



## Optimal powder dispersion

# All process steps in one machine

**Powders are used in the production of many different products. Whether in lacquers or paints, sealing compounds, adhesives or construction chemicals, food and cosmetics – the production of all these products requires the addition of powders into liquids. To achieve best results, the powder has to be dispersed perfectly. Using conventional agitators, mixers or dissolvers this is impossible or at least very difficult. However, there is a solution: The Conti-TDS from ystral inducts and disperses powders optimally.**

**M**ain target in the processing of powder is its complete wetting, desagglomeration and homogeneous distribution in the liquid. The process starts with the transfer of the powder into the process tank, incorporation, wetting and dispersion and finally ends with the homogenous distribution in the liquid. Ystral TDS machines are designed to handle all five steps in one single machine. The meaning of TDS is Transport and Dispersion System. This combination not

only streamlines the overall process, but also reduces production costs and time.

### Dust-free handling

Conventional powder addition from top into a process tank always creates dust. But TDS machines add the powder in a different way, they induct it with vacuum. The vacuum is created by the machine directly inside the liquid. This way the powder is incorporated dust free directly from bag,

hopper or container. The dust-free induction is one of the key arguments to use that system. No powder is poured onto the surface of the liquid. No bag has to be lifted on top of the vessel. No dust sticks to the inner wall of the tank, and no powder is emptied onto the surface of the liquid in the presence of solvent vapour.

TDS machines are available in two basic versions. The TDS-Induction mixer is installed inside the tank. It mixes homogeneously and inducts the powder sub surface. The other version, the Conti-TDS, is installed in a loop outside the tank. Powder is inducted in line. Powder and liquid enter the machine via separate inlets and get in contact with each other not before reaching the high shear dispersing zone. Dispersion is carried out under maximum vacuum and high shear. If the powder concentration is low, it may be inducted completely in just one single pass. This method is used for example during filling a tank or transferring a product into another vessel.

Since powder is inducted directly into the liquid, it can be inducted easily into flammable liquids as well. When using the term “flammable liquid” this is not quite correct: it’s a matter of fact, that the liquid itself is not inflammable, only the vapours above it. Using Conti-TDS the powder is inducted into the streaming liquid under vacuum. It does not get in contact with any inflammable vapour above the liquid.

### Wetting and dispersing

Powder has a large specific surface. The powder in a normal 25 kg bag may have a

Conti-TDS between three process vessels



Pictures: Ystral



Powders and liquids collide dust-free only in the dispersing zone of the Conti-TDS



Conti-TDS module with process vessel on load cells and powder addition from a big bag station

surface in the range from less than 100 000 m<sup>2</sup> to more than a square kilometre, depending on particle size and structure. This huge surface has to be wetted with liquid completely. When powder is poured into the tank from above, it is added to a liquid surface of not more than a few square meters. Of course the powder is somehow getting below the liquid surface with the movement of the agitator, but the extreme mismatch of powder and available liquid surface causes the formation of agglomerates. These agglomerates have to be destroyed again. This takes time, requires energy and often destroys shear sensitive ingredients in the formulation.

The Conti-TDS works differently: The vacuum expands the air between the powder particles and separates them on their way into the dispersing zone. The turbulence in the high shear zone increases the liquid surface a million times. This way every single particle is wetted completely without the formation of agglomerates. Normally the machine can be stopped after induction and the dispersion process is finished already.

### Not only for powders

The TDS process is not restricted to powder induction alone; the same machines can be used for the dispersion of liquids into liquids as well. This is especially interesting for oil/water emulsions, but also, when liquids with totally different viscosities have to be mixed. In the production of adhesives, coatings and anti-perspirants for example high-viscous thickener concentrates have to be mixed into a low viscous basic liquid. In a normal agitated tank, the gel swims on the

top or sticks to the wall. Real homogenous distribution is very difficult to get and takes long. Using the Conti-TDS the high viscous gel is dispersed into the liquid inline, meaning when it reaches the process tank it is already homogeneously dispersed. The opposite problem is mixing low viscous additives into very high viscous dispersions or pastes. The low viscous components remain on the surface of the high viscous material. With the agitator or dissolver you simply don't get it in. You can see the low viscous material standing on the high viscous mix. Here, as well, the Conti-TDS provides immediately a homogeneous dispersion in the external recirculation loop.

### Rheological additives

One of the most difficult and tricky field is the addition and dispersion of rheological additive powders. Rheological additives like thickeners or stabilisers are used to create a specific flow behaviour and texture in the final product. They prevent the product from separating and the dispersed ingredients from sedimenting or floating. They come as a powder, either inorganic or organic, and have to be dispersed into a liquid to create the required rheology. To achieve their maximum effect, they require a colloidal dispersion in the liquid phase. Because of their strong thickening effect, they are used in low concentrations only. They tend to form lumps and agglomerates which have to be broken down again. In a conventional powder addition, the product has to be further dispersed until all lumps are destroyed. Swelling and hydration of these powders starts immediately upon their

first contact with water. They develop shear-sensitive polymer structures and form gels. But from this point on, any further shear destroys the gel structure and reduces the thickening effect. Already hydrated gel is damaged. Finally, more powder has to be added since a part of the thickener is destroyed again by agglomerate dispersion. But Conti-TDS machines work in a different way. In the dispersing zone, the powder particles get in contact with the liquid under maximum turbulence and they are completely wetted on an individual basis and colloidally dispersed. At this moment the powder is not yet hydrated and therefore it is not yet sensitive to shear. The Conti-TDS wets and disperses every single particle. Agglomerates do not occur. Further subsequent dispersion when the gel gets shear sensitive is not required.

Conti-TDS machines are available in different sizes, with a power spectrum ranging from 3 to almost 300 kW. Depending on the application, they can be equipped with a variety of powder inlets and tools. Optimum equipment for powder handling and dosing comes with the system.

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