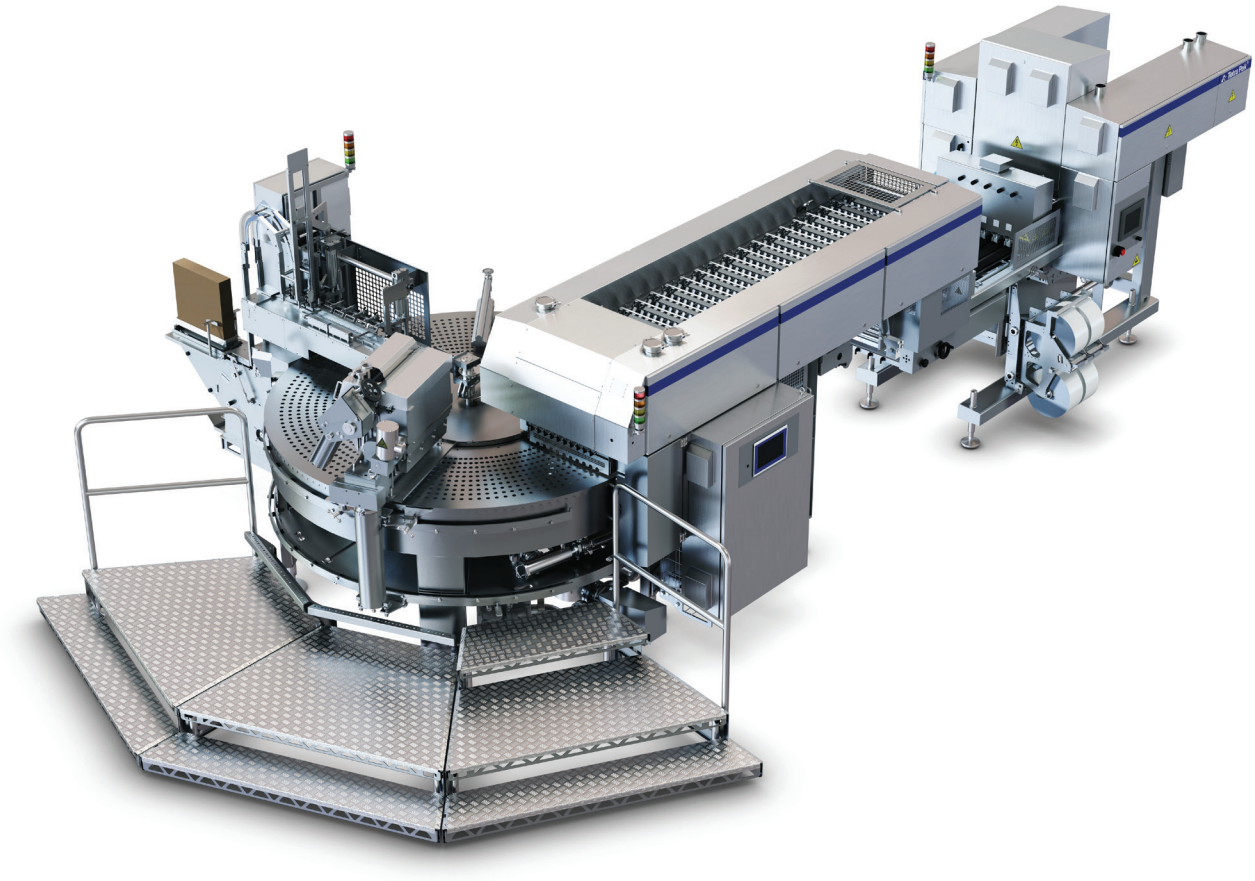
Tetra Pak®
Rotary Moulder 27 A4

Moulded stick production equipment



Application

Tetra Pak® Rotary Moulder 27 A4 is a highly automated line for efficient production of moulded ice cream, water ice, fruit-juice ice and shebert products.

