

SNACK PELLET PROCESSING

Cutting edge technology
developed by pioneers

Pavan GROUP
TECHNOLOGY TO FEED A GROWING WORLD

EXTRUSION TECHNOLOGY

Expertise and know-how



Pioneers of extrusion technology

Pellet snacks are produced dried and semi-processed for easy storage and shipment and in a second phase are expanded, seasoned and packed. The pellet snacks' peculiar capability of expanding is due to the presence of gelatinized or partially gelatinized starch in their matrix. The water entrapped into the matrix, if heated rapidly above boiling point, evaporates thus creating an internal pressure; the gelatinized matrix itself becomes less viscous and keeps the water steam inside for a certain time increasing its volume. The volume of the product increases and reaches again rigidity due to lack of water: the result is a light, crunchy and pleasant snack.

The main advantages of the pellet snack technology

- Well defined shapes compared to directly expanded products
- Wide choice of raw materials: possibly all starches containing raw materials can be utilized.
- Large choice of shaping systems: from the most classical die-cut products to the sheeted ones, the double and the multilayer ones

Many cooking systems have been and are in use to produce pellet snacks from unprocessed flours and starches but the most internationally known and used is the **extrusion cooking system**.

Forming extruders are used to shape the pellets after cooking, to make die cut products or to extrude sheets or ribbons to be shaped and cut at distance from the die. When the raw materials are already pre-cooked, like for instance with potato based products, there is no need for the cooking step: this pellet production process is referred to as **cold extrusion**.

All raw materials requiring cooking are processed in the first extrusion-cooking step, followed by the shaping step of the cooked mass, which can be either the above-mentioned cold extrusion or any other system capable of giving a correct shape to the hot dough before the drying.



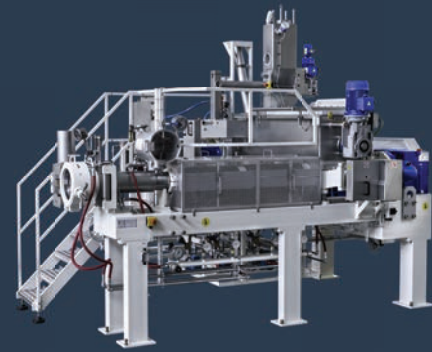
SMART PRODUCTS

Innovative solutions which allow maximum flexibility in raw materials and shapes and optimum control of the textural aspects.

R&D

Continuous improvement

Developing customised solutions following a tailor-made philosophy



Pavan Group feeds its success through constant and thoroughly organized Research & Development activities, performed by a team of 30 people between process technicians, analysts and mechanics. They have at their disposal an area of 2000 sq. m equipped with 3 pilot

plants, 4 flexible production lines that can analyse new products in all respects and a laboratory equipped with all types of instruments for chemical, chemical physical, rheological analysis and nutritional / organoleptic tests on food.

RAW MATERIALS

Ingredients impact on the process

Different raw materials lead to different production processes



The simple principle of expansion of the pellet snacks allows the utilization of a wide choice of starch based raw materials. Cereal flours are the most common ones, followed by root starches like potato and tapioca and cereal starches. A great advantage of the pellet snacks technology is the possibility of making formulas with peculiar characteristics like high fibre content, multi grain or multi coloured. Although the pellet production process generally includes a step to cook the starch

matrix, allowing the use of raw flours and native (uncooked) starches which are cheap and widespread, some common raw materials are already cooked, such as the potato based raw materials like potato flakes and granules. Sometimes precooked or par-cooked cereal raw materials are also used. Pre-cooked materials generally do not require going through the cooking step but only the phases related to shaping and drying.

