Content

1 The Scanima Concept

Scanima A/S is a limited company with its registered head office in Aalborg, Denmark. Scanima employs approximately 85 people.

Scanima Head office

Scanima A/S is specialised in manufacturing and developing Turbo Process Mixing Systems, High Shear Mixing Plants, Blending Vessels, Cooling Vessels and In-Line Mixing – supplying to the world market.

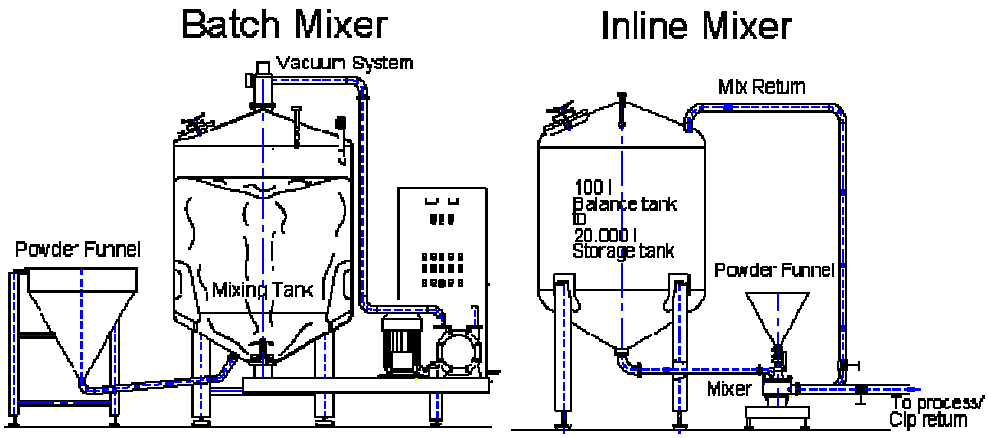

Figure 1-1 The Batch versus In-line mixer principle

Section 1.1 gives basic process principle for our Inline Mixers, whereas section 1.2 gives basic process principle for our Batch Mixers. Please read these descriptions in order to see the great world of Scanima Mixers. Section 1.3, 1.4 and 1.5 gives principle of vacuum, vortex and steam.

Scanima can meet all national standards and regulations when supplying equipment. Our highly educated and experienced staff will make sure that the Scanima Systems will work to your satisfaction.

The Scanima Systems are used for producing:

Dairy Products, Prepared Food, Baby Food, Convenience Food, Pre Spray Dried, Health Care, Cosmetic, Veterinarian, Dental, Technical, Chemical and Pharmaceutical Products.

The Scanima Systems technology gives optimal liquid/liquid, liquid/powder or liquid/solid mixing, with or without high shear mixing.

Products/ingredients homogenise, emulsify and disperse in a matter of a few seconds, even products with a very high total solids or very high viscosity. Particles can be blended gently into the product. All powder and additives can be drawn into the system by vacuum, and the product can be de-aerated. All these functions can be fully automated to suit the individual product and process.

To achieve this total process, technology has taken several years of on-going research and development. Scanima can confidently say that we can provide equipment which will give you an "**All in one process**" production and therefore reduce processing time, handling time, down time for CIP/cleaning and down time for maintenance.

The Scanima system "**All in one process**" gives you:

- Turbo Mixing
- High Shear Mixing
- Gentle Mixing
- Blending
- Homogenising
- Emulsions
- Pasteurisation
- Dispersing
- In-Direct Heating
- Direct Heating
- De-Aerating
- Cooking
- Cooling

Please refer to www.scanima.com for further information.

1.1 Process principle - Inline Mixer

The Scanima Turbo Mixer is a self discharging mixing plant which can be operated with continuous discharge to a buffer tank

A pre-set amount of (preheated) liquid (water - milk - etc.) is fed into the buffer tank and brought into circulation over the Scanima turbo mixer. Powder and additives are fed into the mixing vessel or into the powder funnel. The raw materials are mixed with the liquid to a homogeneous product under circulation over a buffer tank (see Figure 1-2).

When the desired dry matter content and/or composition are reached, the product is discharged from the buffer tank.

