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Correct dispersion ensured

Non-electric explosion protection through slip monitoring

When transferring high mechanical power, blocking monitoring between the drive and output is required as overload protection. Thermal monitoring is excluded due to its inertia, as a blocked system transfers enormous power in fractions of a second. In addition to damaging the transfer elements, sparks can be generated: a side effect that should be avoided in hazardous areas. Rotational speed monitors are particularly suitable due to their fast responsiveness. The rotational speed or slip monitoring of a transfer unit is described using the example of a dispersing plant.

Common mixing operations

The introduction of powders (dust) into liquids is performed on a daily basis in many areas of process automation. In the food industry, such as dairy products and chocolate or in the production of toothpaste, cosmetics or hairspray, solids must be in introduced into media of varying viscosity. If the powder is only poured on the surface of the liquid and stirred, there is the disadvantage the dust settles on all machine parts, not to mention the side effects of inhalation by operating personnel. Lumps and deposits are not acceptable for quality reasons.

TDS – for dust prevention

TDS induction mixers are the ideal solution for dust prevention and powder wetting. These inline machines work according to the rotor/stator principle with high shear rates. TDS machines induct the powder directly from a bag into the liquid with a hose. The powder is wetted and dispersed with no lumps. The process takes place with a high shear gradient in a rotor/stator system that can be adjusted for different tasks.

Beware of jamming

The system can be subject to blocking due to foreign objects, highly-viscous media, or with media that solidify in a cold state. Such blocking requires a fast reaction, particularly in hazardous areas, in order to avoid damage to the system and prevent impermissibly high (surfaces) temperatures. Therefore, between the drive and TDS system there is a torque-dependent coupling that abruptly disengages when a previously set drive train torque is exceeded.

However, in the event of a fault or incomplete disengagement of the coupling elements, there is the danger of high surface temperature or even spark formation as a result of the high energy generated. This situation must be prevented for explosion protection. Initiators on the drive and on the output side constantly detect both rotational speeds and compare them for slip. The occurrence of slip is immediately detected and the drive can be switched off before a dangerous situation occurs.

Non-electric explosion protection in the dispersing plant

The explosion protection of non-electric apparatus is not possible without a basic knowledge of reliable ignition risk assessment. Whether or not a device has a potential ignition source is not always easy to answer. With implementation of the EC Directives 94/9/EC (ATEX 95) and 1999/92/EC (ATEX 137) regarding explosion protection, non-electrical explosion protection was also regulated throughout Europe. If the ignition risk assessment shows that a potential ignition source exists, measures must be taken to eliminate the risk. During ignition risk assessment, the following aspects should be examined: An electrostatic discharge can cause ignition. Devices with plastic housing components, for example, must be taken into consideration. Hot surfaces can ignite a potentially explosive atmosphere if the ignition temperature is exceeded. When a great deal of mechanical energy is transferred in a small space, the temperature can increase considerably due to friction losses under normal operation and in faulty operation (so-called predictable fault). All surfaces of the device that come into contact with the surrounding atmosphere must be considered.

In rapidly rotating systems, such as the TDS, fast temperature increases may occur due to mechanical energy transfer in the medium. A temperature monitor is essential so that every temperature increase is reliably detected and extremely high surface temperatures are prevented. Simultaneously, the temperature detection to control the process temperature can be used, to prevent damage to the product and protect it from overheating. Friction or impact sparks can occur if metal components, e.g., metal couplings, strike each other. These friction and impact sparks can occur during blocking of couplings and are controlled by slip

monitoring. Because of potential differences, electric sparks can occur. But they can be prevented with equipotential bonding.

Slip monitoring from Pepperl+Fuchs

"Slip" generally refers to the speed difference between mechanical elements or fluids in frictional contact, under tangential stress. In order to prevent premature damage to slipping clutches, conveyor belts and drive belts, the difference in rotational speeds between drive and output side are evaluated.

Slip monitoring must be clearly distinguished from synchronization monitoring. Synchronization monitoring compares the number of pulses and not the frequency of the drive and output side. With slip monitoring however, a short-term slip (difference frequency) within limits is tolerated and then "forgotten." At the next slip occurrence, this is newly evaluated without taking history into consideration.

Modern slip monitoring, such as the KFD2-UFT-EX2.D from Pepperl+Fuchs, even allows slip monitoring of couplings with downstream gear units or conveyor belts with transmission ratio. In addition, the input frequency is converted into an analog 0/4 - 20 mA signal output.

Summary

Rotational speed detecting systems provide ideal protection against overloads in drive units. They increase the service life of your plant and fulfill the requirements of non-electric explosion protection.