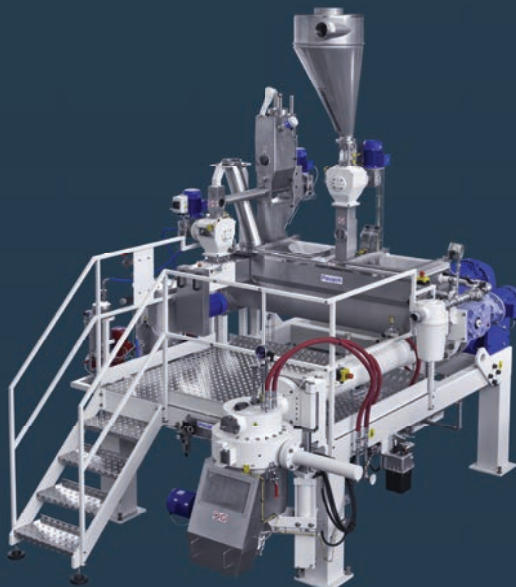




EXTRUDERS
The core of our technology

F FORMING EXTRUDER

Single screw
forming extruder



G COOKING EXTRUDER

Single screw cooking
extruder



TT COOKING EXTRUDER

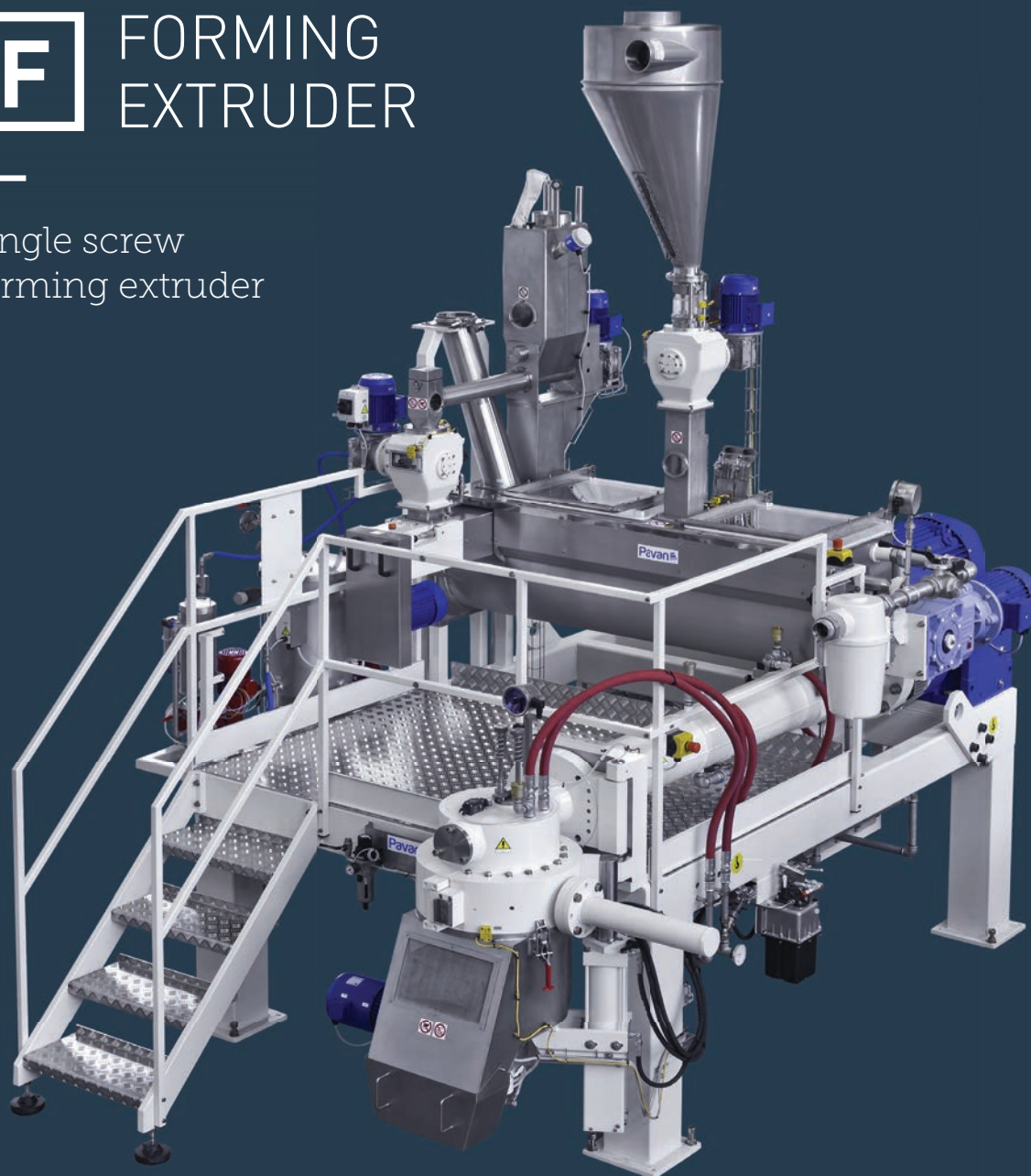
Twin screw cooking
extruder





FORMING EXTRUDER

Single screw
forming extruder



The model F was designed for the extrusion, forming, at controlled temperatures of pre-gelatinized raw material and/or cooked doughs coming from a cooking extruder,

using interchangeable dies and a suitable cutting system.

A wide range of products, such as snacks, breakfast cereals,

traditional pasta and special dietary pasta, is obtained by varying process conditions, raw materials and replacing dies.



FORMING EXTRUDER

MODEL	SCREW DIAMETER mm	CAPACITY (kg/h)		TYPICAL INSTALLED POWER kW
		In combination with cooking extruder	Standalone	
F55	55	20	40	4
F70	70	45	80	9.2
F90	90	90	140	15
F115	115	180	250	22
F130	130	280	400	30
F150	150	450	600	55
F175	175	650	800	75
F200	200	1000	1200	90
F218	218	1400	1600	110
F240	240	1900	2100	132

Technical characteristics

- Structure in welded heavy-duty steel sheet-plate and profiles, epoxy painted.
- Mixing tank in stainless steel AISI 304, ensuring proper kneading time or cooling time for the cooked dough.
- Stainless steel shaft and paddles (made with special profiles and end scrapers).
- Plexiglass and/or stainless steel closing cover with plexiglass inspection holes.
- Humidity exhaust system (if coupled with a cooking-extruder).
- Volumetric dosing system and optional vacuum mixing system (not when in combination with cooking-extruder).

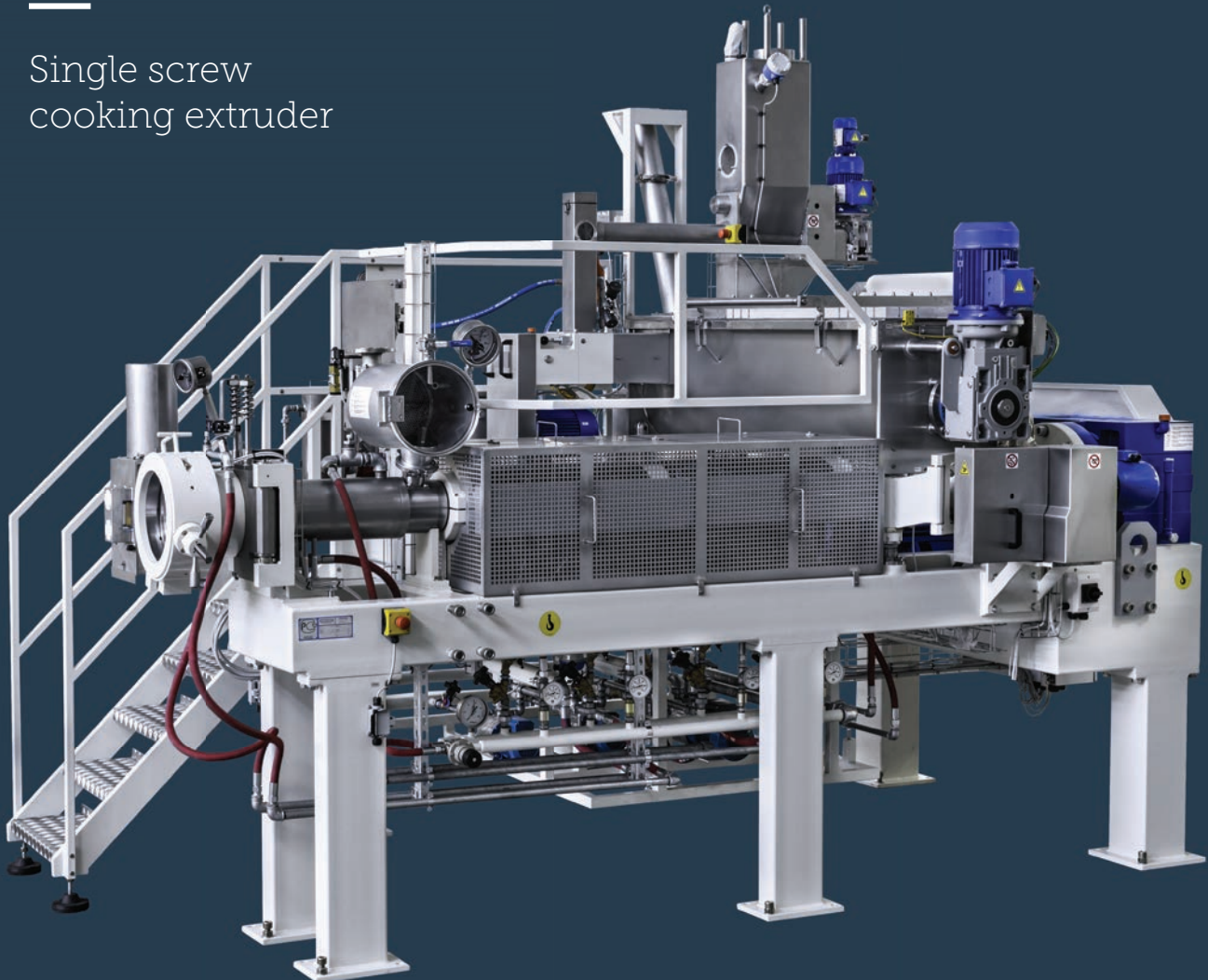
- Stainless steel compression screw, hardened, with a typical 12 L/D ratio, ideal for cooked doughs.
- Oil-bath lubricated thrust bearing group, coupled to the driving group of the extruding screw composed of motor and parallel axis reduction gear.
- Motor-driven trolley for the extraction of the screw from the cylinder, safety limit-switch and screw-lifting support.
- Steel cylinder, longitudinally grooved, complete with stainless steel jacket for the circulation of thermostatically controlled cooling water to maintain the barrel at a pre-set temperature.

