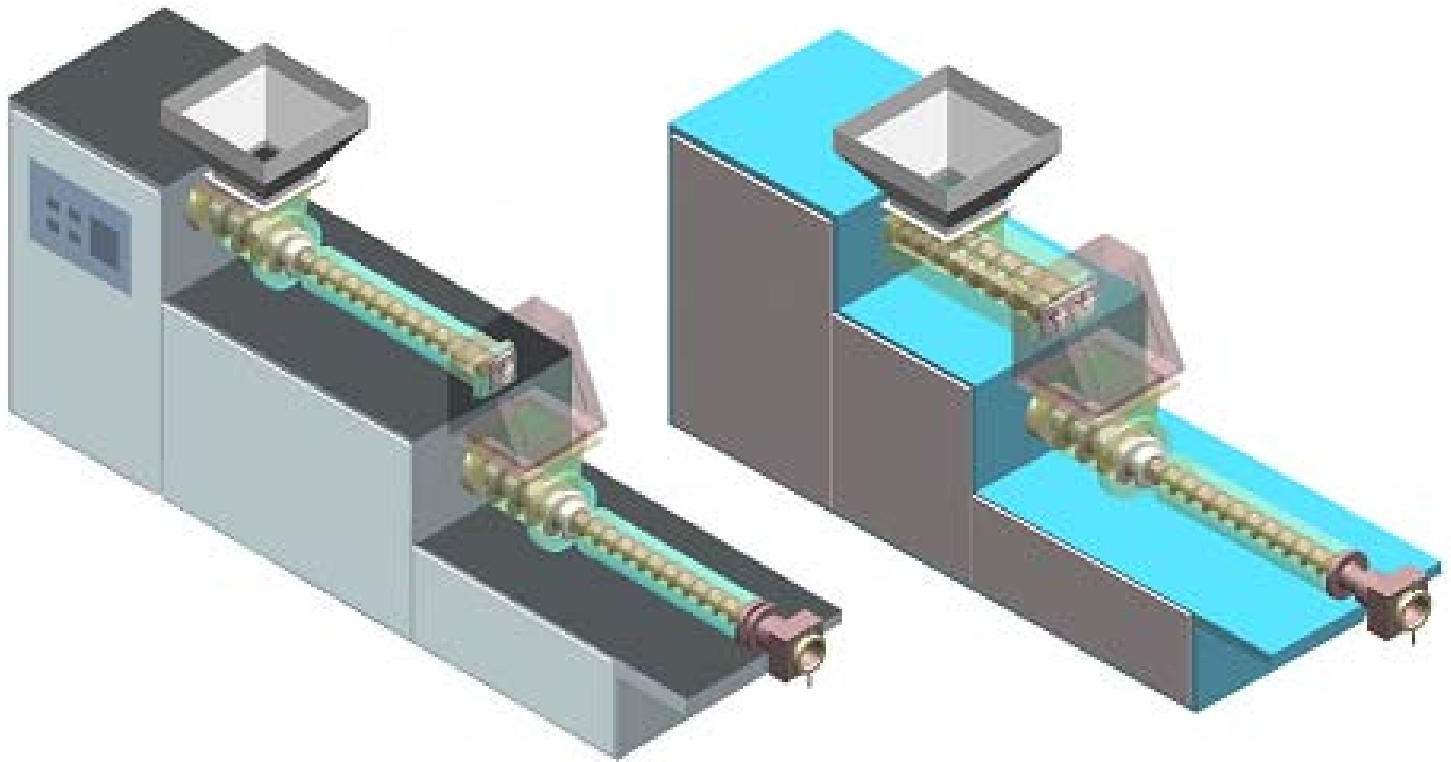


TRANSAVON DUPLEX VACUUM PLODDER



TRANSAVON DUPLEX VACUUM PLODDERS

OPTIONAL COMBINATIONS



TRANSAVON SPECIAL DESIGN FEATURES

1. **COMBO-SCREW DESIGN**
2. **MILLING VALVE**
3. **SOAP TEMPERATURE AND PRESSURE GAUGES**
4. **AUTOMATIC COOLING WATER CONTROLLERS**
5. **FREQUENCY DRIVE MOTORS**

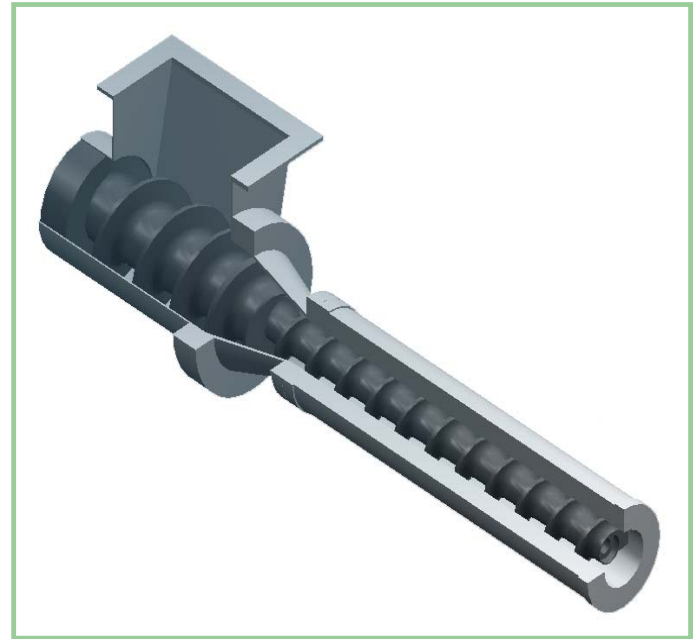


AUTOMATIC COOLING WATER CONTROLLERS

COMBO-SCREW

The novel “combo-screw” design with two different diameters optimizes the two main functions of a plodder screw:

1. The large diameter infeed section assures an optimal soap infeed.
2. Small diameter and long compressing section assures maximum homogenization and compression.





