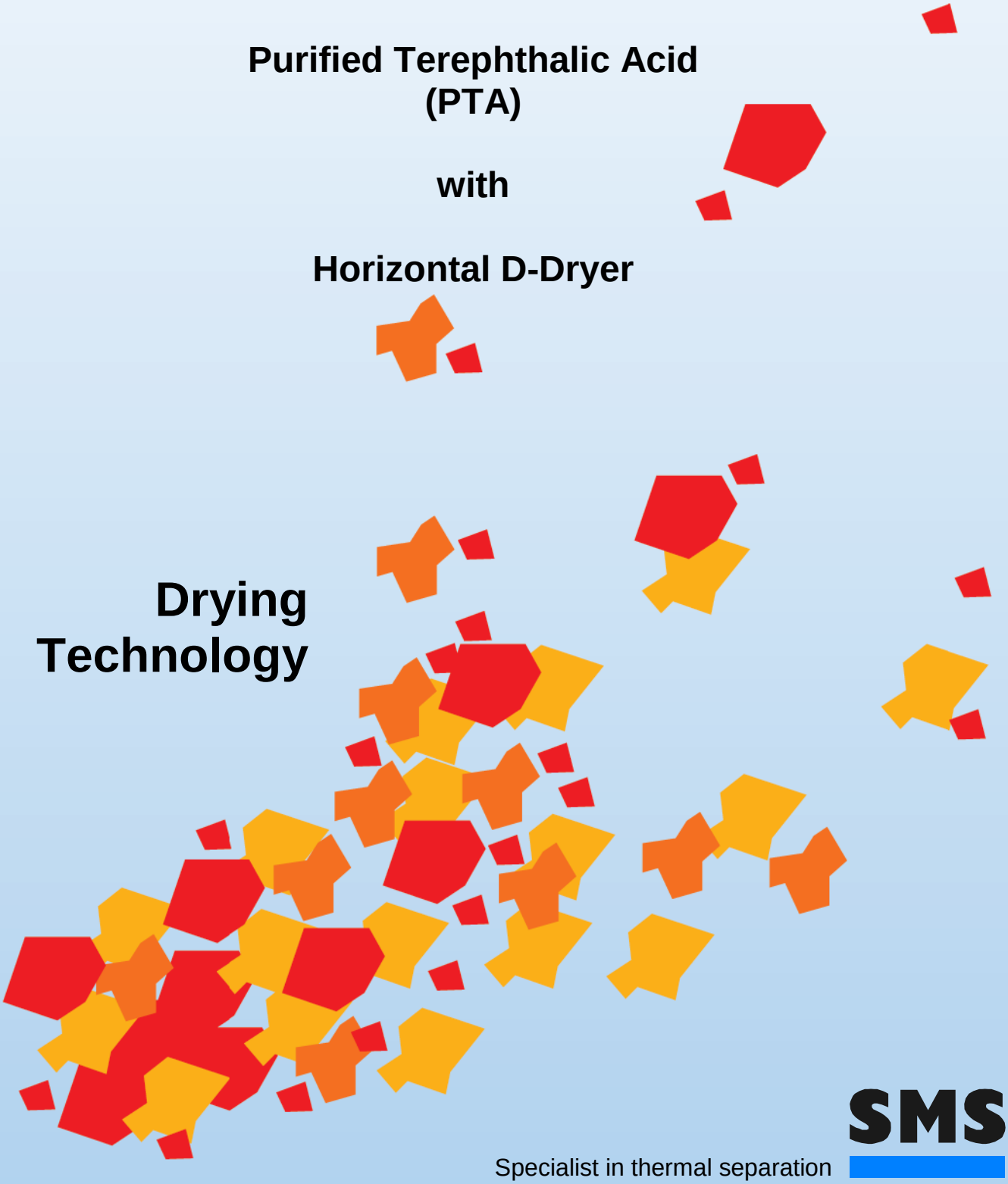
Buss-SMS-Canzler

Continuous Drying of water wet

Purified Terephthalic Acid (PTA)

with

Horizontal D-Dryer



Drying Technology

SMS

Specialist in thermal separation
and membrane technology

The production of Purified Terephthalic Acid (PTA) can be divided into two process stages where DRYING of Terephthalic Acid is being applied, namely

a) Drying of Crude Terephthalic Acid (CTA), where mainly acetic acid has to be driven off
b) Drying of Purified Terephthalic Acid (PTA), where mainly water has to be driven off

a) In the former case, where acetic acid has to be removed from the CTA, also segment disc dryers are installed. In this application Buss-SMS-Canzler is well established in the process stage with their segment disc dryers, type Rovactor.