- Head and cutting group fixed to the extruder by mean of a heavy-duty hinge-type system. The head is fitted with a special mechanism for the quick extraction of the die from its housing. It is further equipped with an independent heating circuit and a pressure-control manometer with an alarm system for the automatic stop of the machine in case of accidental overpressure.
- Additional safety device based on calibrated bolts to fix the head to the extruder and also on the product flow barrel plug. Head ventilation group, complete with ventilator, air diffusion cover and die-protection.



COOKING EXTRUDER

Single screw
cooking extruder



Six stages single screw low shear cooking-extruder G200 model.

The unit can process automatically and continuously a great variety of flours and cereal/potato starches, both mixed and in pure state.

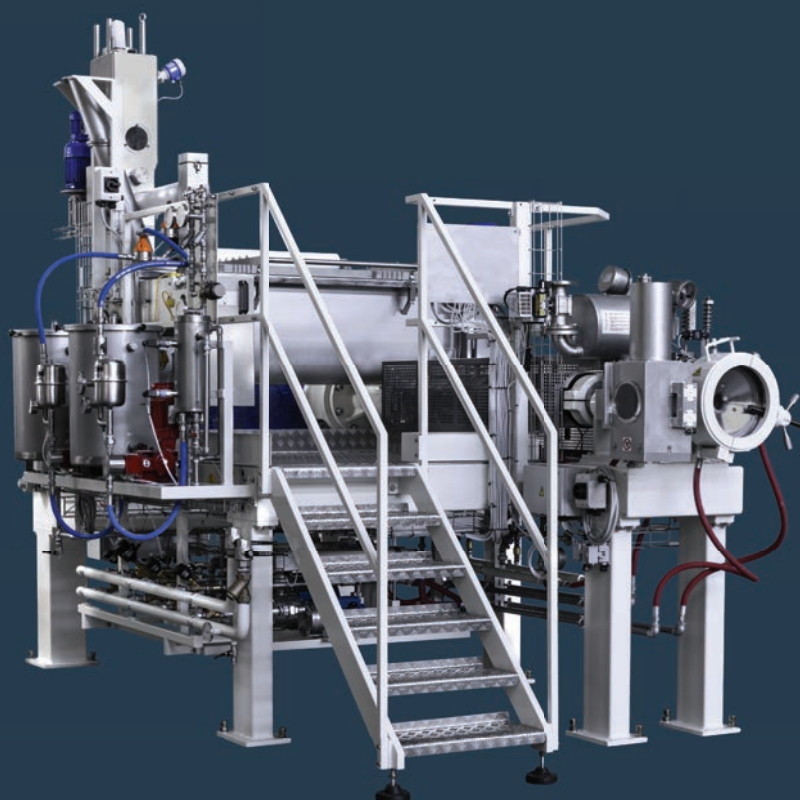
Equipped with dosers for solid and liquid ingredients, high speed pre-mixer, mixing tank, extrusion group composed of motor with variable speed, gear box and thrust bearing group.

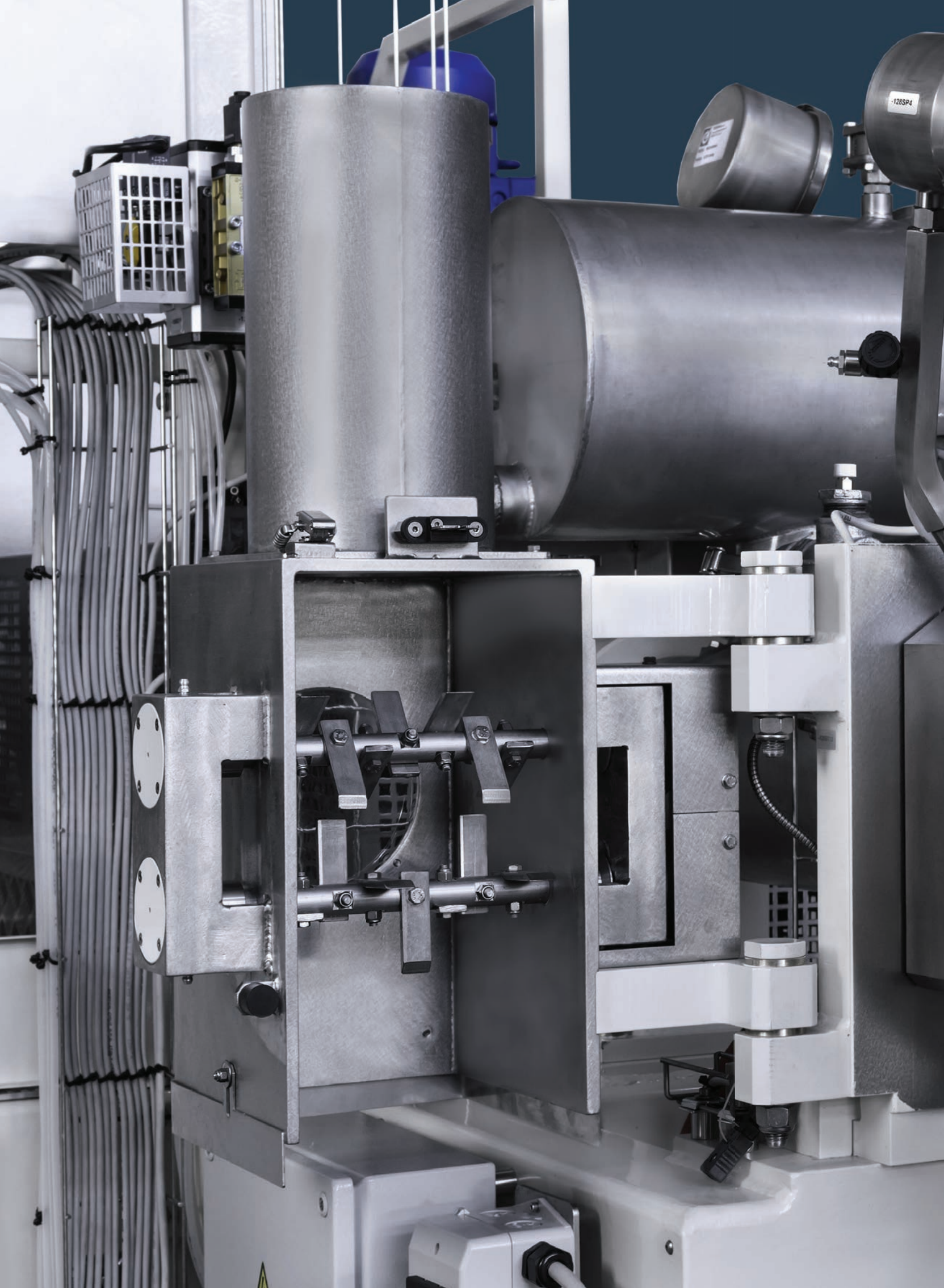
Forced feeding screw, modular type cooking screw with interchangeable shear locks, segmented barrel with independent thermo regulation, peripheral extrusion system complete with cutting group.