COMBO-SCREW: MANY SPIRALS FOR HIGH PRESSURES

MORE SPIRALS IN THE SCREW



MORE SOAP PRESSURE

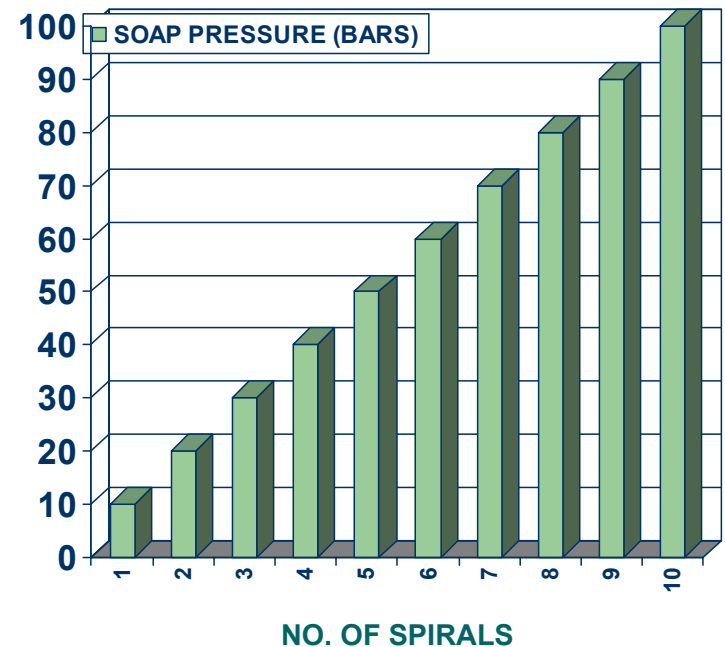


FINER SCREENS



MORE SOAP REFINING

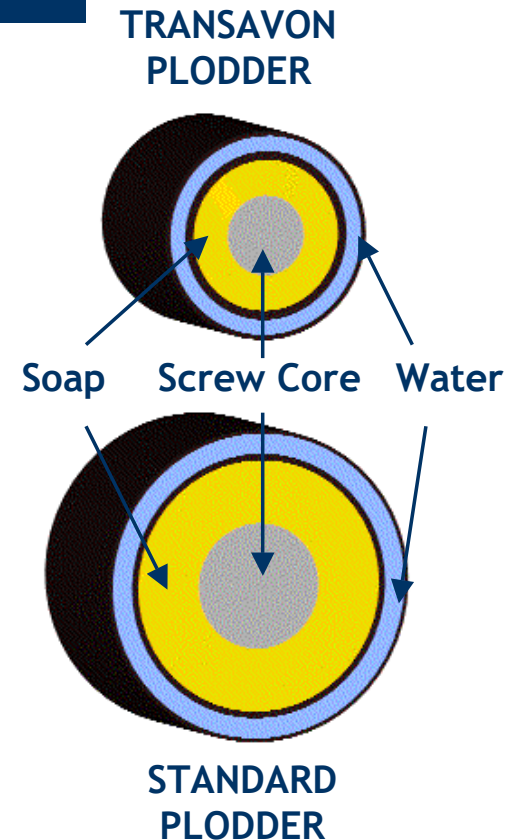
The SPIRAL NUMBER is more important than the compression ratio L/D since it takes into consideration also the screw design.





COMBO-SCREW - LONG & NARROW BARREL FOR BEST HEAT EXCHANGE

- ▶ Dissipation of generated heat in the barrel is a critical issue.
- ▶ Heat Exchange Efficiency = $\frac{\text{Barrel Internal Surface}}{\text{Enclosed Soap Volume}}$
- ▶ *Calculated TRANSAVON efficiency ratio is 70% to 80% higher than a conventional plodder.*
- ▶ Soap temperature can be decreased in a Transavon stage
- ▶ Minimum soap thickness -> minimum temperature gradient.