Highlights

- Conical-shaped tank, with easy access for cleaning
- Improved brine flow to secure even cooling across all lanes
- Pump speed adjustment for brine flow control
- Servo-controlled extractor – up to 30 strokes/min
- Quick start-up thanks to cool-down during cleaning and reduced brine volumes
- Ergonomic platform design for improved operator access
- Unique, one-piece mould table enables maximum number of radial rows for increased capacity and longest possible hardening time
- Built-in crane assist for mould table

Working principle

There are six main stages to producing moulded ice cream products on a rotary concept:

1. Filling of ice cream into the moulds
2. Freezing of the product in a –40° C (–40° F) cold brine bath
3. Insertion of wooden sticks into ice cream when mixtures is sufficiently hardened
4. Defrosting of a thin product outer layer in the mould via a 15-25°C (60-77° F) warm brine bath
5. Extraction of the frozen product from the moulds
6. Lay-off for packing

Between extraction and lay-off, the moulded products may also be coated with chocolate as well as subsequently coated with dry ingredients.

Basic design -

Mould table

The moulds for freezing and shaping the products are welded onto an circular plate, creating a rotating table on top of the brine tank. The one-piece mould table is made of stainless steel. The number of lanes defines the possible product width and the number of rows defines the possible product thickness. A typical example configuration is 10 lanes with 150 radial rows. See the size and capacity section, below, for more information on various configurations.

Brine tank

The double-walled circular brine tank is fully welded in stainless steel, with insulation between the walls. Two rails are placed on the outside of the brine tank for mounting the stick dispenser, the cleaning equipment, the filling equipment, etc. The brine tank is divided into a freezing zone with cold brine and a defrosting zone with warm brine.

Cooling system

The primary cooling system consists of a semi-welded titanium plate heat exchanger using ammonia (NH_3) as the refrigerant. Options for CO_2 or R404A are also available.

The secondary cooling system is a cold brine bath using pumps for circulation. The cold brine distribution trough is made of stainless steel with special nozzle plates to control the vertical brine distribution around the mould pockets. One pump secures the external flow through the plate heat exchanger (the “external flow pump”). The other pump builds up sufficient flow in the mould section (the “internal flow pump”). Both pumps are frequency controlled.

Defrosting system

Steam, hot water or electrical elements heat warm brine for defrosting the products. The brine is sprayed vertically onto the underside of the moulds through nozzle system. The defrosting system is equipped with a separate centrifugal pump.

The warm brine temperature is typically set between 15-25°C (60-77° F). A thermostat prevents operation of the extractor if the warm brine temperature is too low.

Main drive

The Rotary Moulder 27 A4 is equipped with five servo drives:

1. Mould table index
2. Lamella chain index
3. Extraction movement
4. Dipping movement
5. Lay-down movement (into the wrapper)

All drives are controlled through the PLC and the HMI. The auxiliary functions and other functions with limited power demands are controlled and actuated pneumatically.

The speed of the Tetra Pak Rotary Moulder 27 A4 depends on product type/size and relevant equipment, typically between 15 and 30 strokes per minute.

Automation system

- The standard automation platform is from Rockwell Allen-Bradley.
- All functions and movements are controlled by the PLC via the HMI on the integrated control cabinet
- All production data is adjusted through the touch screen operator panel/HMI
- All product dependent parameters are defined in a recipe control set-up for easy product change-over
- The touch screen also provides operation and diagnostic information