COOKING EXTRUDER

MODEL	SCREW DIAMETER mm	CAPACITY (kg/h)		TYPICAL INSTALLED POWER kW
		Standalone	In combination with cooking extruder	
G55	55	10	30	8
G70	70	30	60	15
G90	90	80	120	23
G115	115	150	200	45
G130	130	250	400	55
G160	160	400	600	106
G180	180	600	900	118
G200	200	800	1200	130







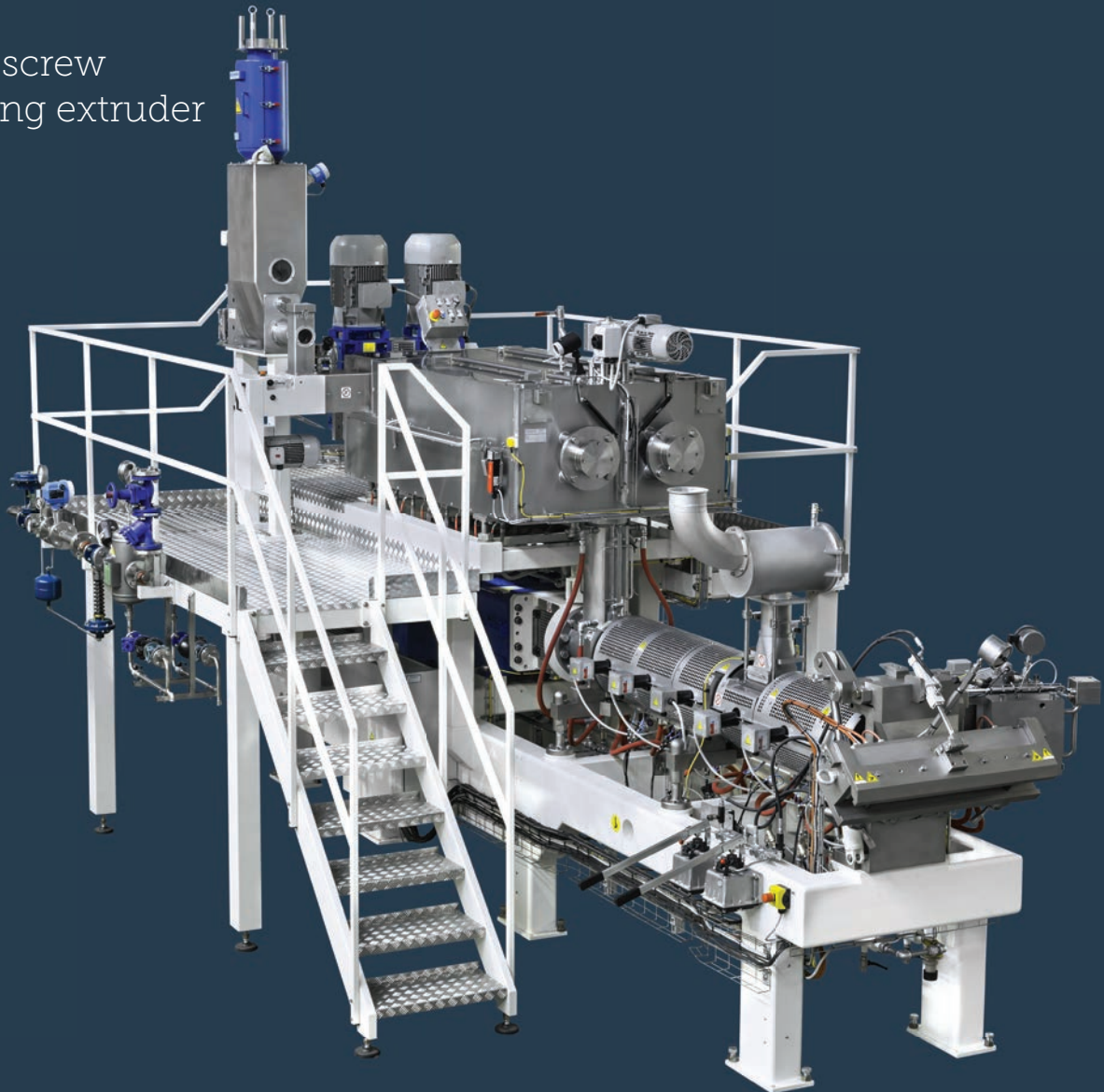
G EXTRUDER HEADPIECE

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Interchangeable
system for flexible
production



COOKING EXTRUDER

Twin screw
cooking extruder



The TT cooking-extruder continuously and automatically gelatinizes flours and starches.

After dosing the raw materials it starts the mixing phase, adjustable in accordance to the product

needs. Thereafter comes the extrusion section. The TT extruder is a modular machine featuring segmented barrel, available in both closed or clam shell type (up to the TT 70 model). Different heating and cooling systems are available for the

barrels. They can be equipped with feeding port, steam/liquid injection port or venting port (atmospheric and under vacuum according to specific needs).



COOKING EXTRUDER

MODEL	SCREW DIAMETER mm	CAPACITY (kg/h)		TYPICAL INSTALLED POWER kW
		Standalone	In combination with cooking extruder	
TT70	70	350	500	160
TT92	92	800	1200	250
TT112	112	1200	2000	315

Technical characteristics

The co-rotating fully intermeshing screws assembly is composed of sectional modules with the following functions: forward and backward transport, mixing, feeding of additives, injection of liquids, de-gassing, cooking and forming. The screw profile allows high mechanical working capacity and high torque transmission. An AC variable speed drive, a safety clutch and a double cascade gearbox for the proper reduction compose the driving system. The thrust bearing system, integrating the gear box and with forced lubrication circuit, is composed by one large thrust

bearing on one shaft and a multiple thrust bearing series on the other shaft allowing a compact and robust construction.

