WHITEPAPER

PVC Pelletizing with the Optimized KM-GK Pelletizing Head

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The efficient production of PVC pellets is a crucial step in plastics processing. At the Technology Center Laatzen, this process is specifically optimized using the

Introduction

The production of PVC compounds is a critical step in PVC processing. PVC is never processed in its raw form but is always combined with additives, which can be divided into two main categories:

- **Processing aids:** lubricants, stabilizers, antioxidants
- **Fillers:** mineral additives that extend the PVC or impart specific mechanical properties

Depending on the PVC type, different types of mixing processes are used. Due to PVC's high sensitivity to residence time, the heated-cooled mixer is predominantly employed. In this process, precisely weighed amounts of raw materials and additives are mixed and conditioned over a defined period until a homogeneous, powdery dry blend is obtained. This dry blend can then be directly processed further, for example, in a counter-rotating twin-screw extruder.

Pelletizing: The Solution for Special Applications

For certain applications, however, pelletizing the dry blend is advantageous—particularly when further processing is carried out on a single-screw unit. These machines, including conventional extruders or the plasticizing units of injection molding machines, are generally not suitable for handling powders.

The pelletizing process therefore requires a pelletizing system, which typically consists of the following components:

- Extruder with pelletizing head
- Air-cooling section
- Shaker or vibrating cooler
- Bagging station, or conveying into a silo
- Feeding station for the dry blend

Step by Step Through the Process

1. Heated-Cooled Mixer

Figure 1: Example of a heated-cooled mixer. The heating mixer is positioned above the horizontal cooling mixer. Source: Mixaco

The PVC dry blend compound is produced batch-wise in a heated-cooled mixer-combination. The production of the dry blend takes place in two stages:

- **Heating mixer:** Raw PVC and additives are homogeneously mixed. The shear forces and frictional action of the mixing tools generate a controlled temperature input into the mixture. Once the target temperature is reached, the mixture is discharged into the cooling mixer.
- **Cooling mixer:** The mixture is cooled to the specified target temperature in the cooling mixer. The finished PVC dry blend is now available for further processing.

The high mixing quality, along with the precise control of heat input and cooling, makes the heating–cooling mixer the ideal process solution for the production of PVC dry blend.

Figure 2: Example of the tool configuration in the heating mixer. Source: Mixaco

2. Pelletizing Process

The pelletizing process is carried out in several steps:

1. **Feeding station:** Controlled supply of the dry blend
2. **Extruder:** Plasticization, homogenization, and melting
3. **Pelletizing head:** Shaping the melt into pellets (hot cutting)
4. **Cooling section:** Air-cooled solidification of the pellets
5. **Vibrating cooler:** Classification, final cooling, and removal of dust or oversized particles
6. **Bagging station:** Filling into big bags or other packaging

3. Extruder and Pelletizing Head

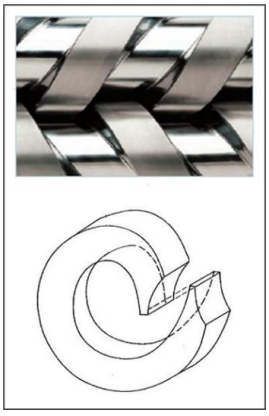

Figure 3: Schematic representation of C-chamber conveying

Unlike other thermoplastic plastics, which are usually supplied as pellets, PVC is processed in powder form (dry blend). This powder can be fed directly into a counter-rotating twin-screw extruder, which is particularly suitable for handling powdered materials due to its design.

The material is conveyed with low shear and a defined residence time in so-called C-chambers.

Figure 4: Example of a counter-rotating twin-screw extruder

The sealing of the screw channel creates enclosed conveying chambers in which the powder is transported and plasticized. Heating occurs through heat conduction from the barrel as well as internal friction within the material and against the metal surfaces. Additional friction is generated in compression zones, and if necessary, plasticization can be intensified using kneading or mixing elements.