However, for the CTA-Drying we believe that the Horizontal D-Dryer is also most suitable for this process stage due to its self cleaning effect of the rotor on the heating surface.

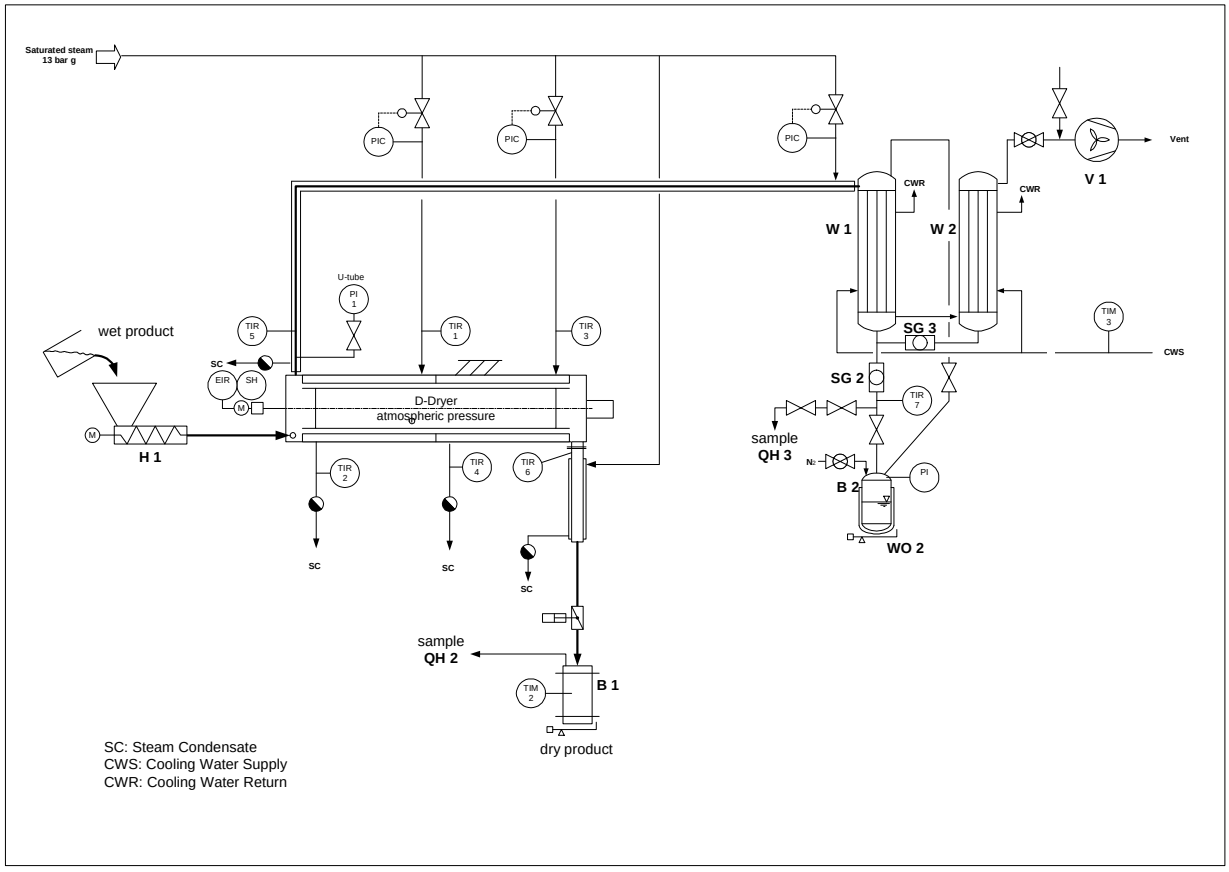
b) In the latter case however, where water has to be driven off from the final PTA, traditionally Steam Tube Dryers (STD) have been installed over the last decades.

The drying of water wet PTA is a very simple process. During the drying, the product does not pass through a pasty or gummy phase.

This gave us the initiative to have a closer look into this final drying stage by conducting extensive Pilot Tests on our continuous operating horizontal Thin Film Dryer.

These pilot tests underlined that our Thin Film Drying Technology is best suitable for the drying of water wet PTA.

