

Manufacturing Plant and Production Process for Highly Viscous and Difficult-to-homogenise Products

I Introduction

INOXPA has designed special equipment to mix and homogenise highly viscous, thixotropic and difficult-to-stir products that contain a large quantity of solids which need to be dispersed, such as sludges, toothpaste, ointments, pastas, household and personal care products, etc.

Use of this equipment eliminates the environmental dust commonly produced by such processes and improves the reliability of the mixing throughout the process and the properties of the end product in terms of apparent viscosity, sheen, fluidity and texture.

This type of agitators can be mounted in standard tanks with automatic lid and lifting, or without lifting. A tank can be a simple tank or with heat-insulated chambers; with brackets to be placed on a frame or legs to be placed on the floor.

They are normally mounted on load cells connected to a weighing terminal to make product addition to the equipment by weight easier, thereby avoiding the need of pre-weighing of the major components.

I Applications

This equipment is designed for the mixing of all types of formulas containing a large quantity of solids which are highly viscous throughout the production process.

It is ideal for pastas, pharmaceuticals, cosmetics or household and personal care products.

Some examples are given below:

- Toothpastes
- Cosmetic muds
- Bitumen-based sealants
- Pharmaceutical ointments
- All type of silicones
- Colorant pastes
- All types of pasta
- Special putties
- Food-based creams
- Footwear products, etc.

I Description of the equipment

A unit essentially consists of a simple or heated tank, with a flat or curved lid, in which three types of agitators can be fitted.

A. A central anchor-type agitator with scrapers and sealing system. Slow variable speed and power according to process.

B. A second radially mounted agitator fitted with two mobile Cowles-type discs at different heights, whose diameters depend on the capacity of the tank. The power and speed are calculated in accordance with the capacity and product to be processed, but it normally is between 400 and 1200 rpm.

C. A third agitator mounted radially at 180° to the previous one, at a height intermediate between the two discs of the latter agitator, with just one Cowles-type disc, its diameter depends on the product and tank capacity. The fast speed between 400 and 1200 rpm completes the agitation system.

The three agitators are driven by a variable-speed system with constant torque electronic frequency converters.

The following optional attachments can also be added:

- A CIP system with rotating spray balls and external supply and extraction unit.
- Weight-control system with a simple weigh-and-tare terminal or a programmable formula dosing system.
- Lid lifting system with hydro-pneumatic cylinders to make internal maintenance of the vat easier.

The equipment is normally loaded and fed with the materials to be mixed using a vacuum system. Products are introduced through the bottom of the tank and their flow rate should always be controlled in accordance with the product and type of mixing to be used. The vacuum system is an option.

Liquids and solids can also be added through the top of the equipment using transfer pumps for liquids and pneumatic or mechanical systems for solids. Additives can be added manually via the upper part of the lid.

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I General information

This equipment is manufactured with a usable capacity of 1000 or 2000 litres as standard. Larger versions are available on request. Smaller versions are not available.

It is manufactured in stainless steel: AISI 316 (EN 1.4404) for the parts in contact with the product, and AISI 304 (EN 1.4301) for the remaining components.

The gearboxes and cylinders are painted white RAL 9010.

The interior of the heating vat and the lid have a polished finish. The exterior is matt-finished using glass-ball blasting.

The central anchor with scrapers has a power of between 10 and 18 kW for standard equipment (1000 and 2000 L) and speed of between 10 and 60 rpm.

The two-disc fast agitator has a power of between 25 and 40 kW for standard equipment (1000 and 2000 L) and speed of between 400 and 1600 rpm.

The second, single-disc agitator has a power of between 20 and 30 kW for standard equipment (1000 and 2000 L) and speed of between 400 and 1600 rpm.

A current deflector containing a PT100-type thermocouple or 4–20 mA electronic temperature sensor is fitted to this equipment. A CIP system with rotating spray balls. And all the safety accessories required by EU guidelines.

The scrapers of the anchor are oscillating and are normally of from high-density nylon.

This equipment has a maximum working pressure of 2 bar, or –1 bar under vacuum. Both are controlled automatically.

The sealing system is mechanical or radial, depending on the type of agitator fitted.

All solids are loaded by means of vacuum or suction via the bottom of the tank through a special valve, liquids are added through the top of the tank.

Discharge is performed through the bottom and centre of the unit with a minimum diameter of DN80 and an automatic activation control.