The efficient turbo unit produces a homogeneous product free from lumps and ensures optimal wetting and processing. A continuous processing is achieved by using two or more buffer tanks, arranged for alternating storing or emptying.

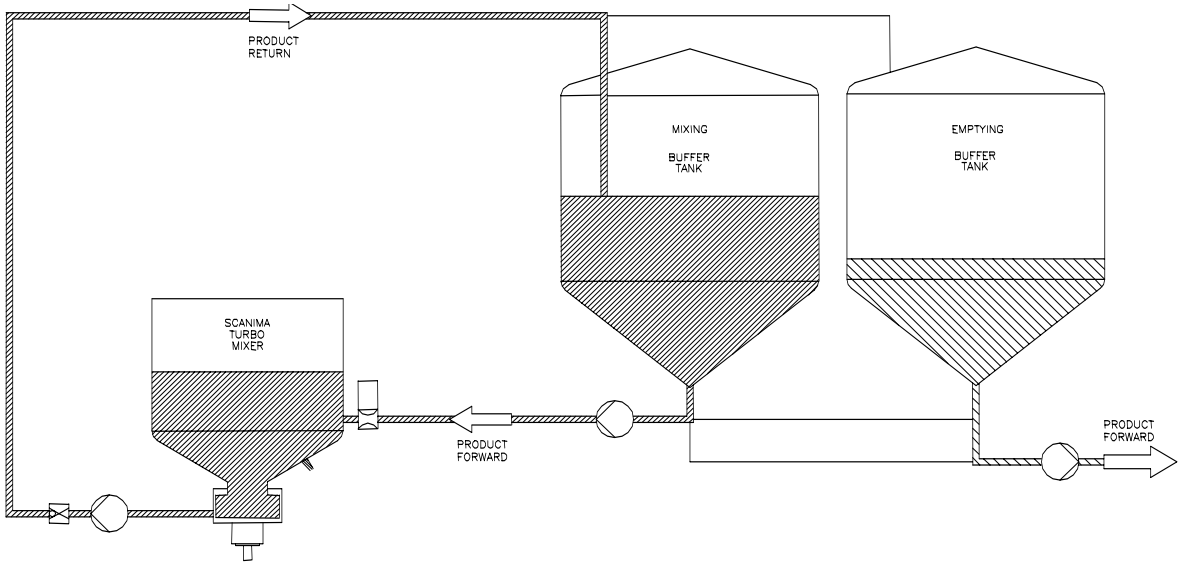

Figure 1-2 Principle for continuous processing

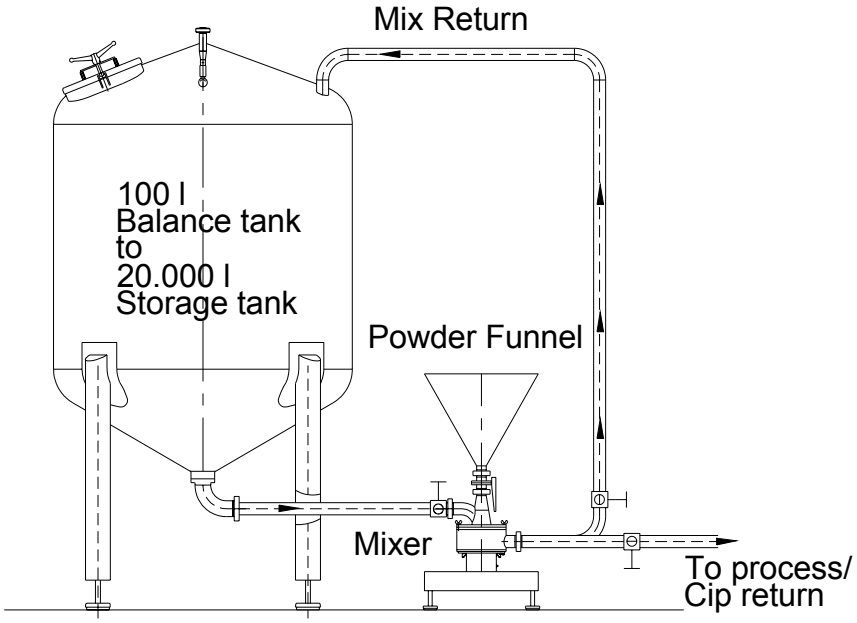

Figure 1-3 Principle for continuous processing, SFM 200

1.1.1 Inline Mixing unit, principle

The mixing plant is built around the special designed turbo, see Figure 1-4. When operating the turbo unit the product is sucked down into the turbo wheel and pressed out through the holes in the perforation ring. On its way through the perforation ring, the impeller wings cut the product.