Extruder	max. screw speed (soft/ rigid PVC) [rpm]	specific output (soft/ rigid) [kg/h*min^{-1}]	output range (soft/ rigid) [kg/h]
KMD 90-32G	71/ 55	20/ 22	540 -1200/ 460 -1000
KMD 114-32G	56/ 43	37,5/ 43	810 -1800/ 700-1500
KMD 133-32G	49/ 35	55/ 66	1200-2300/ 900-2100
KMD 164-32G*	-/ 26	-/ 105	-/ 1100-2400
KMD 184-32G*	-/ 22,3	-/ 165	-/ 1700-3200
*KMD 164 and KMD 184 only for rigid PVC			

Figure 5: Discharge table

To remove volatile components, the extruder is equipped with a degassing zone where a vacuum is applied. In the subsequent metering zone, plasticization is completed, and a uniform melt is achieved through defined shear and friction. Homogenization can be further supported by increased screw clearance or mixing grooves.

The screw geometry is adapted to the specific material. Parameters such as the number of flights, flight pitch, and mixing grooves influence residence time, friction, and the homogeneity of the final product.

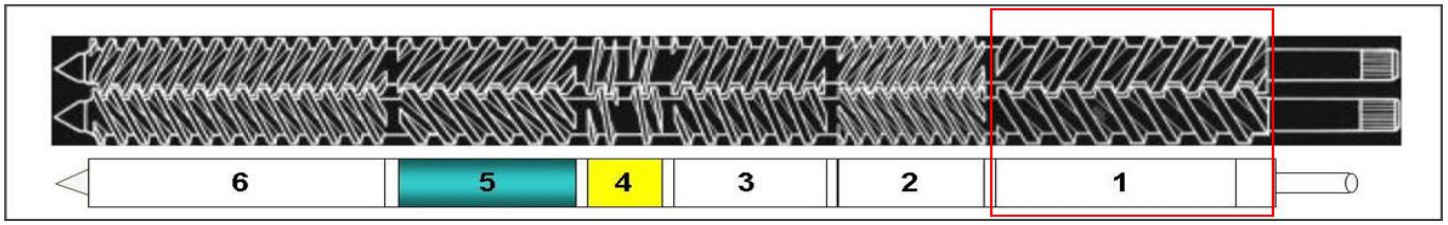

Figure 6: Illustration of the functional zones of a twin-screw extruder; 1: Feed zone, 2–4: Preheating and compression zones, 5: Degassing, 6: Metering zone

In PVC pelletizing, a hot-cut pelletizing head is attached to the extruder. The melt is pressed through a perforated plate, in front of which a rotating knife cuts the strands. The number and diameter of the holes, knife speed, and distance to the plate are set according to the material and process requirements to ensure a uniform pellet output.

4. Cooling and Bagging

After hot cutting, the PVC pellets are conveyed from the pelletizing head into the cooling section. Unlike water-based systems, cooling is carried out using an air stream. This air stream is generated by a blower, which directs the hot pellet flow from the pelletizing head into a pipe system. The pipe system simultaneously serves as a transport and cooling section, with its length adapted to the specific material throughput.

Figure 7: Air-cooling section with extruder in the background

At the end of the cooling section, a vibrating screen is installed. Here, the pellets are classified, separated from dust and oversized particles, and further cooled with supplied fresh air. The material, brought to the desired particle size, is then conveyed to packaging—typically into big bags, octabins, or other suitable containers.

