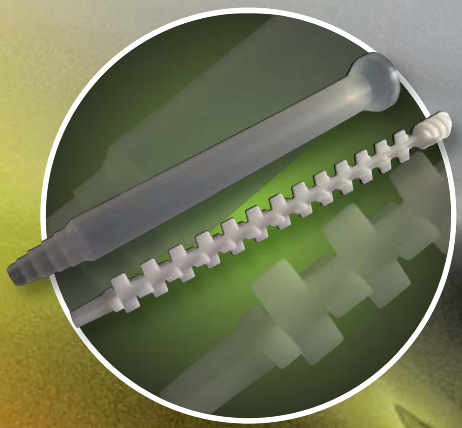
Q4 | Newsletter 2014

IN THE MIX

WHAT'S NEW

The Right Mixture Matters

PGM-Silicone



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The Right MIXTURE Matters...

Dynamic and Static Mixers

Reactive polymer materials consisting of two or more components by definition needs to be homogenously blended. We are all familiar with the process where two components are apportioned out of cartridges or tubes and then quickly mixed using a spatula, inducing air and possible leaving unmixed elements.

On an industrial scale this process is unworkable either because the processing time is too short or the amount of material too large. This is why special in line static mixer tubes were developed as these used the flow of the materials to fully mix the materials.

From Steel to Plastic

In 1924 the first static mixer was already used to mix materials in a mixer tube.

Initially, those mixer elements were made out of steel and needed to be flushed. Material developments and improved mold tools meant plastic mixers could be used. Compared to dynamic mixers, motionless or static mixers offer several advantages the mains ones being that they are inexpensive and thanks to their construction, maintenance-free items.

Nevertheless, the static mixers have a significant disadvantage. The quality of the mixture can depend on variables such as viscosity, temperature and flow rates leading to inconsistent mix quality. With these materials, using dynamic mixers was the only option.

The use of a dynamic mixer means that the reacting material needs to be flushed from the chamber to prevent the whole assembly being bonded solid. As the materials being processed are extremely strong the cleaning required aggressive solvents. Solvents in general, have the disadvantage of not being environmentally-friendly and quite costly to dispose of.

Attempts were made to overcome the specific disadvantage of a pure static mixer, by using a motor to drive the mixing element. This greatly improved the shearing of the material and hence the mixing quality and is used in many applications to date. The rotary static mixer no longer required the usage of solvents, as the inexpensive mixer elements along with the mixer tube were simply disposed after the mixing process. The process became more economical and environmentally friendly.

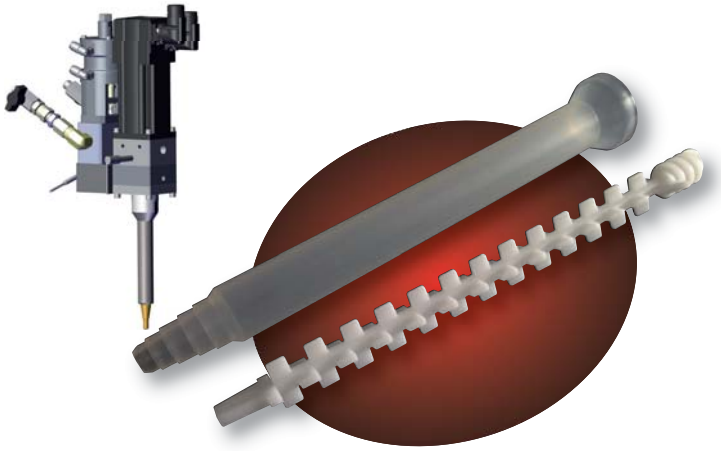
Unfortunately, the disposable plastic mixers were not perfect. Sometimes, during the mixing process the mixer element or actuation shaft would break. If that happened the component was classified as a failure and needed to be disposed of. Detecting a mixer break on viscous or opaque materials is nearly impossible. This limitation again narrowed the potential use of a good solution.

Overcoming the Challenge

Many different systems were tried to detect when a mixer had broken or not turning at all. This included inject mould metal elements in the mixer and ‘pick ups’ to monitor the rotation. That made the process more complicated and not quite ‘production efficient.’ 2KM really wanted to overcome the obstacles and starting working on the an innovative solution.

The focus remained on the following areas:

- We wanted the mixer to be made of plastic – light and easy to change
- We wanted to exclude the use of solvent
- The mixer had to be strong and break resistant



The Innovation

Working on all the above mentioned criteria lead to the **2KM Dynamic Mixer** with disposable mixing chamber. Through a robust design and innovative drive system, increasing material viscosity, through fast reaction or the mixer not purging often enough, would now prevent the motor from turning rather than snapping the drive or breaking the mixer.

Sensors were no longer required as the drive current on the motor, or sensors on the coupling can easily detect a stalled motor, stop the process and make the operator aware of an issue before the start of an application.