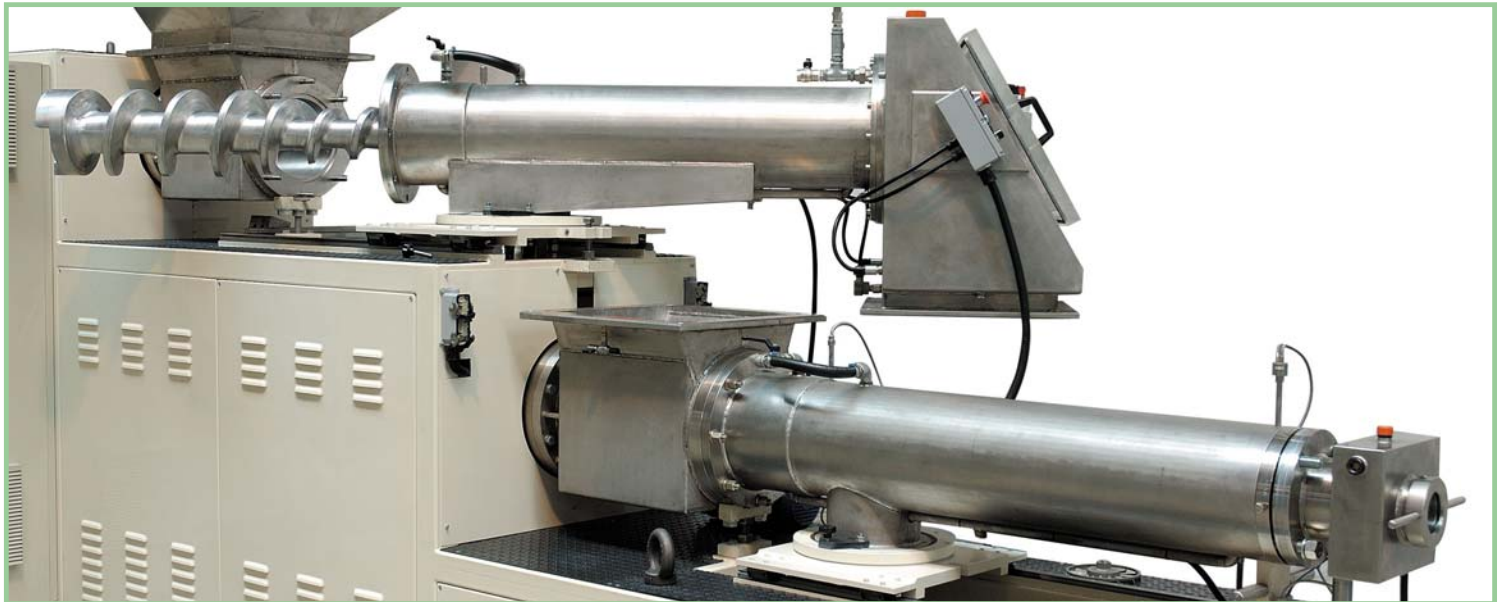
COMBO-SCREW: OTHER SPECIAL FEATURES

- ▶ SMALL SOAP QUANTITY IN THE BARREL:
Quick process and formula adjustments,
quick start-ups and shut-downs.
- ▶ BARREL WALL OF SMALL THICKNESS:
Positive heat transfer.
- ▶ HIGH SCREW SPEED:
More shear effect, more homogenization.
- ▶ WIDE SCREW SPEED RANGE:
Quick soap temperature control.

COMBO-SCREW: BACK SCREW EXTRACTION



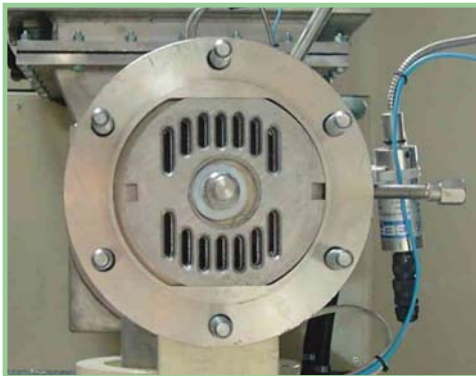
The combo-screws must be extracted from the back. Sliding barrels allow quick operations.



SOAP MILLING VALVE

This is a unique feature of the Transavon. The device consists of two sliding slotted plates positioned down-stream of the screw. Adjustment to control the soap output can be made even during production.

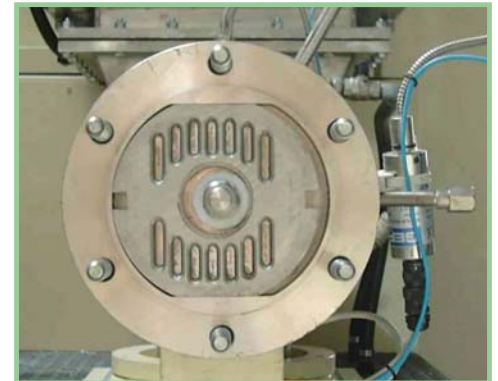
Soap is then immediately re-compacted and is ready to be pelletized with a special drilled plate or extruded with a cone.