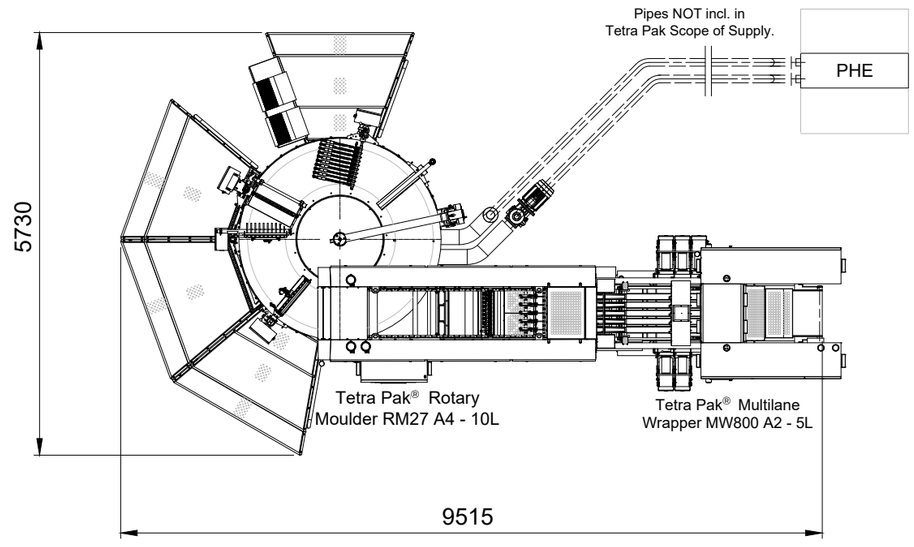
Extractor and lay-off device

The extractor and lay-off device consists of an in-line chain conveyor with 46 extractor arms. These arms carry extractor tongs that hold the products in the sticks. The updated tong design includes a robust, moulded plastic arm with an embedded hard metal knife. To ensure the highest food safety standards, the tong is detectable in both metal detectors and x-ray systems.

A two-position lay-down system transfers the products from the extracting arms directly to the top of the lanes of the multi-lane wrapper. An individual exit function for pre-release, just before the lay-off position, can be activated either manually or automatically if the paper lane is broken.

Safety

The Tetra Pak Rotary Moulder A4 is equipped with a safety-fence system, including safety doors with lock handles and emergency stop buttons.



Equipment options

Filling equipment

A wide range of filling equipment is available for Tetra Pak moulding lines, including a combination of volumetric and time elapse systems, as well as top and bottom-up solutions. The optimal choice will depend on filling media, flavour and colour combinations, and inclusion type and size.

Ice Cream volumetric filling

1. Drum filler – fixed volume, manual change-over
2. Combi filler – adjustable volume (on the fly)
   - » colour – standard
   - » colours per row – AAAAABBBBB (example)
   - » colours per lane – side-by-side/concentric/zebra

Water ice top filler-time elapse filler

- » colour - standard
- » 2 colour solution for twin-stick products
- » 2, 3 or 4 colours across the row available

Core (pencil) filler for sauce filling – time elapse

- » Choco, jam, caramel or similar
- » 2-string or central core string pattern

Bottom-up filler for high overrun and creamy texture

- » Volumetric 1-colour solution, enabling large inclusions
- » Volumetric 2 colours – side-by-side/front-back/ concentric
- » Time elapse solution – 1 colour without inclusions, and with option for 2 colours per row

Back suction device for shell-and-core or multi-layer water ice.

Stick inserter

With the standard stick inserter device, an operator manually loads bundled sticks in magazines row-by-row. The device makes the insertion by means of vertical pneumatic pistons.

The Tetra Pak® Automatic Stick multi A2 is an automated alternative. The sticks are loaded into a magazine from boxes typically containing 10,000 sticks. The sticks are inserted by means of a collecting chain, stacking system, indexing belt and gripper system. A separate main drive, PLC control and HMI are included.

Cleaning

A washing device is available for cleaning-in-place (CIP) of the mould-table. It requires connection to water and relevant cleaning detergents.

Coating equipment

The extractor device is equipped with a coating system positioned below the lamella chain, transporting the products from moulder to wrapper. The device comprises a dipping cup and a drip tray with drip scraper. The height of the dipping is fixed, as the dipping level is adjusted by the servo up/down movement.