A double heating/cooling jacket the product is optional. This always consists of a two-chamber system (upper and lower) with a further heat-insulated chamber.

The lid lifting system is hydraulic and is fitted with all the required safety and control systems to ensure compliance with EU guidelines. The central hydraulics are fitted with a 2 kW pump, with a maximum pressure of 20 bar.

An independent command and control system which activates and powers all systems, with electrical protection, can be fitted on request.

The entire system is mounted on a load cell-based weighing system with a simple weigh-and-tare terminal or a programmable formula dosing system. The terminal is connected externally to other control equipment via an RS232 connector.



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I Production mode

ALL EQUIPMENT

- Ensure that all equipment is clean and ready for use.
- Check that all connections are correct.

PRODUCTION EQUIPMENT

- Load the first batch of liquid material into the vat, by vacuum suction or using a pump, until the first agitator disc is covered by at least 20 cm.
- Switch on the double-disc agitator to 600 rpm and the anchor to 10 rpm.
- Maintain the temperature throughout the process using the heating or cooling system, as appropriate.
- Load the solids, by controlled vacuum suction, in the order stipulated in the formula through the bottom of the vat using the valve. Solids should be added slowly to ensure that they are correctly dispersed by the agitating system.
- Once the product covers the disc of the second agitator, increase the speed of the first agitator to 1000 rpm and start the second agitator at 600 rpm.
- Once the product covers the second disc of the first agitator, increase the speed of both agitators to 1200 rpm.

The maximum speed should always be set in accordance with the viscosity and stirring vortex of the product.

The whole process should be performed under vacuum to prevent the incorporation of air into the mixture, thereby increasing the sheen of the final product.

- Agitation should be maintained for 15 minutes after addition of the final component.

FINISHED PRODUCT

- Once mixing is complete, the speed of the anchor is increased to 15 rpm and the valve opens.
- The product is pumped into stock tanks.
- If a storage tank is used prior to filling, it should be fitted with an anchor-type stirring system to maintain the product under suitable conditions until filling.

FILLING

- Filling is performed from the stock or storage tanks using a transfer pump.
- It is recommended to insert a SIL PIG system in the line. This allows any product remaining in the pipes which lead from the transfer pump to the entry to the filling system to be recovered, thereby helping to maintain and clean the line.

WASHING

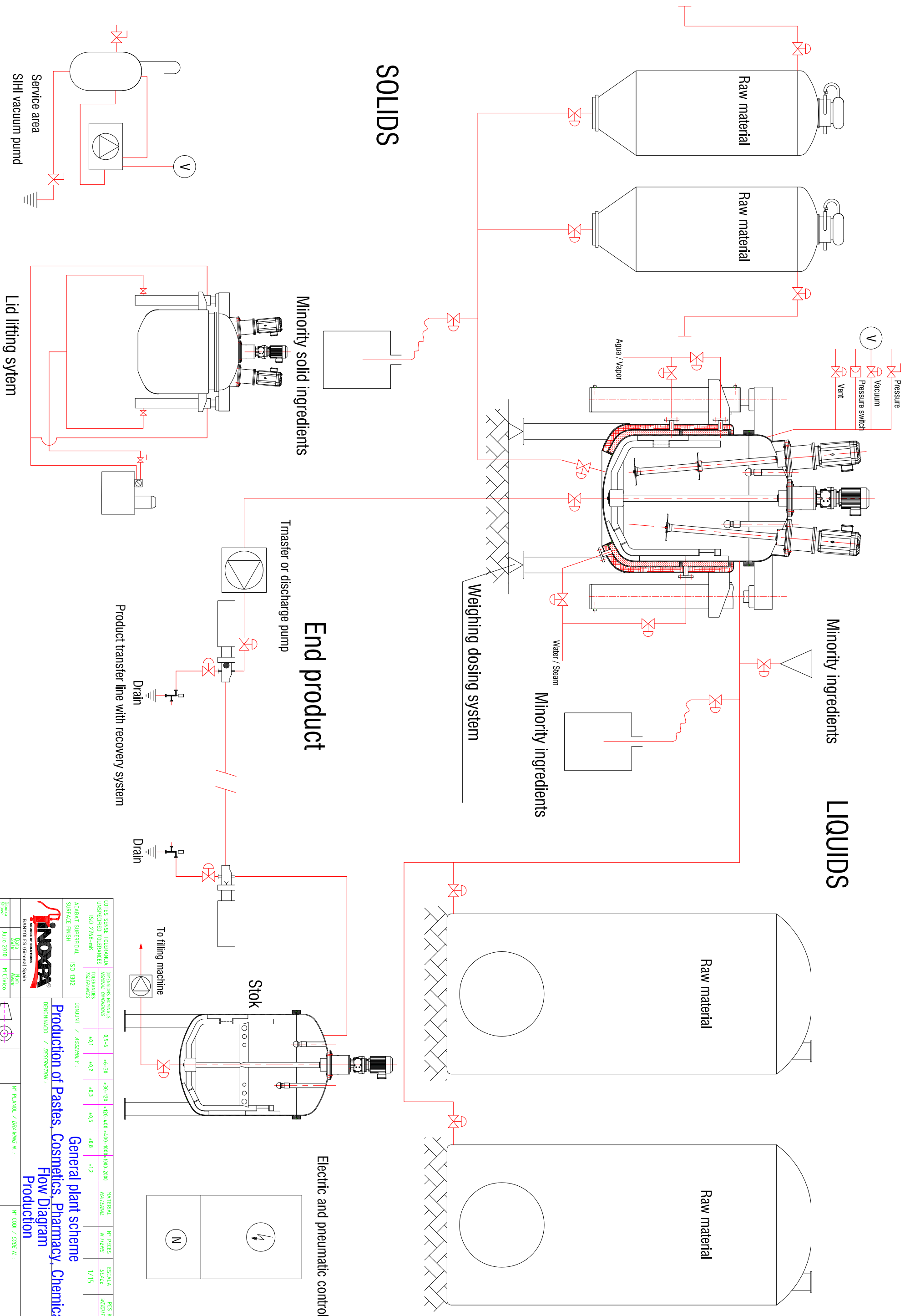
- All equipment can be cleaned using a CIP system or manually with a pressure hose and directable nozzle.