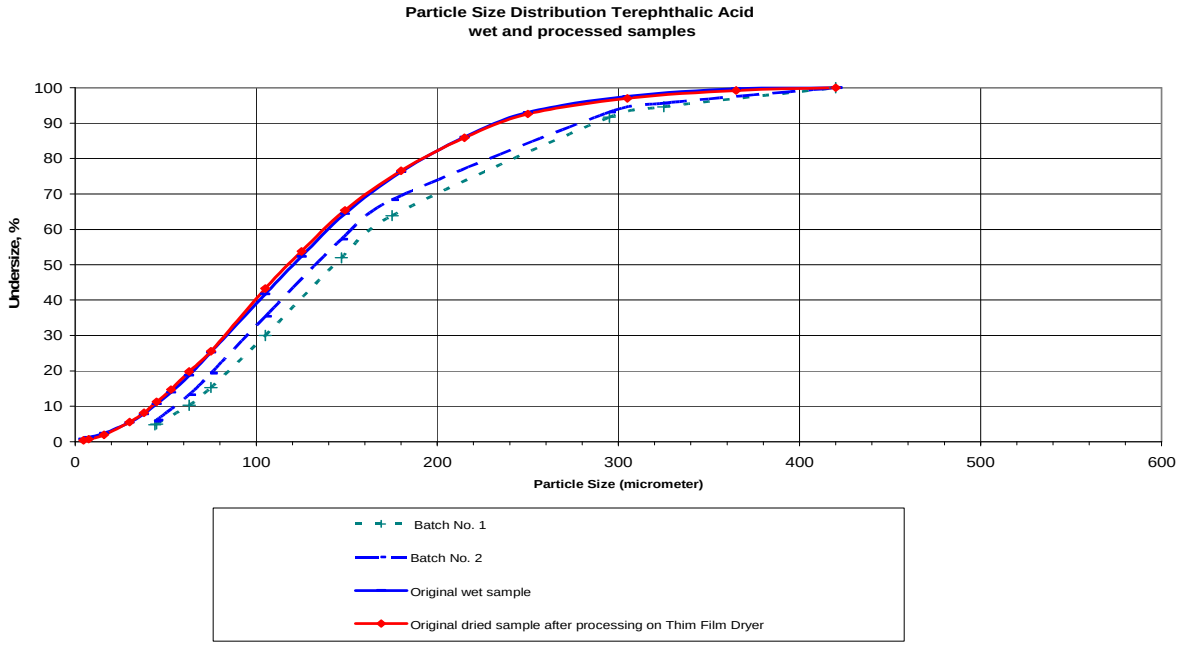
A flow diagram of the Pilot Test arrangement is shown below



A short summary of the achieved Pilot Test results are:

inlet moisture	8 – 15 wt%
heating agent	saturated steam
steam pressure	4 – 12 bar
operating pressure	slight negative pressure
achieved final moisture	< 0,1 wt %

After the Pilot Test particle size analyses were done to underline that the rotor turning at high speed has no negative influence on the particle size distribution.

