MuCell: new screw from KraussMaffei delivers 30 percent more plasticizing performance

- Modular screw concept developed for analyses
- Three-zone, mixing and gas supply zone and medium non-return valve optimized
- Universal screw for low- and high-viscosity materials
- Knowledge kit for development of special screws

(Parsdorf, June 13, 2023). Physical foaming of thermoplastics (MuCell) saves money, energy and resources—and is a multifaceted technology of the future. After intensive development work, KraussMaffei is presenting the new HPS-Physical Foaming universal screw for MuCell applications with 30 percent higher plasticizing performance.

Lightweight solutions with a smaller CO_2 footprint: In the effort to conserve resources, MuCell is being used more and more frequently and is a strong growth market. By adding a physical blowing agent to the thermoplastic (usually nitrogen), it is possible to save significant material weight compared to compactly manufactured components. In addition, longer flow paths are possible for thin-walled components, and foaming results in low-warpage components.

Universal screw with versatile applications

The materials used for MuCell are diverse and often contain different proportions of fibers and fillers. In the HPS-Physical Foaming, KraussMaffei has responded to this by developing a screw that can be used universally and has a 30 percent higher plasticizing capacity. For this purpose, all screw types available on the market were compared in extensive laboratory tests. A modular concept made it possible to combine the individual components by means of bolting so that a new screw did not have to be made each time.

KraussMaffei Technologies GmbH
Corporate Communications & Marketing
Krauss-Maffei-Straße 1
85599 Parsdorf/Germany

Phone +49 (0) 89 8899 2334
www.kraussmaffei.com

The focus was on the mixing and gas supply area, the center backflow barrier and the three-zone area.

More plasticizing performance with less wear at the same time

The three-zone area was able to be enlarged without loss of quality at the expense of the former and is now 17 times the diameter (previously 15D; mixing and gas supply area now 4D). This both increased the plasticizing performance and had a favorable effect on the wear behavior. Up to now, larger screws (with a correspondingly higher investment) were usually used than the component weight would normally dictate in order to ensure complete homogenization of the melt before injecting the gas.

The middle non-return valve (M-RSP) closes at the end of the metering process, thereby separating the mixing and gas supply area from the three-zone section and preventing the melt from flowing back. This is the only way to keep the critical pressure above 33.9 bar and thus prevent foaming in the plasticizing unit. Another task of the M-RSP is to ensure a constant shot weight. The developers' analyses showed that the most effective design of the M-RSP has a ball check valve. Here, too, the various materials used played a major role.

Trials with different fillers

The KraussMaffei team investigated the previously existing and the newly developed screw using PP with different flow indices (MFI 11 and MFI 44), with mineral filling, with glas fiber content of 20 and 30 (LGF) percent, and with ABS and PA6 GF 30. The plasticizing performance changes depending on the compound selected and the parameters set, such as dynamic pressure.

Since KraussMaffei's MuCell customers have a wide variety of applications worldwide, the universal screw had to reflect this diversity. The three-zone section was therefore designed with one thread (for PA6 GF30, two threads would be even better), and the M-RSP with ball check (for high-viscosity materials, a helical shear section is also possible).

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The in-depth research effort yielded additional benefits beyond HPS-Physical Foaming. KraussMaffei now has a knowledge toolbox that makes it possible to develop screws specially adapted to a material—for customers who manufacture corresponding products constantly over a long period of time, for example. Here, too, the modular concept is helpful for quick tests.

Physical foam molding is and remains a technology of the future. Driven by the desire to save money, energy and resources, it is gaining in importance all the time. The new universal screw is a milestone in this respect.

01_PM_2023_06_IMM_MuCell Screw.jpg
Universally applicable: The new HPS-Physical Foaming screw with a 30 percent improvement in plasticizing performance

02_PM_2023_06_IMM_MuCell Screw Details.jpg
Modular screw concept. The individual functional areas of the screw can be combined as desired. The individual elements are joined by means of screw connections.

03_PM_ 2023_06_IMM_MuCell Part.jpg
MuCell technology is a market with a promising future: The components are stable, lightweight and additionally thermally insulating due to the foam structure inside

Photos: KraussMaffei

Enclosure: Pictures and more information can be found at www.kraussmaffei.com

Press contact:
Petra Rehmet
Content & Campaign Manager / Press Officer Injection Molding Machinery
Phone: +49 (0) 89 8899 2334
Email: Petra.Rehmet@kraussmaffei.com

Uli Pecher

KraussMaffei Technologies GmbH
Corporate Communications & Marketing
Krauss-Maffei-Straße 1
85599 Parsdorf/Germany

Phone +49 (0) 89 8899 2334
www.kraussmaffei.com

Head of Corporate Communications
Telefon: +49 (0) 89 8899 1080
Email: Uli.Pecher@kraussmaffei.com

(Number Words: 452 / Number Characters: 4056)

KraussMaffei – Pioneering Plastics

KraussMaffei is among the world's leading manufacturers of machinery and systems for the production and processing of plastics and rubber. Our brand stands for cutting-edge technologies – for more than 185 years. Our range of services covers all areas of injection molding machinery, extrusion technology and reaction process machinery. In 2022 we added additive manufacturing to our portfolio. This broad range of technologies gives KraussMaffei a unique selling point in the industry. With the high innovative power of our standardized and individual product, process, digital and service solutions, we can guarantee customers sustained additional value over the entire value-adding chain. Our range of products and services allow us to serve customers in many sectors including the automotive, packaging, medical and construction industries, as well as manufacturers of electrical and electronic products and household appliances. KraussMaffei employs around 4.700 people all over the world. With more than 30 subsidiaries and over 10 production plants, as well as about 570 commercial and service partners, we are represented internationally close to our customers. The company was founded in 1838 in Munich.

In April 2016, China National Chemical Corporation Ltd. ("ChemChina") became the majority shareholder of KraussMaffei Group. In December 2018, ChemChina listed the KraussMaffei Group as KraussMaffei Company Limited in Shanghai. The listing opened up access to the Chinese capital market and local investors. Now ChemChina is part of Sinochem Holdings Corporation Ltd., one of the world's leading chemical conglomerates with over 220,000 employees.

For more information: www.kraussmaffei.com

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