The extruder can be equipped with one head unit with independent temperature control, product pressure device and interchangeable dies with a series of different cutting groups selected in accordance with the different production needs of the finished product.

Control system

The typical control system of the TT extruder features a supervising

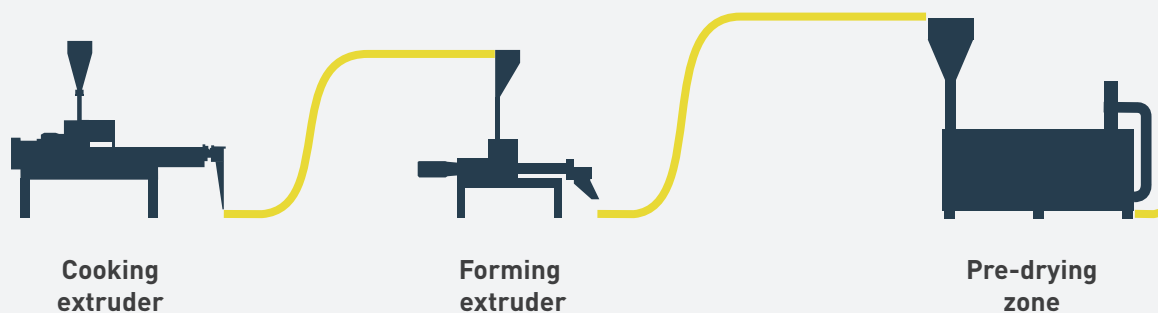
unit monitoring all functions of the extruder from the dosage to the cutting unit, allowing an easy recipe management and displaying all variable of the process such as, among others, flows of raw materials, extrusion torque, specific mechanical energy value, barrel temperatures and die pressure. The supervising system stores the values and allows data export and management with the most common spreadsheet software.

PRODUCTION LINES

A wide range of advanced solutions

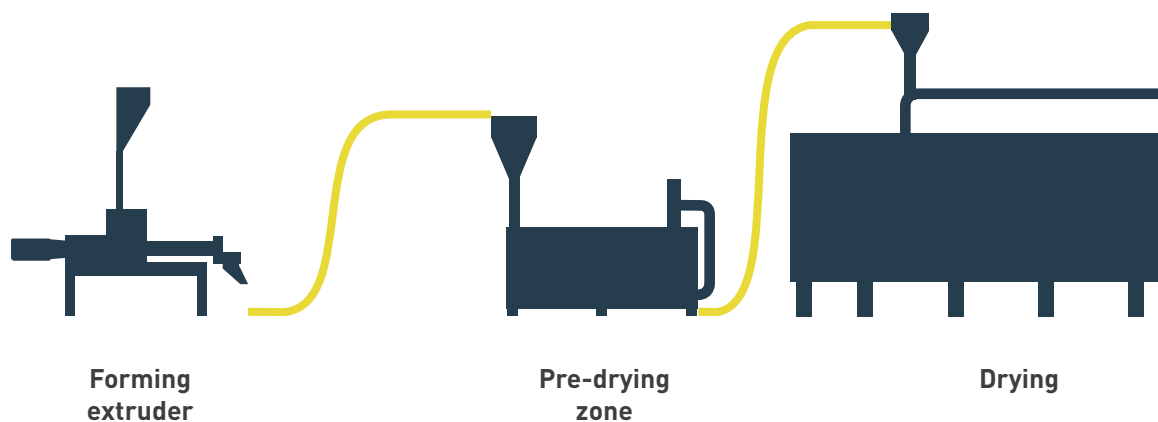
CEREAL BASED DIE-CUT

01



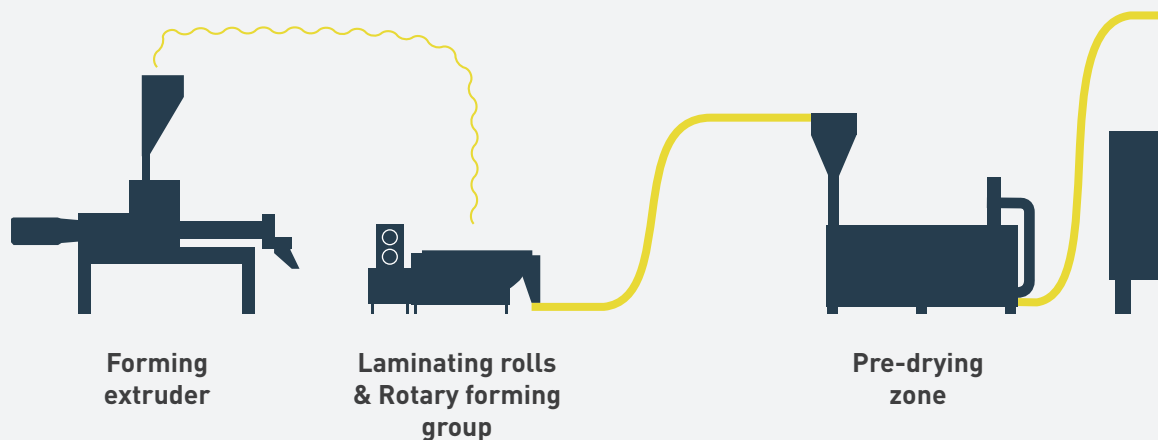
POTATO BASED DIE-CUT

02

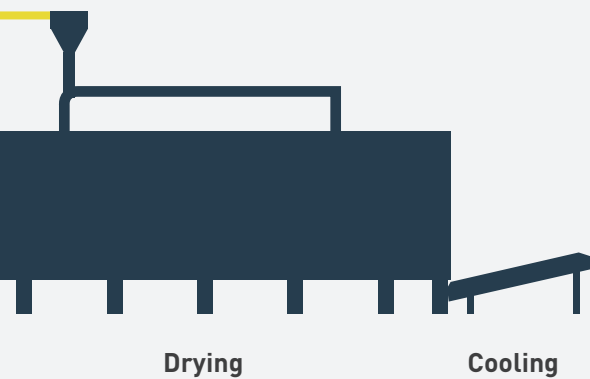
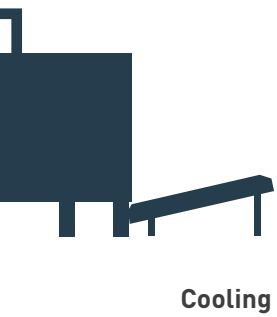
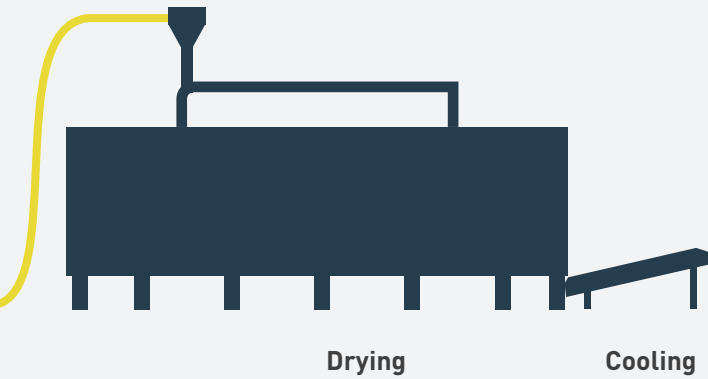