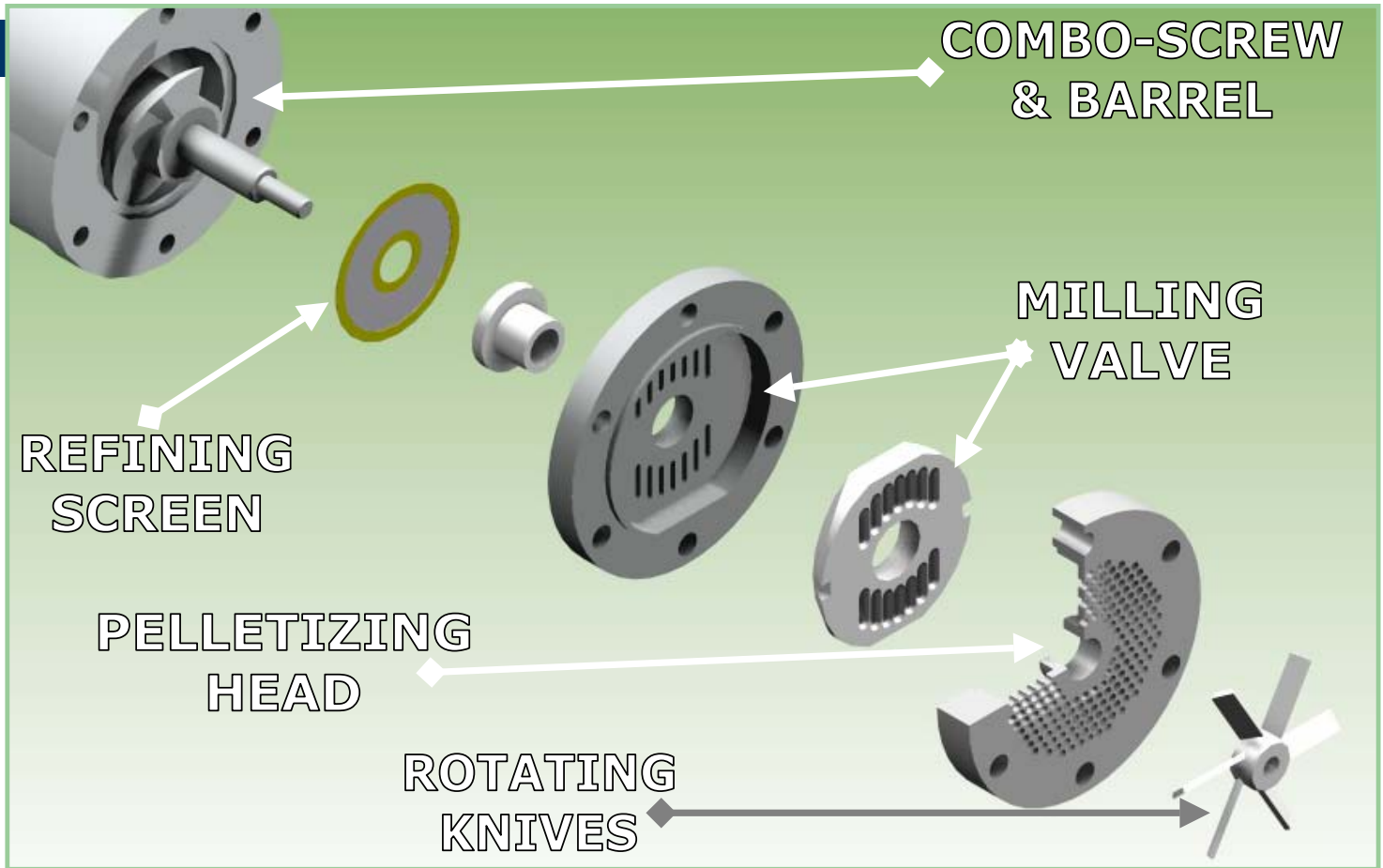
NO MILLING
Wide Passage

INTERNAL VIEWS WITH
OPEN MACHINE

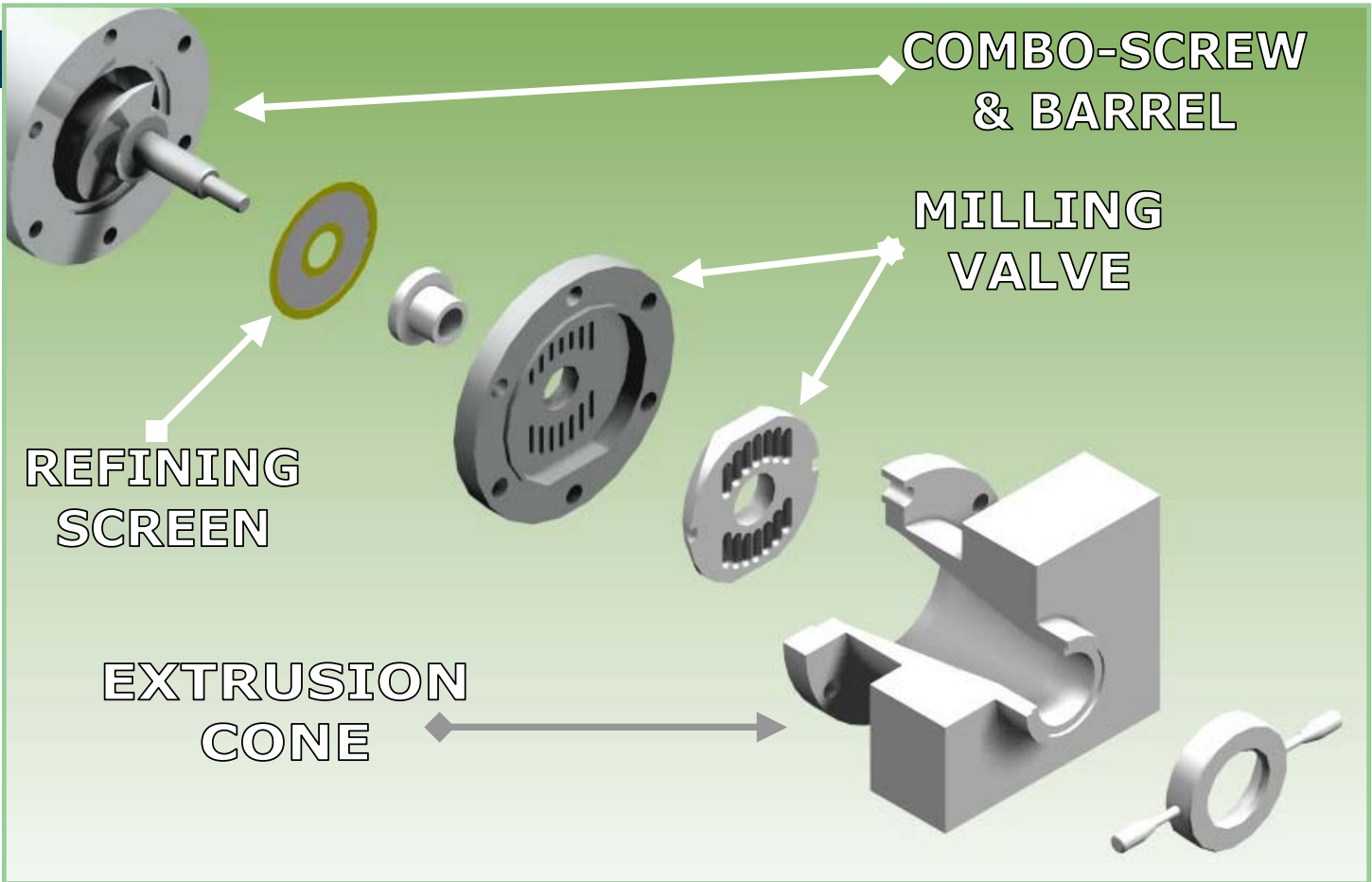
MILLING
Narrow Passage



TRANSAVON REFINING + MILLING



TRANSAVON REFINING + MILLING + EXTRUSION

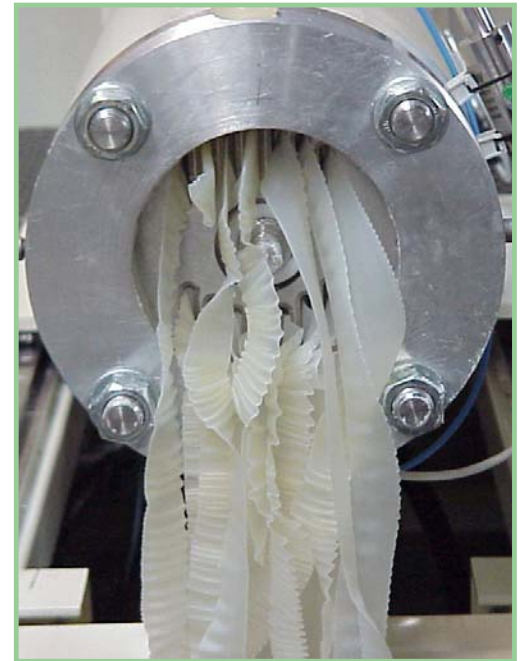


MILLING VALVE ON-LINE SOAP PRESSURE CONTROL

By controlling the soap passage the soap processing pressure is adjusted.

ON-LINE PRESSURE CONTROL MEANS:

- ▶ Control of the energy transferred to the soap by shear effect.
- ▶ Control of the refining grade given to the soap.
- ▶ Control of the soap temperature.