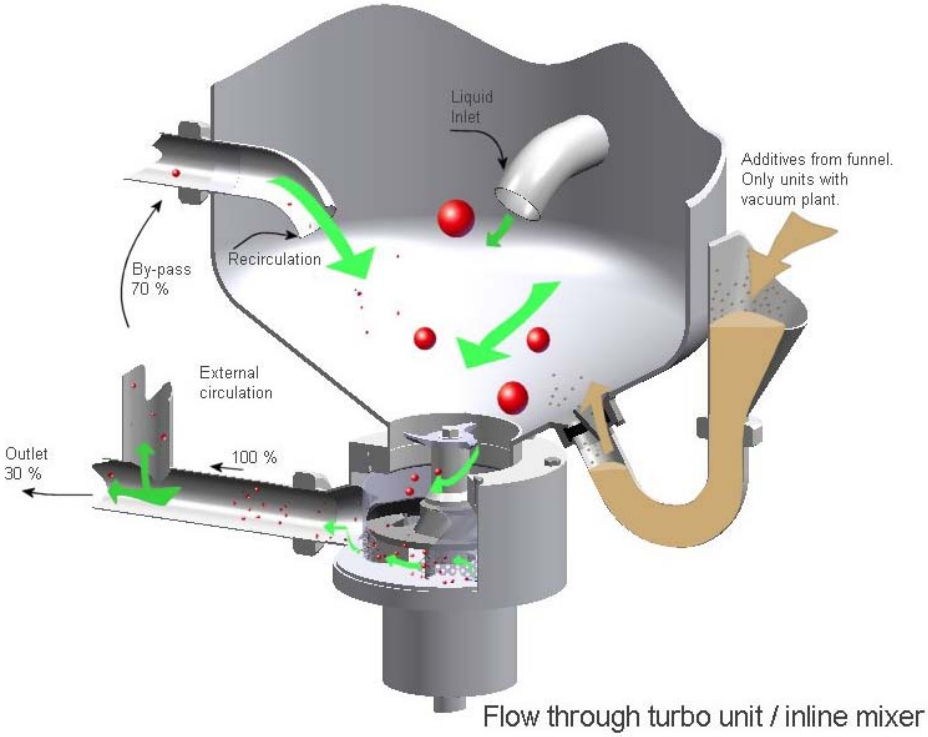

Figure 1-4 Inline Principle

1.2 Process principle – Batch Mixer

1.2.1 Turbo unit principle

Scanima's new revolutionary Dynamic stator system now allows the same machine to be used for high/low shear mixing and blending by raising/lowering the stator. Powders and liquids can be mixed in seconds using high shear; the mixture can then be powerfully circulated using no shear. This innovation further enhances our superior all-in-one system.

When homogenising/dispersing the product it is pushed through the small holes in the stator ring, however with the adjustable stator ring you can lift the ring and by that create "free flow". The mixer will then work as agitator/blender.

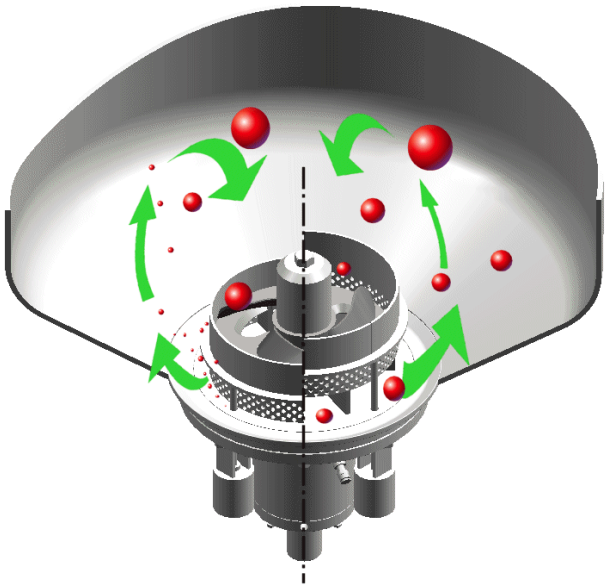

Figure 1-5 Adjustable stator in the Scanima Mixer (optional)
Left side: Stator ring in homogenising/dispersing position.
Right side: Stator ring elevated for agitating/blending mode