LAMINATED POTATO CHIPS

03

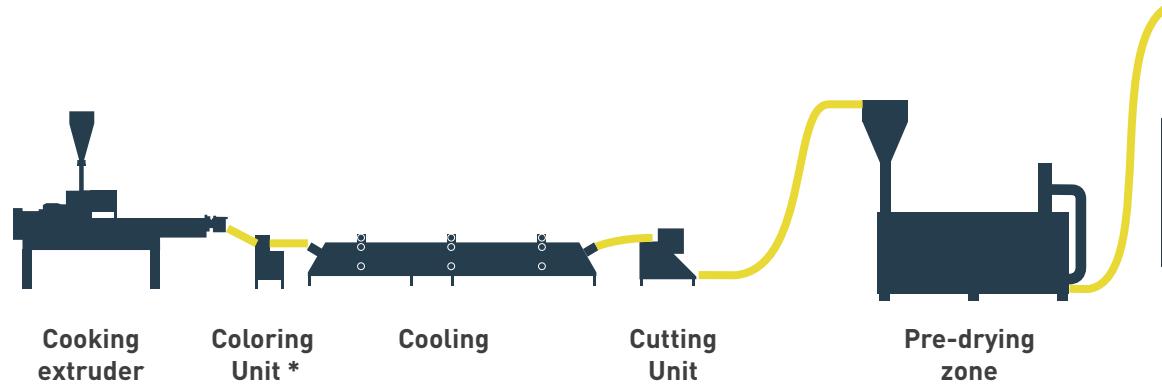


- 01 CEREAL BASED DIE-CUT
- 02 POTATO BASED DIE-CUT
- 03 LAMINATED POTATO CHIPS
- 04 SQUARE SHAPE DIE-DISTANT CUT
- 05 MULTI SHAPE DIE-DISTANT CUT
- 06 3D PELLETS
- 07 PUNCHED PELLETS