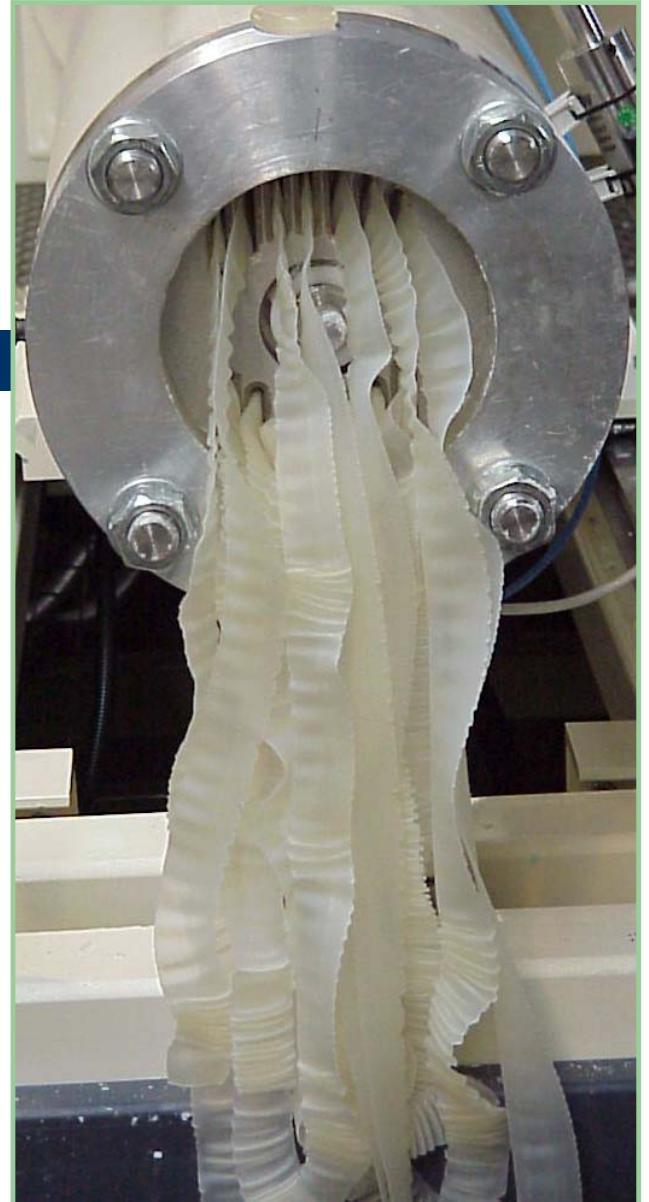
Test production without cone or pelletizing head

MILLING VALVE MILLING EFFECT

Test done without extrusion cone or pelletizing head.

The soap passage is set to 0.1 mm and thin soap flakes are produced.

This milling effect eliminates or drastically reduces dry specks (grit).



MILLING VALVE ENERGY SAVER

EXAMPLE:

PRODUCTION OF 1,000 KG/H

GAP (mm)	SOAP PRESSURE (bars)	ABSORBED ENERGY kW
0.1	100	20
0.5	70	16
2.0	45	13
10	20	10

Each soap formula has an optimal amount of refining to receive.

With the MILLING-VALVE you can immediately adjust the required energy and save the rest.