When operating the turbo unit, the stator can be put into one of two positions. With the adjustable stator you can put the stator ring in the Homogenising /dispersing position. In that position the product is sucked down into the turbo wheel and pressed out through the holes in the perforation ring. On its way through the perforation ring the impeller wings cut the product.

With the adjustable stator in the agitating/blending position, the product will be sucked down into the turbo wheel and out through the bottom, under the perforation ring. In that position the wings will not cut the product.

The turbo unit can, depending on how the customer wants to run the mixing plant, be equipped with a knife or a blind cap and perforation rings with different shape of holes.

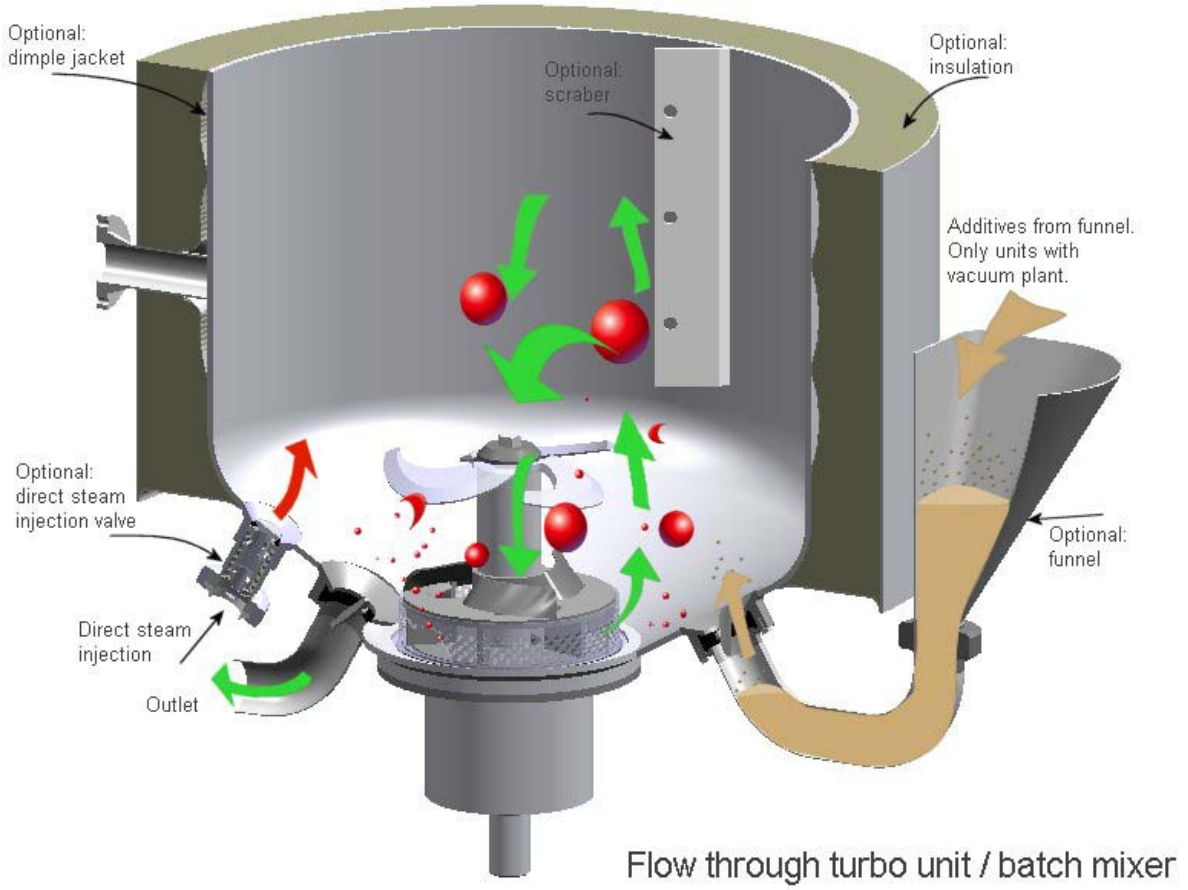

Figure 1-6 Principle function

1.3 Vacuum system

The mixing unit is equipped with a vacuum system that can create vacuum in the mixing vessel down to approximately –0,85 bar. This feature has two advantages:

- Powder can be sucked into the vessel due to the vacuum in the vessel.
- Product can be de-aerated, as air is sucked out of the product. (Applicable to batch mixers only)

The vacuum is established by a vacuum pump. The capacity in terms of powder transport is in theory equal to the capacity of the vacuum pump. In practice capacity in terms of kilos is reduced by other parameters: Air in powder, Humidity, Powder type and geometry of the powder convey line. Capacity of a specific application must be determined by trials.

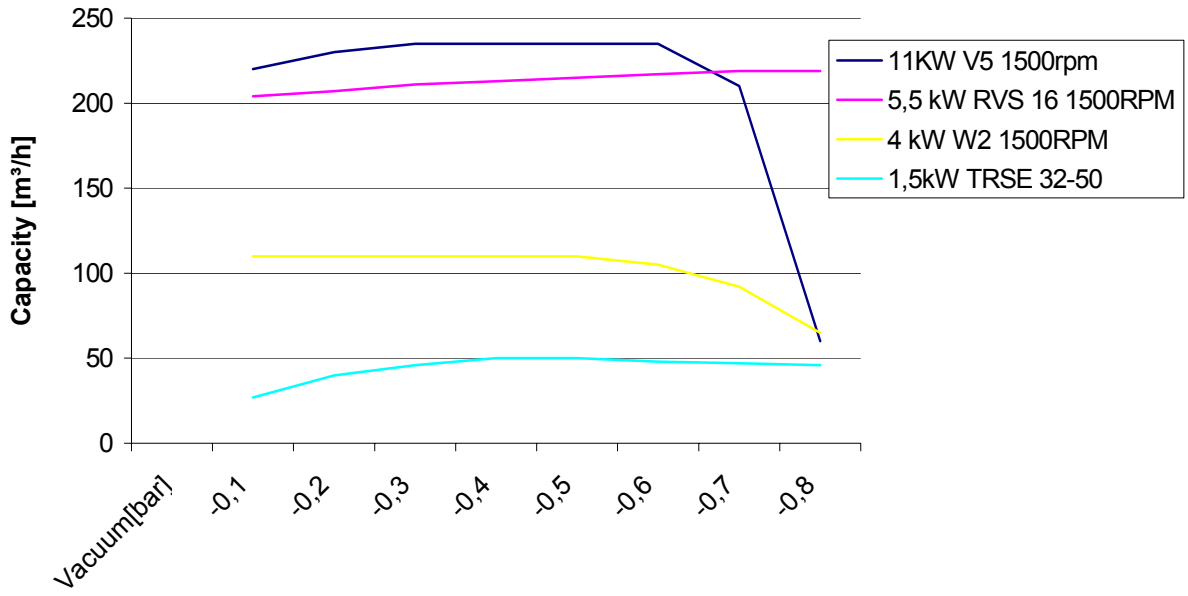

Figure 1-7 Capacity of vacuum pump in terms of Air

1.4 Vortex control

Mixers can create a vortex in the product, which helps the powder getting down to the mixing head. A big vortex helps the mixing process, but on the other hand, the vortex allows air to get into the mixer and the product might foam heavily. Hence the vortex size must be controlled. This can be done by means of:

- Mixer rpm
- Mixer vessel level
- Recirculation (increases rotational speed in vessel)
- Extra propeller on mixing head

Apart from the above-mentioned bulletin, other parameters are relevant for foaming. These are:

- Air content in powder
- Powder funnel runs dry and leaks in air
- Vortex in holding vessel leaks in air to mixer

The capacity of the mixer is also dependent of the viscosity of the product. Adding powder by using the full capacity of the vacuum pump or by manual feeding may cause the viscosity of the mixed product to be increased, and this again will cause a low flow in terms of volume when using an in-line mixer (or a pump).