Key words: Pepperl+Fuchs, K-System, slip monitoring, coupling monitoring, rotational speed monitoring, Ystral, TDS, KFD2-UFT-Ex2.D, non-electric explosion protection, dispersion, dispersing plant

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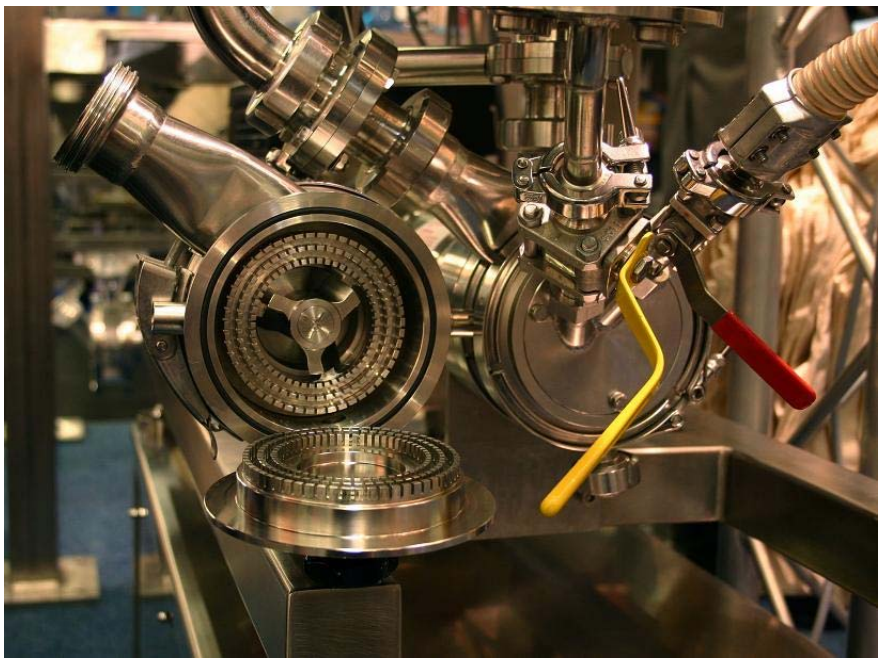

Fig. 1: TDS-dispersing system from Ystral

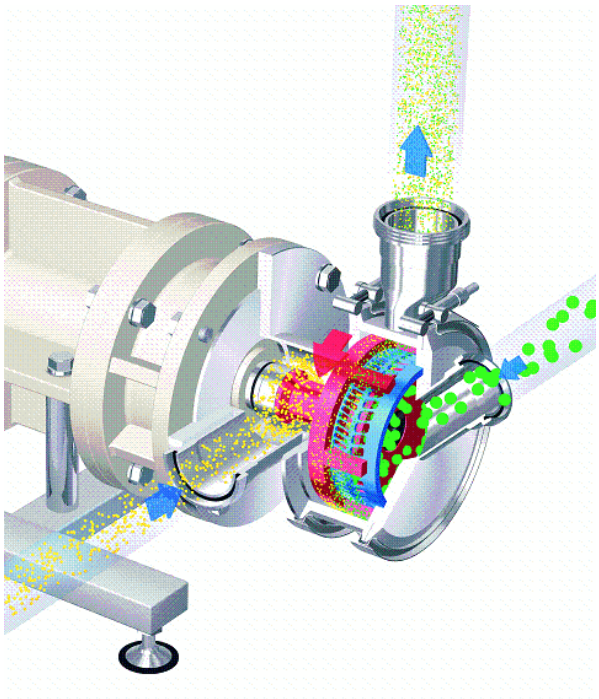

Fig. 2: Material flow in the disperser

Fig. 3: Mechanical structure of the disperser

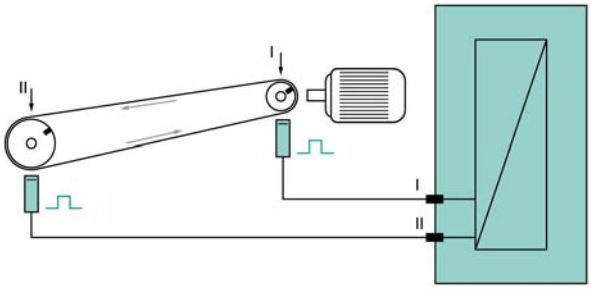

Fig. 4: Slip monitoring for a conveyor drive

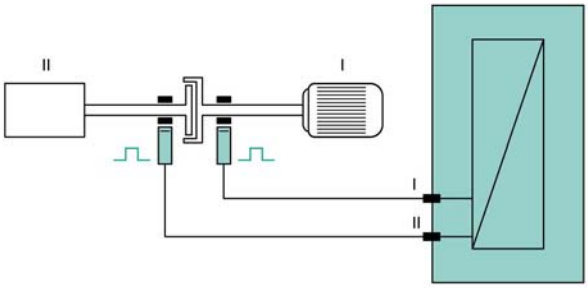

Fig. 5: Slip monitoring for a coupling

Fig. 6: Highly functional logic control units for slip detection