



Case Study

Why PlastChem chose Hosokawa Nauta Mixers

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For its new 40,000m² state-of-the-art manufacturing and warehousing facility, PVC compound producer PlastChem placed a mega order for eight Hosokawa Micron Nauta mixers. Technical Manager Patrick Kok explains how these powder mixing machines contribute to better end product quality and operational continuity as the company pursues further growth, as well as supporting the company's long-term commitment to sustainability.

PlastChem, based in the Dutch town of Hardenberg, annually produces approximately 60,000 tonnes of high-quality PVC compounds for customers across Europe in a wide variety of industrial sectors. The compounds are used for products ranging from pipes and fittings to window frames, wall coverings and floorings. They are worldwide market leader for the production of vinyl records. The company also develops tailor-made PVC compounds with special properties such as foam, heat resistance and fire resistance in line with specific applications and customer requirements.

In the manufacturing process, PVC powder received in bulk is transformed into compounds in a series of steps including warm/cold mixing followed by extrusion. Somewhat unusually for the PVC compounding industry, PlastChem works with an additional pre-mixing step before the warm/cold mixers. In this step, the PVC powder is precisely dosed together with relevant additives and pigments to provide better protection against the elements, resistance to UV light, impact resistance and so on. "We use a large number of different raw materials, so filling

the warm/cold mixers involves numerous dosing steps and the theoretical margin of error is relatively high," explains Patrick Kok, Technical Manager at PlastChem. "By pre-mixing the raw materials in a larger-volume vessel, we have a constant supply of a highly homogeneous mixture for the subsequent process steps. This ensures the continuity of the entire process by reducing the impact of any technical issues or interruptions while dosing the raw materials, maximizing the uptime and also supporting a better-quality end product."

New ultra-modern Factory



The Nauta mixers at PlastChem from below. (Pictures: © Hosokawa Micron B.V.)

In 2017, PlastChem's senior management approved an investment project to build a new, ultra-modern factory. "This was necessary to keep pace with sustained growth and for diversification of the various product groups for hard and soft PVC. Additionally, the directors were keen to make the company's operations as sustainable as possible," states Kok.

They enlisted the help of a system integrator to take care of the engineering, procurement and construction for the entire new facility. However, they were keen to retain the pre-mixing step as part of the manufacturing process, and decided to take care of procuring the necessary mixing equipment themselves. "We have unrivalled knowledge of powder mixing within PlastChem and were confident that we – in partnership with the right equipment OEM – could arrive at the optimal solution ourselves in the most cost-effective manner," he adds.

Quality Focus

After defining their key requirements for the new pre-mixers, the PlastChem team approached two different powder mixing equipment manufacturers, including Doetinchem-based Hosokawa Micron BV. The initial intention was for four mixing lines, but this was later increased to eight. Needless to say, quality was at the top of the list of criteria, plus the client wanted the mixer to be suitable for use with products that present an explosion risk. "Hosokawa Micron has a long-standing

reputation for quality. We always pay a lot of attention to product-friendly mixing and precision with all our machines, plus we are one of the few OEMs to include an oil dam in our mixer design, which eliminates the risk of oil leaks in the product zone," says Menno Logmans, Area Sales Manager Netherlands for Chemicals, Minerals & Metals at Hosokawa Micron BV. "Meanwhile, as a specialist in machinery for powder processing, we have significant experience in designing equipment that complies with the European ATEX directives for use in potentially explosive atmospheres."

Flexibility in Batch Sizes

To meet the varying needs of both large and small customers, PlastChem must be able to produce compounds in a range of different volumes and recipes. Therefore, the initial plan was to install three large pre-mixers and five small ones. "We were able to demonstrate that eight identical 6,000-litre Nauta mixers would actually be a more effective solution," recalls Logmans. "This set-up would still give the necessary flexibility in terms of different batch sizes, because the Nauta mixer's conical shape means that it produces the perfect mixing result even if the vessel is only 10% full, for instance. Additionally, eight identical mixers would offer extra economies of scale and improve the total cost of ownership – from production through to maintenance – because all the components are exactly the same."

Cleanliness

Cleanability of the equipment was another of PlastChem's criteria, not least because the company cannot risk cross-contamination between the many different batches of PVC compounds being produced on its lines. "Smart recipe planning can go some way towards minimizing the problems of cross-contamination – such as by mixing batches with light pigments before dark ones, rather than vice versa," comments Logmans. "But in line with PlastChem's strong commitment to high quality, they were keen for the pre-mixers to be thoroughly cleanable as quickly and easily as possible. Our Nauta mixer is the perfect solution in this case thanks to its conical design. The homogeneous powder exits the mixer at the base, which means that gravity does a lot of the work for you. Additionally, the design provides easy access for cleaning. For extra cleanliness, it can be produced with a polished stainless steel inner wall and a hygienic mixing screw so that virtually no product remains on the inside of the vessel after each batch."