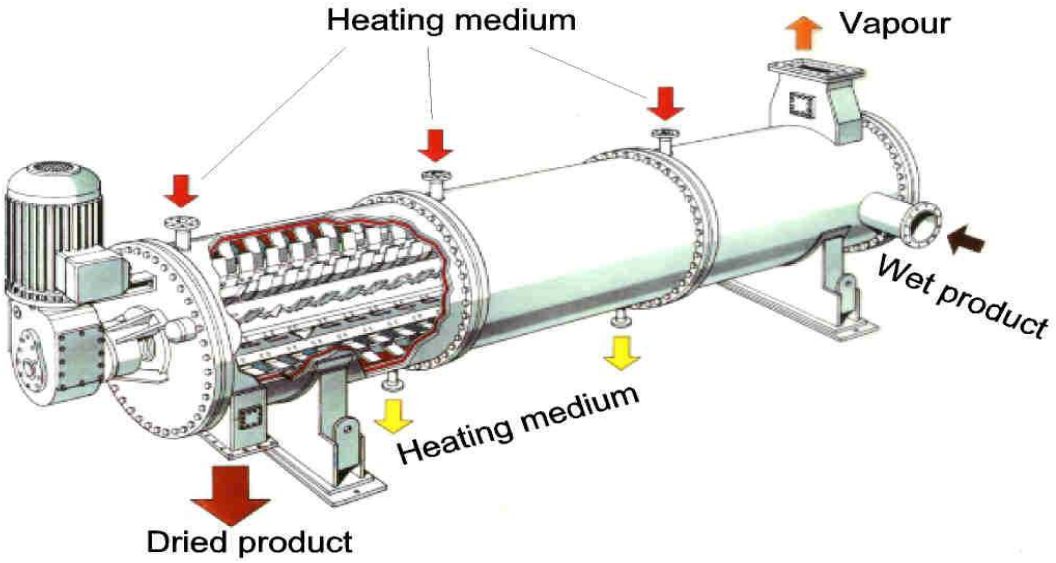


The above diagram shows that on one hand the particle sizes can differ between production campaigns and on the other hand that the particle size distribution does not change between original wet sample and original dried sample after processing with Thin Film Drying Technology.

In the following we explain the operation principle of the Thin Film Dryer in general.

The wet product is fed through the inlet nozzle into the dryer via a screw feeder. Continuous feeding is recommended for this type of dryer. In the dryer the product is picked up by the distributing and conveying rotor elements and accelerated to their peripheral speed. The product then moves along the steam heated dryer inner wall in a thin film and simultaneously the volatile components are driven off. If product properties change the final moisture content can be adapted by altering the process parameters and if required also the rotor configuration in relation to number of conveying and distributing elements can be altered. The product passes through the dryer in an average range of approx. 10 minutes. A small negative pressure is being applied inside the dryer.

Due to the thin product layer over the entire length of the dryer the product hold up inside of the machine is small which is a big advantage for short start-up-, shut down- and response times due to alterations of operating conditions.



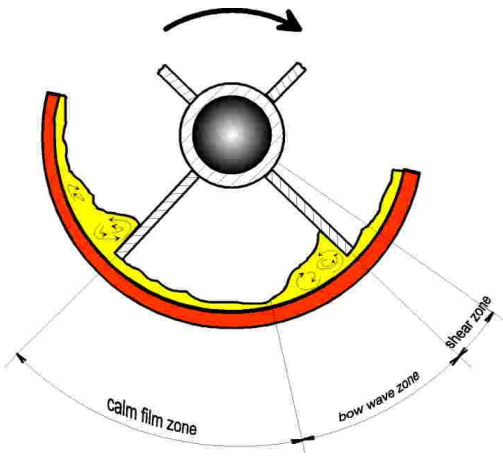
For better understanding of the Thin Film Drying Technology, we would like to explain the latter a bit more in detail.

The rotor is equipped with fixed elements. The distance between the tip of the blades and the shell is in the range of 2-10 mm depending on the size of the machine. The tip speed of the rotor is typically set to 8 - 10 m/s. The product layer is evenly distributed over the shell due to the centrifugal forces created by each rotation of the rotor. In front of a blade a so-called bow wave is built up. Within this bow wave high turbulences take place, influenced by the mechanical movement and the vapours coming from the evaporation.

The picture shows the principle of the horizontal thin film dryer. The red coloured segment shows the jacketed cylindrical housing. Steam or thermal oil can be used as heating medium.

The product has then to pass through the gap between the blades and the shell, which also intensifies the contact to the heated shell and increases the heat transfer. After passing the blades, a calm zone is given, followed by the next bow wave.

The generated vapours go into the free space between product layer and rotor and from there to the vapour outlet flange



Principle of the horizontal thin film dryer

The thin film, as described, has two characteristic properties:

- The thin film layer is highly turbulent
- The heat transfer rate is extremely high

The horizontal Thin Film Drying Technology has a number of significant advantages

- Drying principle	contact drying only
- External heating jacket	stationary
- Jacket gaskets	static
- Internals	single, rotor
- Rotor speed	fast rotating
- Thin product film	highly turbulent
- Heat transfer rate	extremely high
- Heating surface	self cleaning
- Rotor blade configuration	adjustable
- Sweep gas	not required
- Sweep gas conditioning	not required
- Hold up	very small
- Active heating area	100% of install. area
- Heating steam inlet	stationary nozzle

To us these features show, from the design and maintenance point of view, quite some substantial advantages in favour of the Buss-SMS-Canzler horizontal Thin Film Drying Technology.

In addition, due to the fast rotating rotor, a high turbulence is achieved resulting in higher U-values and therefore, the required overall heat transfer area is considerably smaller.

For further detailed information please see our web site at http://www.sms-vt.com/ or write to info@sms-vt.com

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