To keep viscosity down, powder in-take must be levelled to the flow through the in-line mixer. This level is to be found by trials.

1.5 Steam system

The temperature of the steam is dependent of the steam pressure. The correlation between pressure and temperature are given in following table together with specific volume, heat capacity etc. for steam.

Pressure	Steam Temp	Steam Temp	Specifik volume (steam)	Heat of Saturated Liquid (water)	Latent Heat	Heat of Saturated Liquid (water)	Latent Heat
bar(a)	°C	°K	m^3/kg	kJ/kg	kJ/kg	kcal/kg	kcal/kg
1,0	99,60	372,75	1,6940	417	2,257	99,7	539,3
1,5	111,40	384,55	1,1590	467	2,226	111,5	531,8
2,0	120,20	393,35	0,8854	504	2,201	120,5	525,9
2,5	127,40	400,55	0,7184	535	2,181	127,8	521,0
3,0	133,50	406,65	0,6056	561	2,163	134,1	516,7
3,5	138,90	412,05	0,5240	584	2,147	139,0	512,9
4,0	143,60	416,75	0,4622	604	2,133	144,4	509,5
4,5	147,90	421,05	0,4138	623	2,119	148,8	506,3
5,0	151,80	424,95	0,3747	640	2,107	152,8	503,4
6,0	158,80	431,95	0,3155	670	2,084	160,1	498,0

Table 1-1 Steam data

Direct steam

Direct steam is used to heat up the product with steam which is injected direct into the product, See figure below.

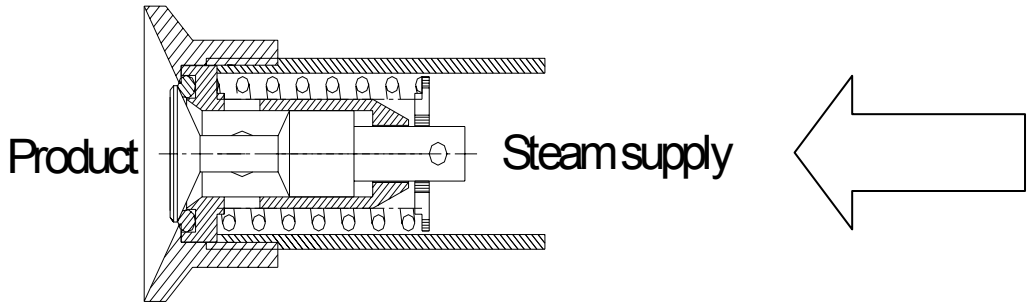

Figure 1-8 Direct steam valve

Indirect heating or cooling

Indirect heating is used to heat up the product with steam, which is circulated via a dimple jacket, See Figure 1-9

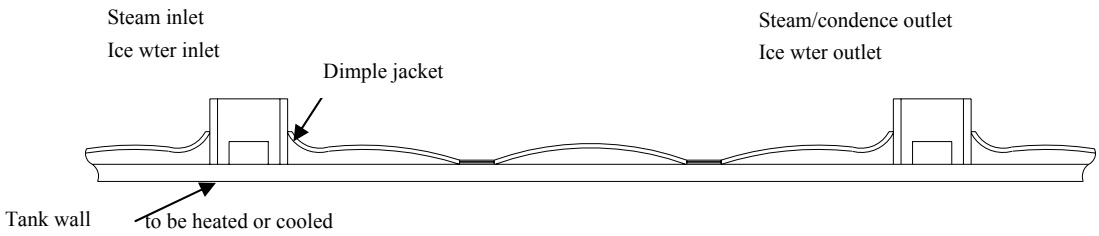

Figure 1-9 Dimple jacket principle

1.6 Agitator

Mounted with scrapers, the agitator prevents burning of product on the tank wall.

In general, the agitator is used for gentle agitating the product, but can also help the mixing process if rotated in same direction as the turbo unit, in order to facilitate a better vortex for products with high viscosity or large vacuum tanks.