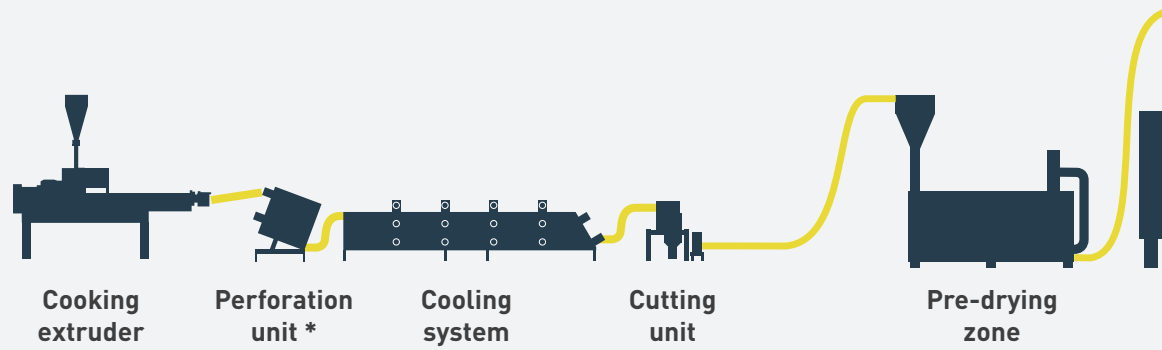
SQUARE
SHAPE

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04



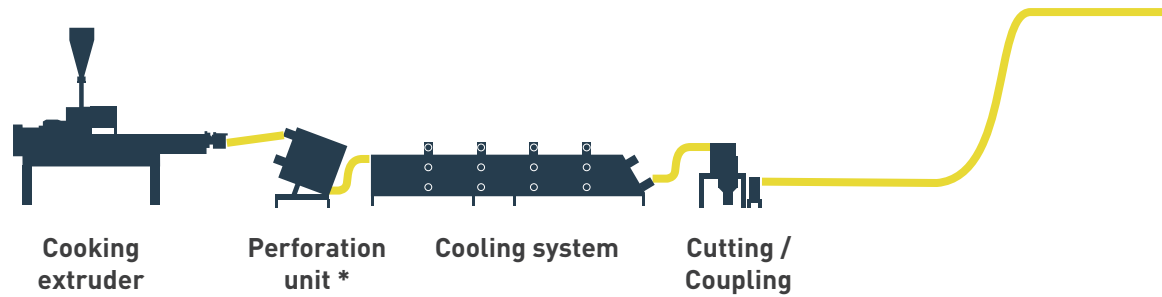
MULTI SHAPE
2D PELLET

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05



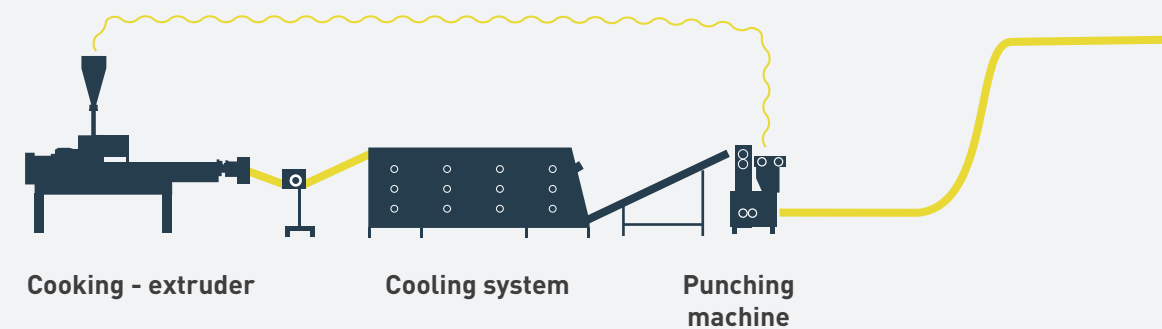
3D
PELLET

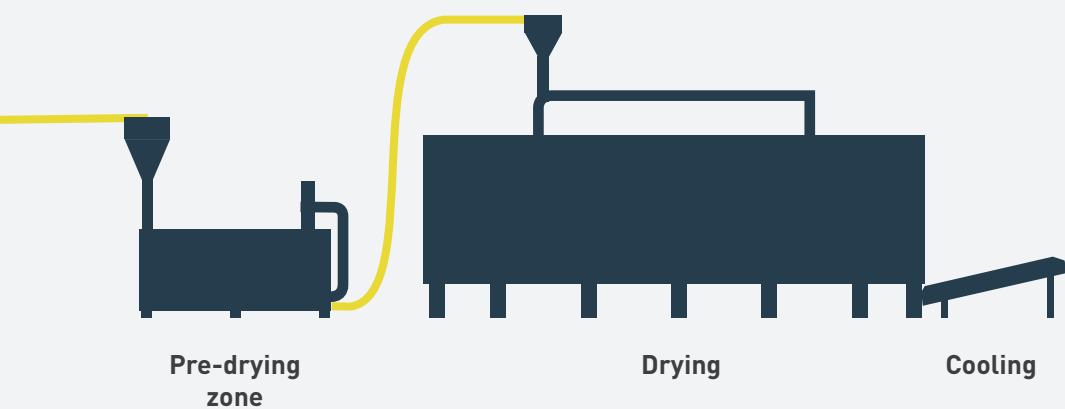
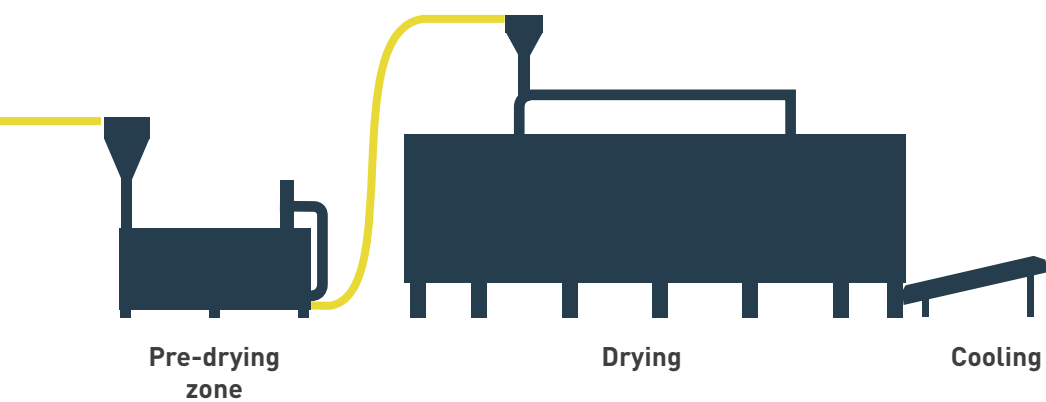
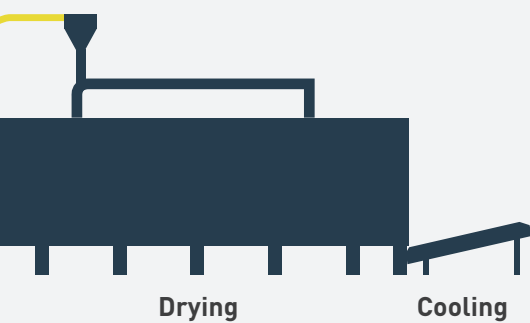
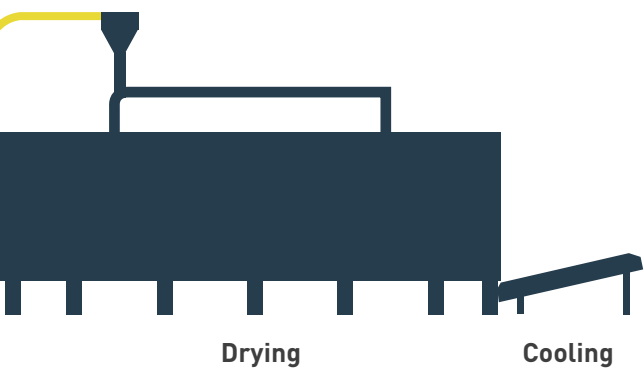
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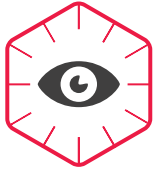
PUNCHED
PELLETS

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07





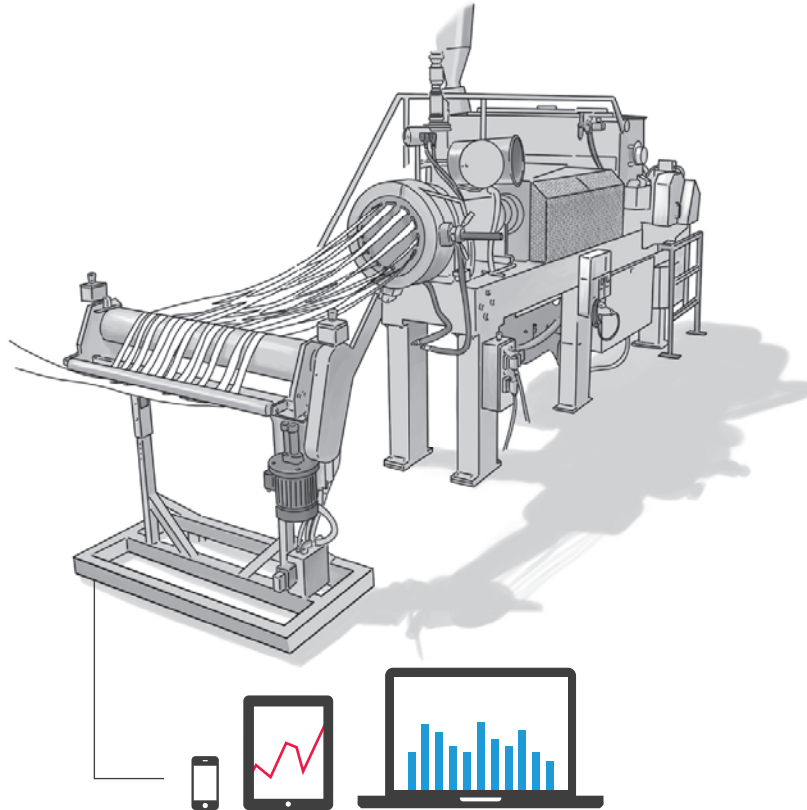
*optional



PASS[®]

PAVAN AUTOMATION & SUPERVISION SYSTEMS

Pass[®] is the integrated automation and supervision system developed by Pavan



- Full automation
- Real time control
- Recipe management
- Power consumption analysis
- Historical data analysis
- Compatibility