Pump station

A pump station is available as an option. It features a 100-litre (26.5-gal) chocolate floor tank with an electrically-heated and thermostatically-controlled water jacket as well as an electrically-driven chocolate circulation pump. The floor tank is a separate unit on wheels, with hoses for connection to the dipping cup.

Dry coater

As an alternative to having dry ingredients (nuts, flakes, etc.) mixed in the chocolate, this device can blow these ingredients on the outside of the coating material just before it has finished drying.

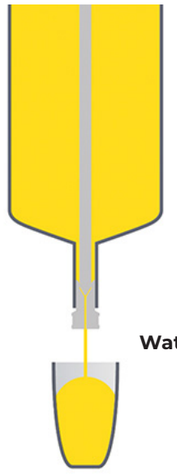
Mould table trolley

The optional trolley (cart) is used for transport and storage of mould tables.

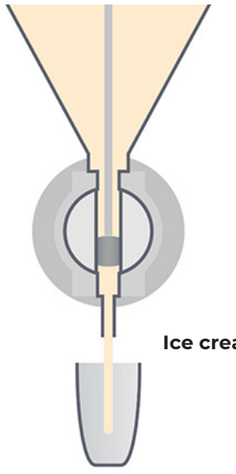
Cooling unit

For factories without a central ammonia (NH_3) cooling plant, a complete cooling unit, typically with R404A or R507A, is also available.

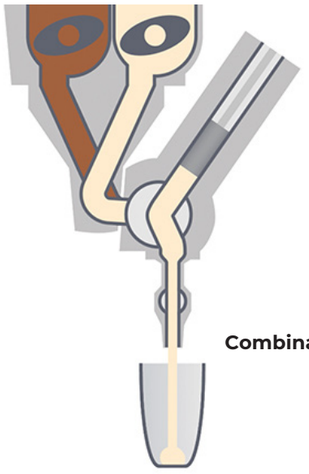
Filler examples



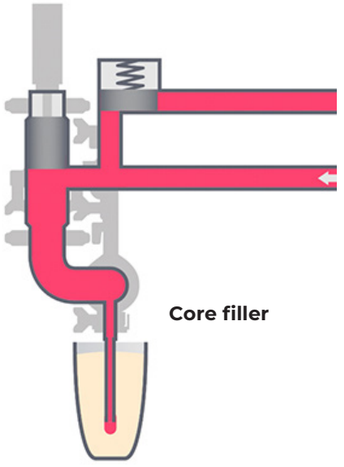
Water ice filler



Ice cream top-filler



Combination filler



Core filler

Size and capacity

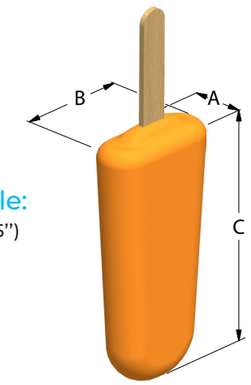
Size:

The number of lanes (moulds per radial row) depends upon the width of the ice cream product.

Maximum width of product pockets	Radial row
63 mm (2.48”) -	8 *
49 mm (1.93”)	10 (standard) *
39 mm (1.54”)	12

The number of radial rows depends on the thickness of the ice cream product.

Maximum thickness of product	Radial rows
Up to 21 mm (0.83”)	160 *
21-23 mm (0.83-0.91”)	150 (standard)
23-24,5 mm (0.91-0.97”)	145
24,5-25,5 mm (0.97-1.00”)	140
25,5-26,5 mm (1.00-1.04”)	135
26,5-29 mm (1.040-1.14”)	125 *



Typical products example:

A: Product thickness: 19 mm (0.75’’)
B: Product width: 49 mm (1.93’’)
C: Product length: 119 mm (4.69‘‘)
D: Volume: 75 ml (4.58 in3)