Figure 8: Vibrating cooler with the bagging station located behind it

Capabilities at the Technology Center in Laatzen

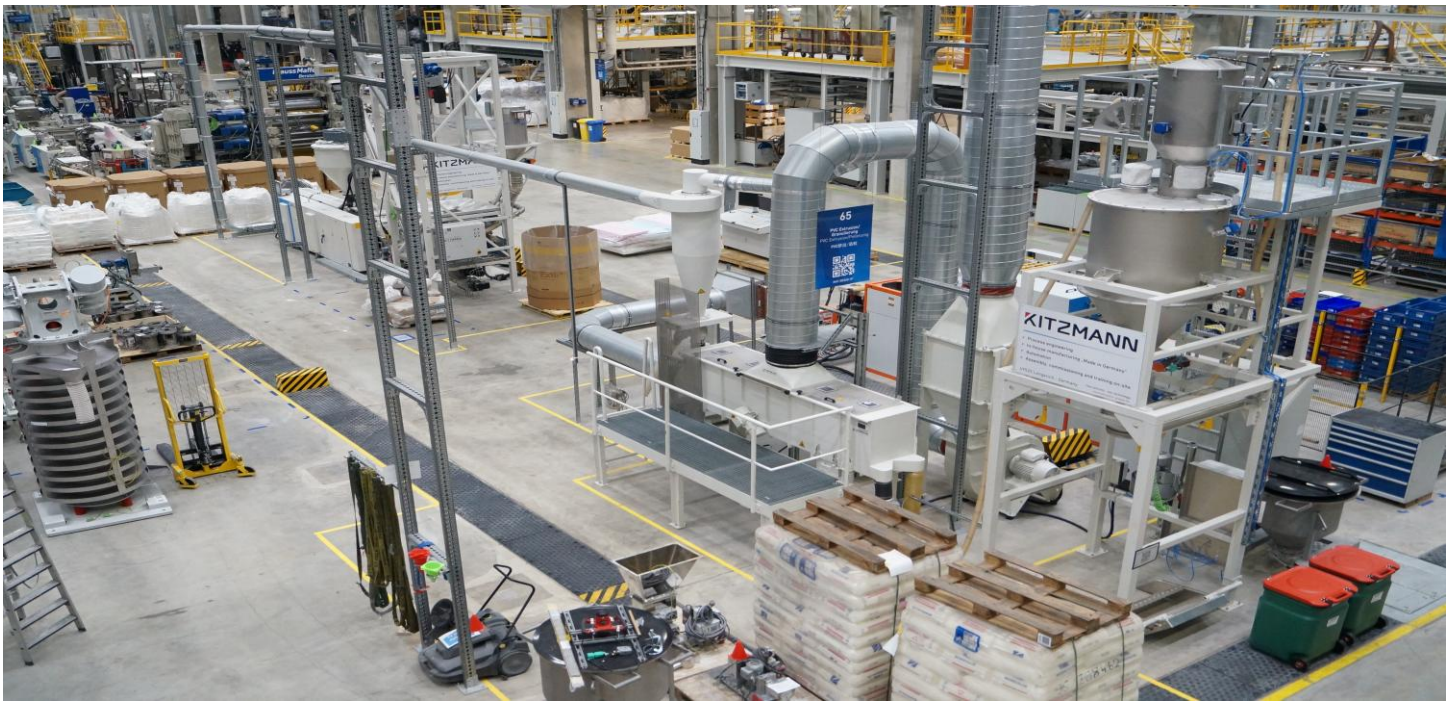

Figure 9: View inside the Technology Center Laatzen, with PVC pelletizing in the center of the image. View from the vibrating screen toward the extruder

KraussMaffei supports customers with equipment expertise and offers a production-scale pelletizing line at the Technology Center in Laatzen:

- **Extruder KMD 90-32 G/W:** For rigid and flexible PVC as well as C-PVC compounds
- **Pelletizing head KM-GK:** Optimized for PVC hot-cut pelletizing
- **Cooling:** Provided by Zeppelin
- **Material handling:** Provided by Kitzmann

With throughputs of 1,000 kg/h (rigid PVC) and 1,200 kg/h (flexible PVC), customers can:

- Optimize processes
- Develop new formulations
- Train personnel
- Produce sample batches

Code	Material / Designation	Material / Designation
HB 510	Granulierkopf KM-GK 90 (2 Messer)	Pelletizing head KM-GK 90 (2 knives)
HB 520	Granulierkopf KM-GK 114 (2 Messer)	Pelletizing head KM-GK 114 (2 knives)
HB 541	Granulierkopf KM-GK 133 (4 Messer)	Pelletizing head KM-GK 133 (4 knives)
HB 542	Granulierkopf KM-GK 164 (2 Messer)	Pelletizing head KM-GK 164 (2 knives)