The new industrial standard has made possible to process materials that are difficult to mix, without the usage of solvents! This breakthrough offers considerable advantages especially in the medical industry where the production of dialyzers for example, was partially effected by the use of traditional dynamic mixer and volatile flushing agents. Contamination would be calamitous so producers would suffer poor mixing or variable results offered by the 'traditional mixing solutions.'

The new dynamic mixer developed by 2KM, can considerably contribute to quality improvement without the disadvantages of its predecessors.

The Requirement

In cooperation with the leading material manufacturers 2KM has developed an inline-metering procedure which meets the industry's requirements of mixing the right material blend at the point of application, reducing the amount of material in use and making the coating process more flexible. Moreover, it guarantees efficient handling of the raw materials.

The concept does no longer require the coating materials to be mixed in a central place (kitchen) and then transported to the converting unit. Instead, each converting unit is equipped with its own metering system.

Expectations were exceeded even during the prototype phase. The quantity of the mixed material, for example, could be drastically reduced. The reactive material mixture provided by the 'kitchen' usually a quantity of approx. 50kg (50.000g) could be reduced down to as little as 500g. That meant that only a maximum of 500g of material plus the content of the laminating unit have to be managed, leading to significantly reduction of the total wasted material.

PGM-Silicone

Efficient & Economical

Up until 10 years ago it was common practice in the paper and film finishing industry to manually apportion and mix coatings and polymers in the 'kitchen' close to the application area.

It hasn't always been an easy task to prepare the right mixture. Sometimes, the recipe would not completely meet the requirements as a reactive mixture cannot be stored for a long period of time and there were cases where the complete batches or residues had to be disposed of leading to variations in the process and large on costs to the process. Not ideal in an increasingly competitive manufacturing world.

One of 2KM's customers reported that the reduction of the disposed material alone meant that the unit had amortized itself within a period of 12 months!

The specific customer did not even need to change the production process, since thanks to a modern mass-flow measuring all the recipes could be administrated and metered in the accustomed gravimetric manner.

The Concept

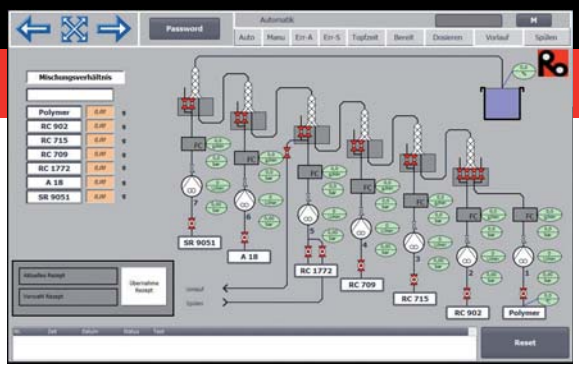
The concept based on a single metering process of all the components in the sector of polymer metering units this is not new, however, the use of in line, mass flowmeters, which allows monitoring and control of the complete process adjusts the system automatically to supply variations. This includes control of material density and temperature which are fully monitored, possible fluctuations detected, protocoled and alarmed when necessary.

Mixing of the various components is achieved by the innovative 2KM 'mixing cascade.' Here all the components are metered into each other progressively with the last, more reactive elements being mixed in the last station. This process dramatically reduces the flushing process since the rinsing part is done with the basic polymer, eliminating the need to use solvents.

Homogenization and in line blending is carried out by the plastic static mixers, which can be easily replaced in regular maintenance intervals by the machine operators.

The material amount is controlled dynamically by a non-contact level sensor mounted onto the laminating unit. The metering unit automatically adjusts its mater delivery rate to that of the converting unit. This, coupled with a speed input from the laminating process, corresponding to the running length and coating width, in combination with the metering unit's consumption data can give the coating's thickness in g/m^2. In the past, this value could only be calculated on the basis of the readily coated substrate.

The aim of an inline metering unit is to operate continuously reducing fluctuations which usually appear in Start/Stop operation. Installing two metering pumps per component covers the partially extreme ranges of recipes.



They can be switched on and off depending on the required application.

The ongoing further development of the metering units and drive technology allows the use of the precision gear pumps being driven by servo motors. These offer a considerably larger speed range and hence a bigger range of recipes opening up the options for the coater and giving the end users bespoke formulations.

New computer systems, with multiple interfaces allow the integration into the company's management system minimizing operator interface with the metering system and increasing process safety.

Conclusion

From both technical and economical point of view it is argued that mixing of the coating materials in the 'kitchen' does no longer fit in the modern lean production model. Many customers worldwide have realized it and have started using the modern inline metering systems.

Ongoing reasearh and developent allows continuous innovation in the paper and film finishing industry. 2KM is known for leading such developents!

The content of this issue has been kindly provided by Mr Uwe Roeger, CEO at 2KM GmbH. Mr Roeger has been part of the 2KM family for the past 23 years and is the head of 2KM Germany for the last 10 year. He is leading the developments around efficiency and revolutionising production while ensuring quality and excellent performance.

Bonding Coating Composite Spraying Moulding

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