Capacity

For a 10-lane wide configuration, the capacity for typical products (see tables) will normally be in the range of up to 16,000 ice cream sticks/hour.
Capacities for water ice are approximately 20% lower than for ice cream. Actual capacity depends upon a number of factors, including:

- Number of radial rows
- Number of products per radial row (number of lanes)
- Product thickness
- Recipe (e.g. sugar content and total solids content)
- Overrun
- Viscosity of ice cream mix
- Brine temperature
- Ice cream filling temperature
- Number and types of filling operations
- Capacity of the packing line

Calculation example:

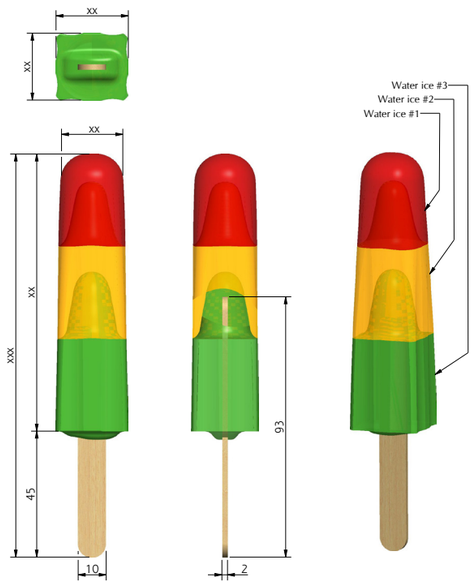
There are 10 strokes between chocolate dip and laydown. This gives a drying time of 22.5 sec. at 16,000 sticks/hour.

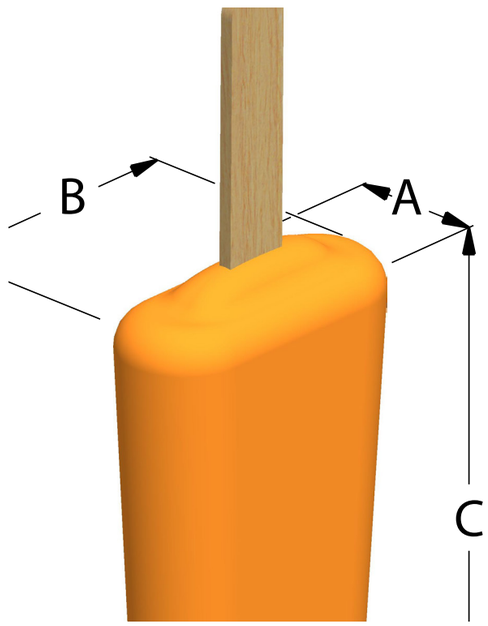
Example

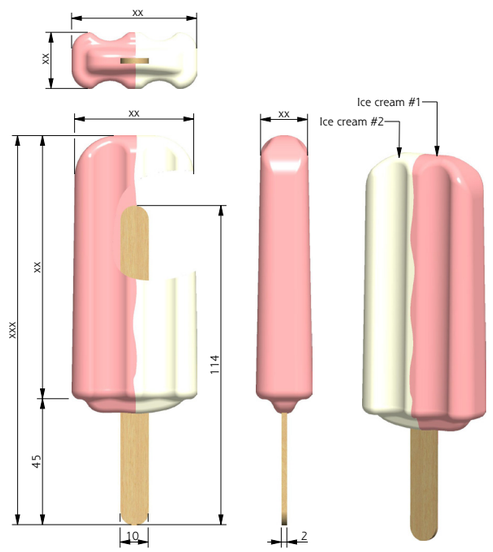
- Product width: 49 mm (1.93’’)
- Product thickness: 19 mm (0.75’’)
- Number of radial rows: 160
- Number of pockets per row: 10
- Overrun of ice cream: 60 %
- Evaporating temperature: –45 °C (–49 °F)
- Brine temperature: –40 °C (–40 °F)
- Ice cream filling temperature: –3 °C (+27 °F)
- Capacity: approx. 16,000 per hour