I Production equipment

Type	Usable capacity (litres)	Power			Double jacket	Lid lifter	Weighing system	
		Anchor	Double agitator	Single agitator				
Standard	VS 1000	1 000	~ 10 kW	~ 25 kW	~ 15 kW	Yes	Yes / No	Yes
	VS 2000	2 000	~ 18 kW	~ 30 kW	~ 20 kW	Yes	Yes / No	Yes
On request	VS 3000	3 000	~ 22 kW	~ 40 kW	~ 30 kW	Yes	Yes / No	Yes
	VS 4000	4 000	~ 25 kW	~ 50 kW	~ 40 kW	Yes	Yes / No	Yes

Type	Usable capacity (litres)	Discharge port	Lower load port	Loiquid load port	Vacuum connection	CIP system	Discharge pump
Standard	VS 1000	DN80	DN40	DN50	DN50	Yes	Yes
	VS 2000	DN80	DN40	DN50	DN50	Yes	Yes
On request	VS 3000	DN100	DN40	DN50	DN50	Yes	Yes
	VS 4000	DN100	DN40	DN50	DN50	Yes	Yes





COTES SENSE TOLERANCIAS UNSPECIFIED TOLERANCES ISO 2768-mK		DIMENSIONES NOMINALES NOMINAL DIMENSIONS TOLERANCES		ACABAT SUPERFICIAL ISO 1302		CONJUNT / ASSEMBLY	
0.5-6	+/- 0.1	+/- 0.1	+0.2	0.5-6	SA-30	SA-30	SA-30
6-30	+/- 0.2	+0.2	+0.3	6-30	SA-120	SA-120	SA-120
30-120	+/- 0.3	+0.3	+0.5	30-120	SA-400	SA-400	SA-400
120-400	+/- 0.5	+0.5	+0.8	120-400	SA-1000	SA-1000	SA-1000
400-1000	+/- 0.8	+0.8	+1.2	400-1000	SA-2000	SA-2000	SA-2000
1000-2000	+/- 1.2	+1.2		1000-2000			
MATERIAL	MATERIAL	Nº PIEZAS / N.º PARTS	ESCALA / SCALE	RES. Kg / WEIGHT / kg			
			1/15				

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General plant scheme
Production of Pastes, Cosmetics, Pharmacy, Chemical
Flow Diagram
Production

Nº PLANOL / DRAWING N.º :
 Nº CODI / CODE N.º :

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