TRANSAVON OPERATIONAL OPTIONS

Using a Duplex Vacuum Transavon, day by day, production by production, formula by formula, the operator can choose the following operational modes:

1. UPER STAGE

- ▶ "RM": Refining + Milling
- ▶ "R": Refining

2. FINAL STAGE

- ▶ "RME": Refining + Milling + Extrusion
- ▶ "ME": Milling + Extrusion
- ▶ "E": Extrusion

COMPARATIVE TABLE

PLODDER TYPE	CONVENTIONAL PLODDER	TRANSAVON PLODDER
L/D Ratio	3:1 to 5:1	7:1 to 9:1
Soap Processing Pressure	Up to 30 bars	Up to 100 bars
Refining Screen	From 30 to 50 Mesh	From 50 to 60 Mesh
Heat Exchange	Soap Temperature increases	Soap Temperature can decrease
In-line Adjustable Pressure and Refining	No	Yes
Back-flow	It increases with the pressure	Minimum
Soap Quantity in the Barrel (i.e. production of 1,500 kg/h)	39 Kg	12 Kg
Screw Speed	About 15 rpm	Up to 50 rpm

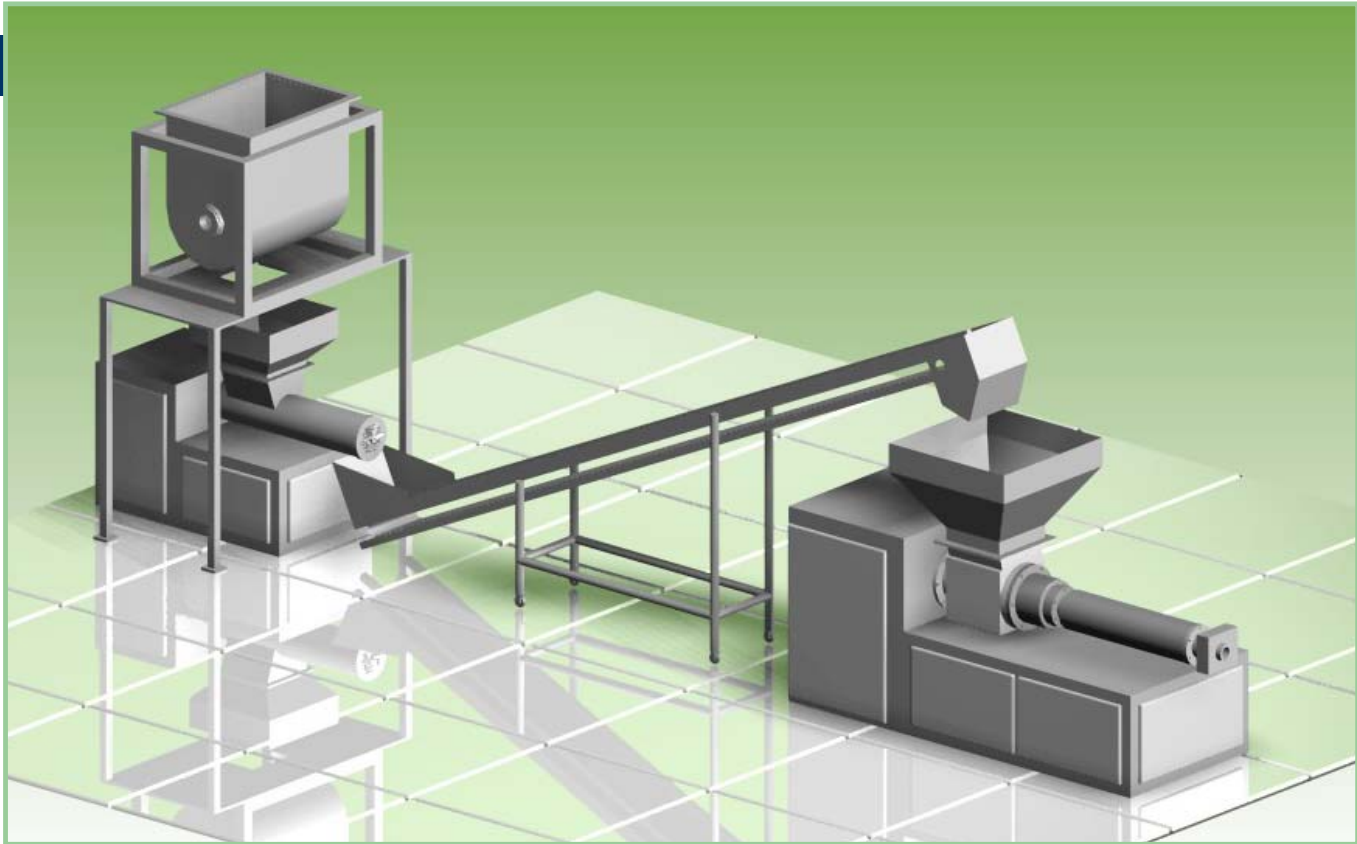
TRANSAVON SOAP FINISHING LINES

In principle different soap products require different finishing lines, a line with less refining stages is indicated for limited variety of soaps, lines with more refining stages can produce “difficult” products.

The Transavon family of plodders make possible *to minimize the space requirements and power consumption* for each application.

