

Mixing PE-Xa efficiently and safely

Raw materials impose high demands on mixer design



PE-Xa is a proven material for gas, heating and water pipe systems, because cross-linking with peroxides significantly increases flexibility, resilience, temperature resistance and stress cracking resistance of high molecular weight PE. Since these characteristics outperform those of differently cross-linked PE pipes, and based on today's output-boosting demands in twin-screw extruder technology, the production of PE-Xa piping is growing steadily. High-volume manufacturers, in particular, increasingly prefer a two-stage production process, using an MTI high performance mixer to blend the PE with additives and peroxide in a first step, providing a dry, free-flowing material mix. The extrusion of the pipe is then performed in a second stage.

Superior safety, improved quality

Splitting mixing from extrusion provides various advantages. A single MTI mixing system can, e. g., cost-effectively serve multiple extrusion lines, and the spatial separation of these two processes supports meeting the safety requirements applying to the processing and storage of peroxide and additives. In addition, MTI's specially developed equipment provides more thorough intermixing of the raw materials and hence, delivers a higher quality and more homogeneous result than with direct pre-mixing of the recipe at the extruder. The PE is wetted with peroxide in a manner enabling the latter to diffuse uniformly into the polyethylene. As a result, comparative studies performed by our customers have

shown the desired high cross-linking levels in final products made of PE-Xa formulations that were mixed using MTI equipment. Even if the mix was stored for several weeks prior to further processing, cross-linking levels remained virtually unchanged due to the intense peroxide diffusion. Mixes produced with different machines and processes showed greatly reduced cross-linking levels –below the threshold values specified for PE-Xa piping – after just a few weeks.

Tailor-made MTI technology

Depending on batch size, MTI's universal Uni tec® and horizontal Flex®-line mixers are both ideally suited for the discontinuous mixing of PE-Xa materials. They process the polymer – typically a readily free-flowing HDPE powder/grit of grain sizes up to 500 µm, or micro-granules < 2 mm – with approx. 0.3 - 1 % of finely powdered additives and approx. 0.5 - 1 % of a low-viscosity peroxide/white oil solution to obtain a high-quality, dry and free-flowing mix. Key advantages of MTI high-performance mixers include minimised strain on the raw materials thanks to very short mixing cycles as well as an outstanding mixing quality yielding particularly high-grade end products. Mixing may be carried out under ambient conditions or with pre-defined temperature profiles to ensure a reproducible compliance with defined process conditions. Moreover, a broad range of options allows both mixing systems to be extended into tailor-made system solutions.

ATEX-compliant design

The raw materials employed place highest demands on the design of the mixer and all peripheral equipment, including the feeding and storage systems. Thus, the organic peroxide used when processing PE-Xa is a flammable and toxic hazardous substance which requires extensive protective measures. Although somewhat less hazardous peroxide/white oil solutions are generally preferred today, parameters such as the flash point and SADT (Self Accelerating Decomposition Temperature) nevertheless have an impact on the conditions of the

process and the design of the mixer including its control system. PE in powder form as well as the finely powdered additives are typically classified as combustible substances or substances carrying a powder explosion hazard. Especially for some additives, manufacturers quote very low minimum ignition energy (MIE) levels, so that operations may have to be conducted under N₂ atmosphere.



Interior of the Uni tec® mixer and detailed view of the spraying system

Facing up to these challenges, MTI engineers all its systems with full attention to critical raw material properties such as flammability and dust explosion risks. Consequently, these mixers are ATEX-compliant as documented by the corresponding test certificates. At MTI's R&D Center in Detmold, which is equipped with mixers of different sizes, the company cooperates with its customers to optimise mixing parameters and recipes and to develop forward-looking products meeting the most exacting quality standards.



PE-Xa mixing system at Agru-Frank GmbH, Mörfelden/Germany