QUALITY

Quality ensured in the end product

REPEATABILITY

Standardised execution of best practices

EFFICIENCY

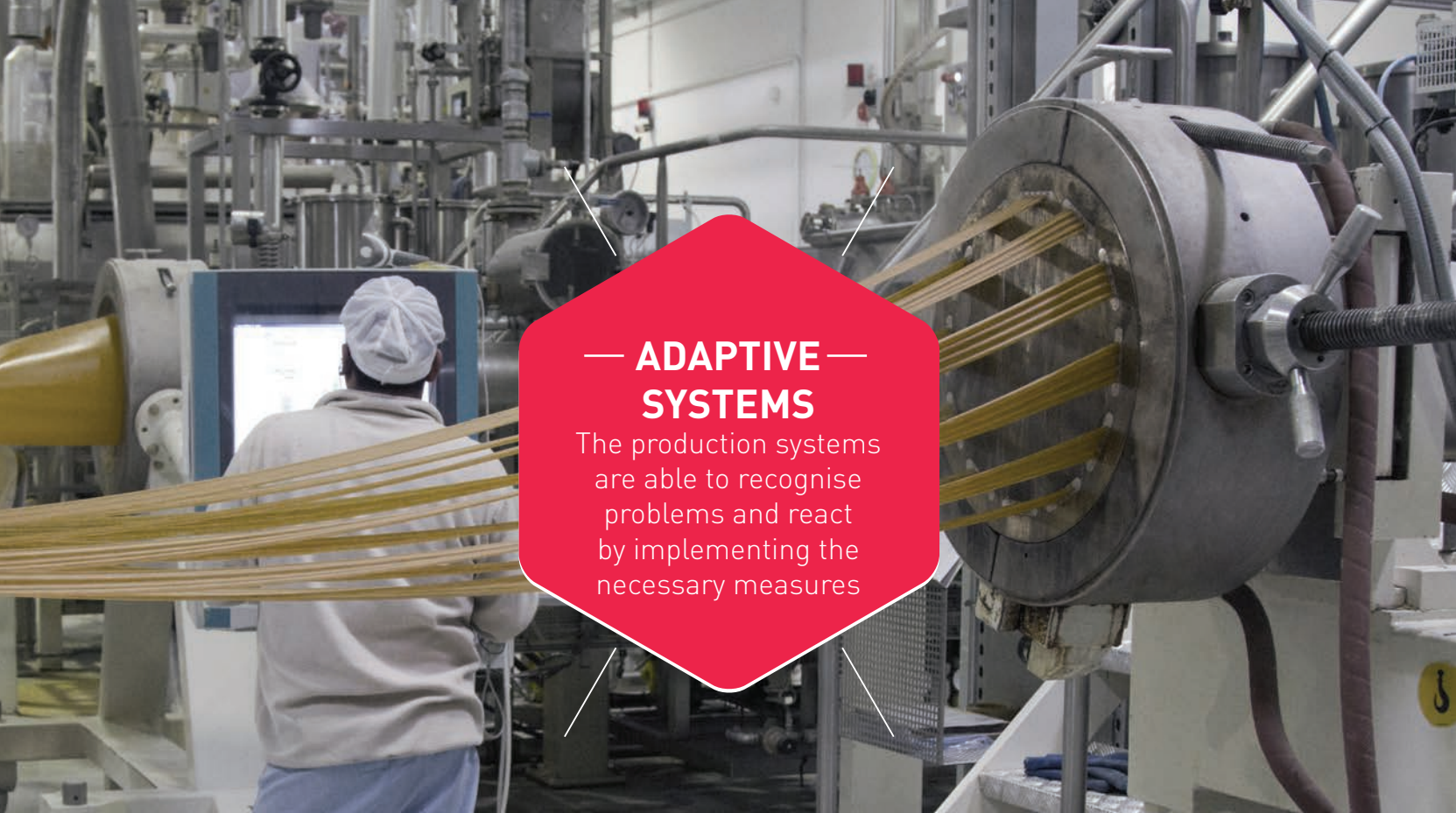
Increased system efficiency

SIMPLICITY

Simple to use, implement and configure

COMPATIBILITY

The system integrates with all the main operating systems



— ADAPTIVE — SYSTEMS

The production systems are able to recognise problems and react by implementing the necessary measures

IMPROVED SUPERVISION

The entire plant is monitored in real time and the software system records every piece of data in order to measure efficiency and compare power consumption against historical data.

- High speed data archiving and retrieval
- Power consumption analysis
- Easy recipe management

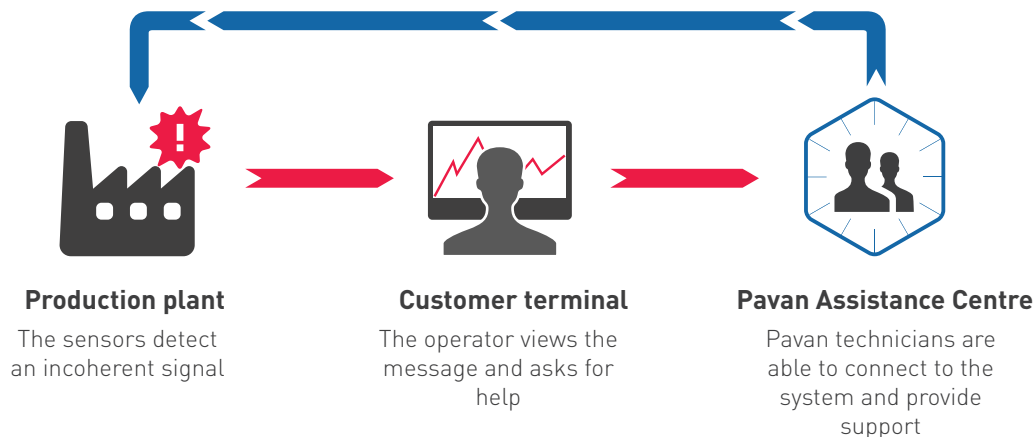
— MOBILE READY —

PASS® has been developed to be accessible from all mobile devices

REMOTE ASSISTANCE

Pavan's technological and software support service is available 24/7; it is also able to solve issues remotely.

- Smart Alert System
- Flexible planning
- Compatible with mobile systems



PRODUCTS

Inspirations for a better choice

DIE-FACE CUT PELLETS



— DIE-FACE CUT PELLETS
LAMINATED POTATO CHIPS
DIE-DISTANT CUT PELLETS
3D PELLETS
PUNCHED PELLETS

LAMINATED
POTATO PELLETS
—



DIE-DISTANT
CUT PELLETS
—



PRODUCTS

Inspirations for a better choice



3D
PELLETS



— DIE-FACE CUT PELLETS
LAMINATED POTATO CHIPS
DIE-DISTANT CUT PELLETS
3D PELLETS
PUNCHED PELLETS

PUNCHED PELLETS



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