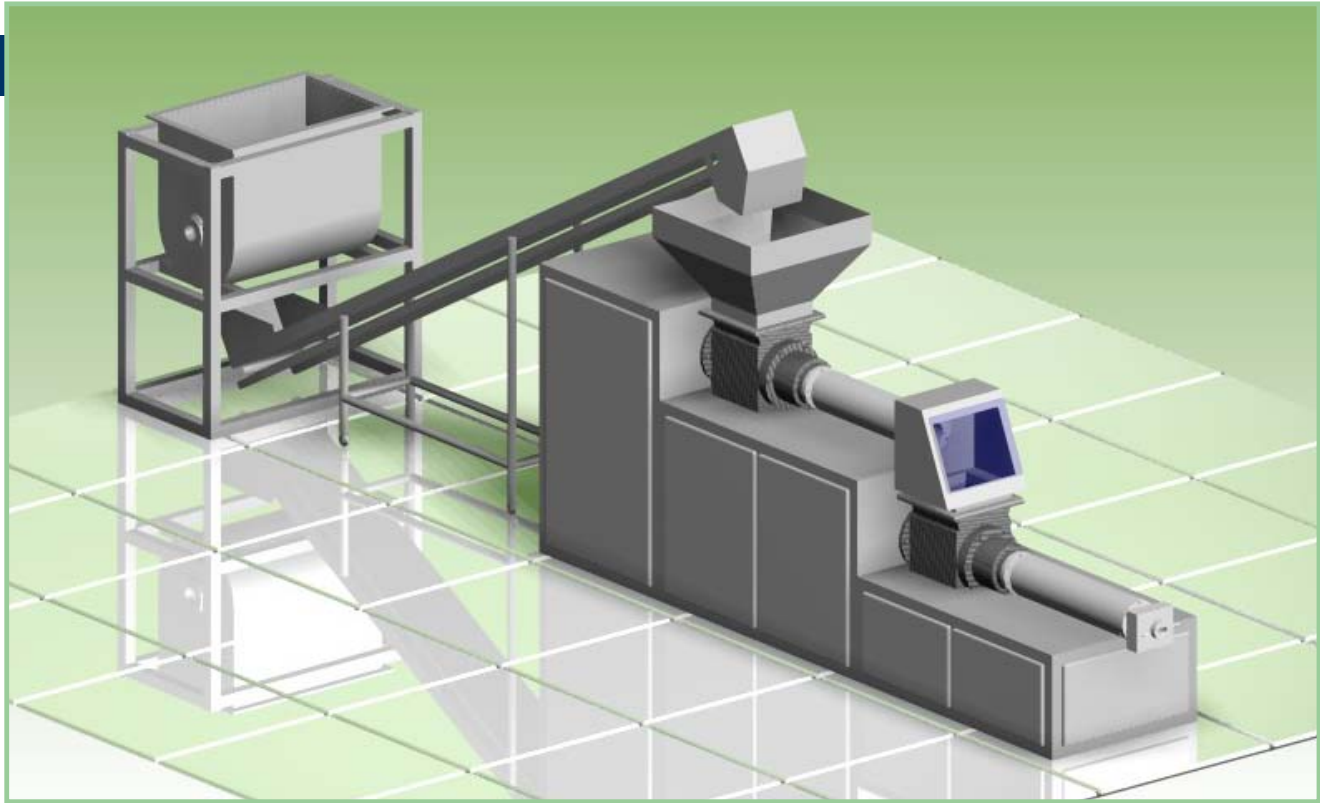
We offer four combinations.

"ECO" TRANSVON LINE



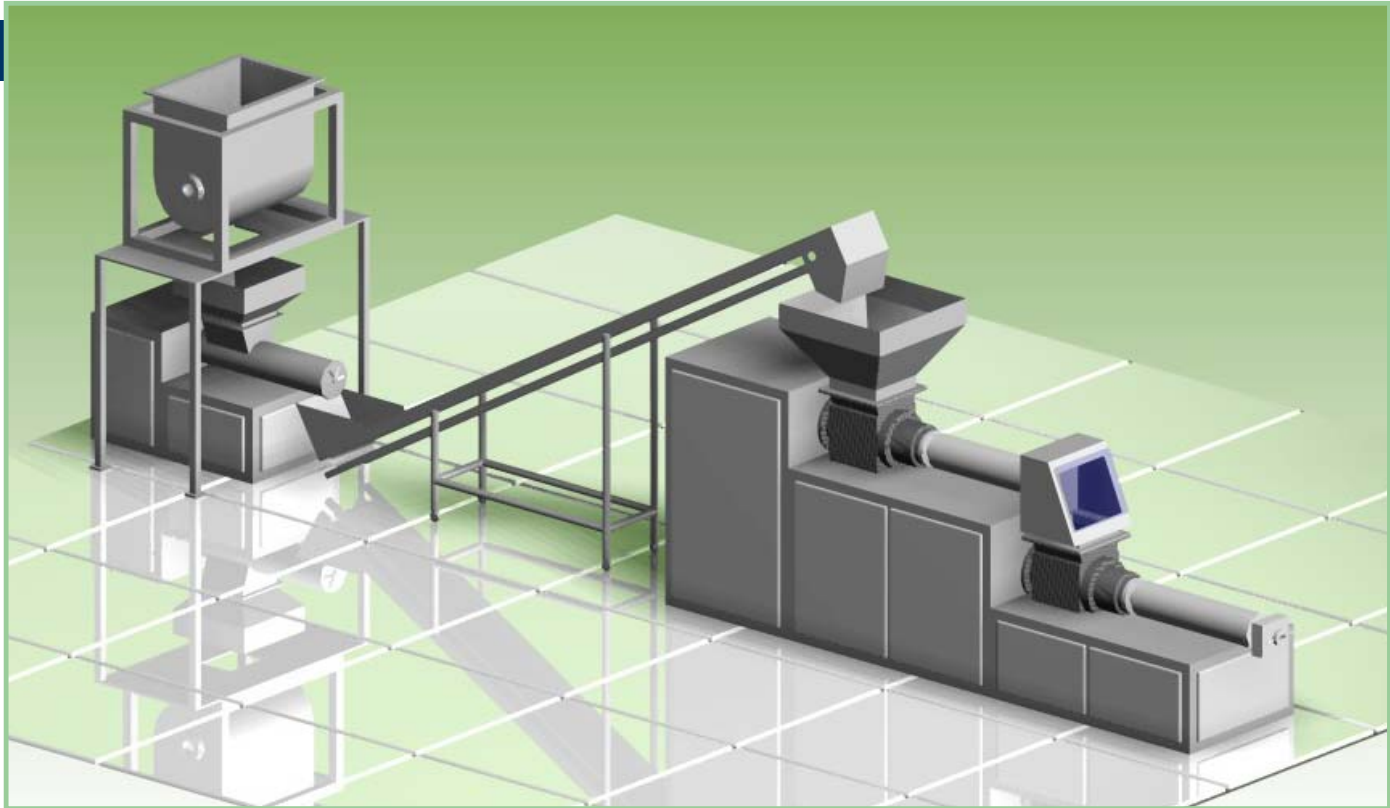
MIXER + CONVENTIONAL SIMPLEX + SIMPLEX TRANSVON