Figure 10: Overview of the different pelletizing head variations

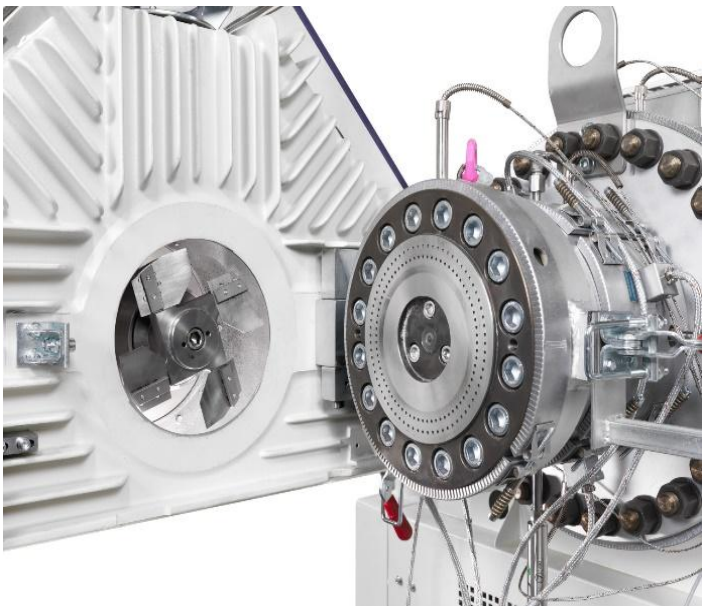

Figure 11: Close-up view of the pelletizing head with knife and perforated plate

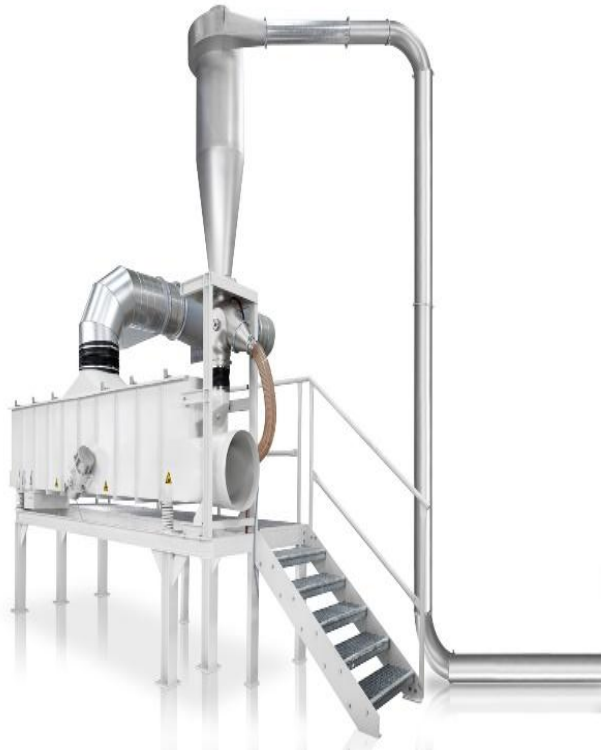

Figure 12: Pellet cooler

The facility allows both the processing of pre-mixed dry blend and the production of custom mixtures on-site. The combined heating and cooling mixer from Mixaco accommodates batch sizes of up to 170 liters (approximately 680 kg/h) and is ATEX-compliant.

Figure 13: Mixaco heated-cooled mixer at the Technology Center Laatzen

In the in-house testing laboratory, both dry blends and pellets can be evaluated for their properties and quality, allowing adjustments to be implemented directly on-site.

For newcomers, the facility provides an efficient bridge until their own systems are installed. At the same time, operators of existing production lines can conduct practical R&D trials at the Technology Center without interfering with their ongoing processes.

Advantages of having an in-house pelletizing line:

- **Knowledge protection:** Safeguarding proprietary formulations
- **Flexibility:** Rapid adaptation to market requirements
- **Recycling:** Efficient use of regrind and recycled materials

PVC as a Future-Relevant Market

The demand for tailored PVC products is continuously increasing, as customers increasingly expect specific properties and specialized applications. In parallel, the need for flexible and high-quality pelletizing is growing, enabling these requirements to be met reliably and efficiently. At the same time, a clear trend toward in-house solutions is emerging, allowing manufacturers to protect proprietary formulations and efficiently integrate the recycling of PVC regrind into the production process.

Your Advantage at the Technology Center in Laatzen

PVC pelletizing at the Technology Center in Laatzen combines state-of-the-art equipment with flexible process capabilities. Heated-cooled mixers, twin-screw extruders, and pelletizing systems enable the production of high-quality dry blends that can be individually tailored and efficiently processed.
Customers benefit from rapid formulation development, optimized production processes, and the protection of their know-how—all within a practical, professional infrastructure. This approach makes PVC processing not only reliable but also economical and innovative.