

# HIGH EFFICIENT MIXING IN FRAGRANCE AND FLAVOR APPLICATIONS

One of the most undervalued step in modern manufacturing processes is the mixing of liquids. This operation is made in hundreds of processes, usually as an initial preparation for subsequent process steps and sometimes being a single process step creating a final product. Given the potential importance of this operation to the overall production cycle times, process control and even the product quality. It is worthwhile to spend some time to look more deeply into optimizing the mixing of liquids.

The most common equipment used by industry is centrally installed. Simple 'stirrers', with low speed and low power which do not give the desired result in an optimal way and subsequently lead to long process times, inhomogeneous batches as well as potentially creating problems in downstream processes.

Some typical issues associated with mixing in fragrance and flavor applications are highlighted here together with a solution which offers a highly flexible and extremely fast process with 'perfect' results, every time.

## Processing Fragrances

### Air

Using stirrers with open shafts typically leads to the creation of a vortex which will draw air into the processed product. Air is a 'poison' for fragrances because of potential oxidation which will result in a characteristic change of the 'desired' aromatic properties.

In addition, fragrance applications are often completed in explosion rated zones due to a low flash point of various raw materials used. Air that has been inadvertently added to the product by stirrers will leave the fluid through the surface which in turn leads to an increased vapor. This will contaminate the environment and may



Picture 1:  
Principle of the Jetstream  
mixer

even lead to an increased explosion risk. Entrained air reduces the mixing efficacy as the air leads to a significant damping of the energy input.

### Sedimentation

Dissolving of crystals in oil is one of the primary operations of the fragrance industry. If the batch is not efficiently 'mixed', which requires the lifting up of particles from the bottom of the vessel and not only rotating them in the vessel, most of these crystals will deposit in a layer towards the vessel bottom. The result is a high concentration of crystals in solution

and thereby a significant reduction in the ability of these crystals to dissolve. The product is therefore 'saturated' with no 'mass transport', the liquid/solid interface is not maximized and dissolving takes far too long.

Using a system that has no rotating shaft through the liquid surface and which does not create any vortices is the perfect solution for applications. Jetstream Mixers (see picture 1) are designed not to create any vortex and for mainly vertical, or axial flow, mixing. A Jetstream Mixer is a fast running mixer type (typically speed 1.500



Picture 2: Principle of Dispermix

upm, today more than 95 percent are driven via VFD) consisting of a stator, a rotor and a so called stator tube. The stator deflects the rotation of the fluid from radial flow into a vertical mass flow which is directed to the bottom of the vessel and finally directed in a vertical way up to the top of the vessel – against gravity. Sedimentation is not possible and the batch is perfectly homogeneous ensuring that every crystal is able to dissolve as fast as possible.

### Processing Flavors

In addition to the points mentioned above, the processing of flavor usually needs to add powders as well as liquids. Many of these powders have the tendency to float on the liquid surface which builds lumps (eg maltodextrins or Arabic gum). These powders need more shear stress in order to adequately disperse them. The ystral Dispermix is the perfect solution for this application.

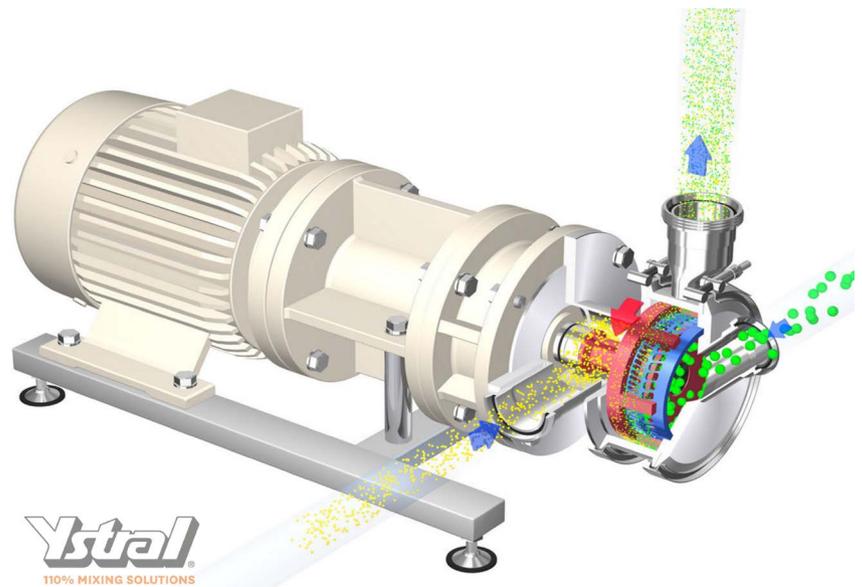
The working principle of this machine is a combination of Jetstream Mixer and Batch Disperser technologies see picture 2, where about 60 percent of the motor power is used for vertical mixing and about 40 percent is used for dispersing. The Dispermix also offers excellent emulsification abilities and can be used as tool for processing pre-emulsions, accelerating dissolving processes and even as a final disperser, depending on the specific product properties and process targets. Jet Stream Mixers and Dispermix are typically installed from the top, for vessels up to circa 2.5m<sup>3</sup>, and installed from the side for process tanks over this volume.

Besides all the advantages of using Jetstream mixers and Dispermix, one point has to be considered: adding of powders from the top of a vessel, directly on to a liquid surface, will always lead to problems:

- Floating powders will create lumps and crusts on the wall of the vessel.
- Pouring in powders through an ex-rated zone in the vessel is potentially dangerous due to static charge.

### The YSTRAL Conti-TDS

to avoid lumps and crusts at the wall of the vessel, a system is available that is able to ‘suck in’ powders by creating a strong vacuum. This system is working as a combination of – for example



Picture 2: Principle of Conti-TDS

- a pump, a homogenizer and a vacuum cleaner. By ‘sucking’ powders directly into this machine, instead of pouring them onto the surface of the liquid, the following advantages are quickly realized:
- No crusts or lumps form on the wall of the vessel or shafts of the mixers
- No Pre-Emulsification is necessary - during powder addition under the liquid surface, the dispersing process begins immediately
- No vacuum vessel is required
- Powder incorporation rates up to 150 kg/min are readily achievable, depending on the specific powders
- Induction of the oils and or aromas can start immediately after powder is added using the same machine
- Direct emulsification of spray dry emulsions and cloud emulsions down to ~1µm is possible – in most cases there is no need for the subsequent processing by High Pressure Homogenizer (HPH) - especially in the case of spray dry emulsions
- WIP/CIP/SIP can be readily realized
- Powder can be directly sucked in from Sacks/Bags/Drums with a suction hose, Sack Tipping Stations, Big Bags or Super Sacks, Containers or even from Silo’s.
- No additional filters needed
- The same machine can work as the transfer-pump as well as an Homogenizer
- Completely automated, closed process systems are readily realized.

The Conti-TDS is available in various sizes and successfully applied in all of the mentioned applications worldwide. The Conti-TDS, with its excellent powder wetting and dispersions capabilities, combined with the Jetstream mixer, for absolutely perfect homogeneous mixing, offers the user perfect products, reduced process times, reduced energy requirements, less need to filter, less expensive and faster cleaning steps and less man power requirements.

Source:  
Ystral gmbh