***"STANDARD"* TRANSAVON LINE**



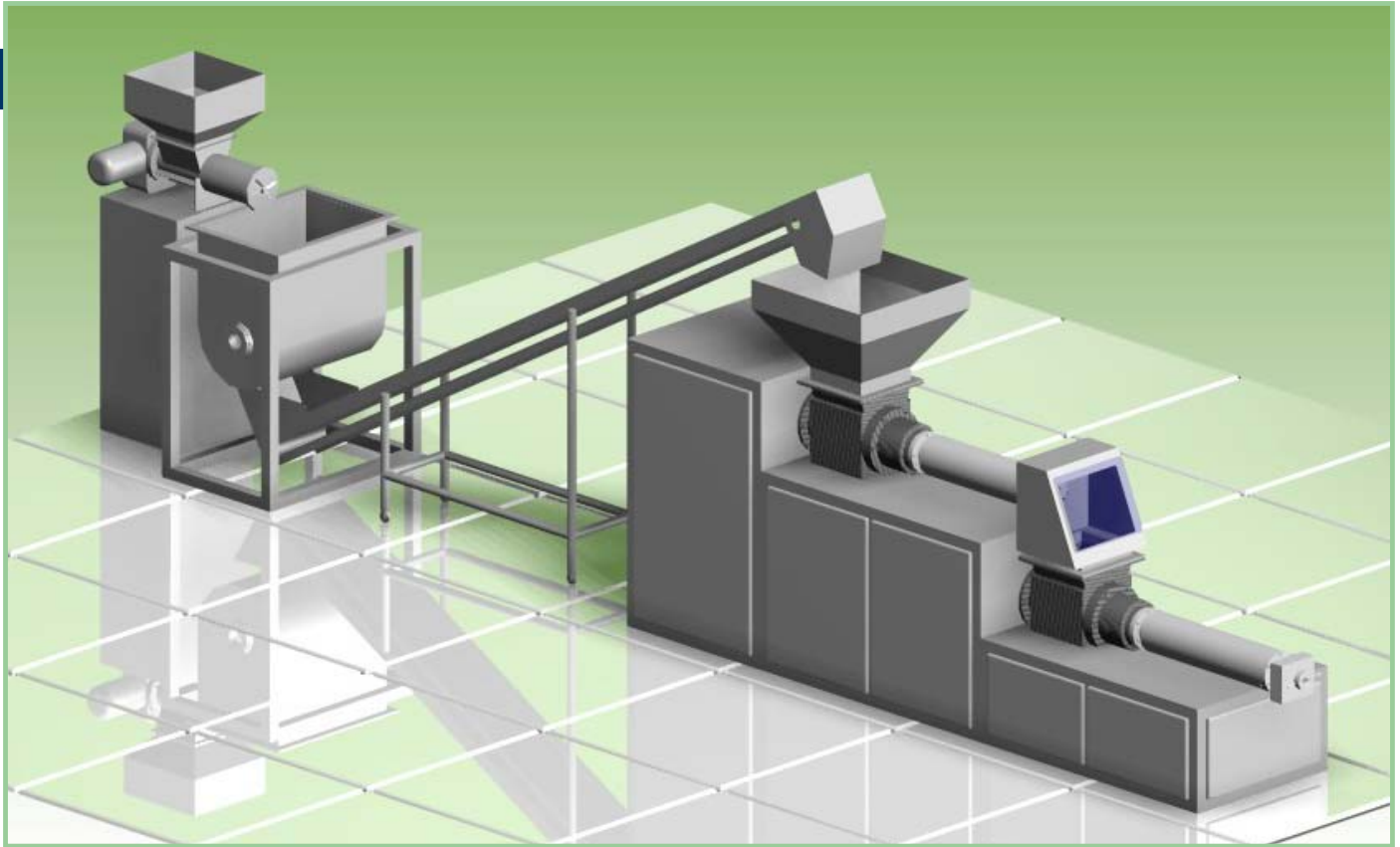
MIXER + DUPLEX TRANSAVON

***"TOTAL"* TRANSAVON LINE**



MIXER + CONVENTIONAL SIMPLEX + DUPLEX TRANSAVON

"SPECIAL" TRANSAVON LINE



PELLETIZER + MIXER + DUPLEX TRANSAVON