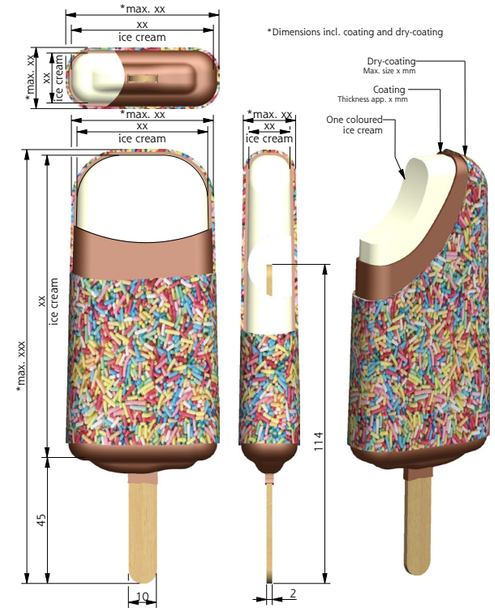
The capacity is based on a mix recipe using good quality ingredients as follows:

Fat	10.0%
Skimmed milk powder, fat free	10.5%
Sugar (sucrose)	12.0%
Glucose syrup	5.0%
Auxiliary ingredients	0.5%
Total solids	38%
Water	62%
Total	**100%**









Technical data

Electric motors	
Mould table servo index drive	2.5 kW (3.4 HP)
Servo choco dip	1.6 kW (2.2 HP)
Lay-down servo	1.6 kW(2.2 HP)
Extractor index servo	2.5 kW(3.4 HP)
Cold brine pump	5.5 kW(7.5 HP)
Booster pump to plate heat exchanger	7.5 kW(10 HP)
Warm brine pump	0.75 kW (1.0 HP)
Chocolate drip tray	0.8 kW (1.1 HP)
Dry coating equipment	1.1 kW (1.5 HP)
Vacuum pump	2.2 kW (3 HP)
Juice return pump	0.55 kW (0.75 HP)

Heating elements
Warm brine, heated either by electricity or by steam. The choice must be made when ordering.

Installed max. effect	
Electricity	
Standard connection	3 x 400 Volts, 50 Hz AC
Nominal load	130 Amps
Main circuit breaker	250 Amps
- when thawing by means of steam	20 kW
- when thawing by means of electricity	45 kW
Low-pressure steam	57 kg (126 lbs)/h
Consumption of max. effect when in production	55-75%
100 litre chocolate container (Tetra Pak® Pump Station)	3 kW
Cable for main power according to local regulations	

Pipe connections	
Cold brine pipe size to / from plate heat exchanger	100 mm (4”)
Main inlet for air	16 mm (½”)
Piping dimensions for ice cream not less than the outlet of the continuous freezer	
Brine quantity	1250 liter/ 1625 kgs (330 gal/3575 ibs)

Brine volume of connecting pipes and PHE is not included in the above

Air consumption	
Standard machine	0.5 m^3/min (18 ft_3/min)
Min. working pressure	7 bars (102 psi)
Max. dew point at atmospheric pressure corresponding to	5°C (41°F)

Normal working temperatures	
Evaporating temperature	–45°C (–49°F)
Temp. of cold brine	–42°C (–44°F)
Temp. of warm brine	20°C (77°F)

Refrigeration load	
Max. evaporator load to 175 kW/150400 kcal/h (49,7.8 TR) at	–45°C (–49°F)
Weight in ready-to-work condition,	approx. 12,000 kg (24,000 lbs)

Shipping data	
Net weight	9000 kg (20,000 lbs)
Gross weight	11,200 kg (25,000 lbs)
Volume	60 m^3 (2120 ft_3)

Main dimensions	
Total height	2227 mm (88”)
Height of table above floor	1400 mm (56”)
Normally required floor-to-ceiling height	3000 mm (118”)