Greater Efficiency

Besides preventing cross-contamination, optimum cleanability means greater efficiency in terms of less product waste, less equipment downtime and less labour required for manual cleaning. "Our Nauta can support these aims in other ways too," adds Logmans. "For example, we proposed to PlastChem the option of quick-exchange dust seals. This may seem like a relatively small design feature, but by keeping the seals easily visible rather than hiding them away, we can help our customers to monitor whether they need replacing without dismantling the whole machine. And the easily accessible connecting bolts mean that the seals can be replaced with a minimum of fuss whenever necessary," he explains.

Shorter Mixing Time



Menno Logmans (l), area sales manager at Hosokawa Micron, in conversation with Patrick Kok, technical manager at PlastChem.

One other important goal of the PVC compounder was to reduce its pre-mixing times in order to better align the throughput pace with the subsequent process steps. "We performed lots of calculations, but mixing times can vary depending on whether you are mixing pellets or powders, so the only way to find out for sure was to test it in practice," continues Logmans. A series of demonstration tests were conducted in the 2,000m² Test & Development Centre at Hosokawa Micron's headquarters in Doetinchem. The tests were attended by a team from PlastChem. "We were keen to get a sense of how the OEM worked. The tests gave us more insight into how the homogeneity of our recipes was achieved and what the actual mixing time would be. Besides that, it was useful to see exactly how the products would enter and exit the Nauta and how it would fit within the wider process," says Kok.

Logmans adds: "We ran the tests on a 1,000-litre Nauta mixer at various mixing speeds, and we were pleased to conclude that the motor was more than powerful enough to cope with the desired higher speed. In fact, the PlastChem team subsequently conducted their own homogeneity tests and confirmed that they achieved a satisfactory mixing quality in a shorter time than they had actually

expected."

After careful consideration, PlastChem awarded Hosokawa Micron with an order for eight 6,000-litre Nauta mixers, type 60-MFC-45. "Hosokawa Micron made a very good impression in terms of design features, performance and advice. The fact that the Nauta is very easy to maintain and therefore has a lower service requirement was also a key benefit for us, and this is reflected in the long warranty period. Plus it's reassuring that the equipment is built in the Netherlands," comments Kok. "Thanks to the economies of scale arising from this order for multiple identical mixers, we were able to incorporate a slight volume discount to keep our proposal as competitive as possible," adds Logmans.

Project Challenges

This project was not without its challenges for the Hosokawa Micron team, especially in terms of logistics. Logmans: "We only have room to assemble around five machines of this size at a time in our factory in Doetinchem. We solved this challenge by producing and delivering the mixers in batches. Thanks to close collaboration, both internally across all our departments and externally with transport companies as well as with PlastChem, we were able to manufacture, deliver and perform factory acceptance testing for all eight Nauta mixers in line with the customer's 'just-in-time' planning as agreed." Kok confirms that he is happy with how the project went: "The partnership with Hosokawa Micron ran smoothly; we received good advice, any issues were addressed quickly, everything arrived on time and the pre-mixing solution based on the Nauta mixers lives up to our expectations."

Sustainability

The new PlastChem factory has been up and running since July 2021. "By designing the factory with a height of 28 metres, we have been able to realize a vertical production line which is not only extremely efficient but also clean, safe and energy-efficient," says Kok.

"At Hosokawa Micron, we design and develop all our products with sustainability in mind, particularly with a view to lifecycle management," adds Logmans. "In the case of the Nauta mixer, for example, the focus is on minimizing energy consumption and maintenance to reduce the total cost of ownership over the machine's lifetime. It has been an honour to contribute to this unique project for a company that clearly has a unique long-term vision and commitment to the future."

The fact that PlastChem had been using old Nauta mixers for the pre-mixing step in the original factory is testimony to the durability of Hosokawa Micron's equipment. "And 'old' is the right word; they had originally been made in 1968 and 1970!" exclaims Logmans. "Needless to say, the mixers were slightly past their best, but fundamentally they were still working after all those years. This just goes to show that when you enter into a partnership with Hosokawa, it's for the long term. So we're looking forward to continuing to strengthen our relationship with PlastChem for many years to come," he concludes.