

USER REPORT

Zutphen/NL and Linz-Pucking, August 2018



Photo: TECHNOKOMM

Fig.1: The Dutch plastics recycling company DALY Plastics processes 35,000 t of agricultural films and pallet shrink films per year into gray, black and tea-colored polyethylene re-granulates for use in blow film production.

The right choice for success!

Like plastics manufacturing and processing, the recycling of plastic products requires specialization to be efficient. Accordingly, the Dutch company DALY Plastics has dedicated itself entirely to the recycling of agricultural films and packaging films from the farming and logistics industries. Currently, DALY Plastics processes 35,000 tons of material per year. When processing film-flakes, DALY Plastics relies on the machinery technology of the Upper Austrian company “MAS-Maschinen- und Anlagenbau Schulz GmbH”. Three extrusion lines are currently in operation with a fourth being commissioned.

The Daalder family in Zutphen in the Dutch province of Gelderland is already a second generation recycling organization. It all started with Simon Daalder B.V., who

professionally collected waste paper and cardboard boxes and sold them to paper mills. At the age of sixteen, Peter Daalder, the pragmatic son of the company's founder, recognized the potential plastics collection in 1985 as an opportunity for founding his own company. That same year, he urged his parents to let him drop out of school and set up his own business. With the promise of completing his degree at evening school, he was hired on at his parents' company. Some of the customers from his father's business also recycled plastic film in addition to cardboard, and the youngster was able to offer the related collection service. His business under the name „Daly Plastics“ was well received.

For the next 25 years, it remained a plastic film collection service, compacting film into bales and selling them. In this context, selling generally meant exporting, especially to China. The export business developed very well, because processing film into re-granulates was a welcome new industry there. Accordingly, during these 25 years the People's Republic of China (PRC) became the largest recycling hub in the world. In 2016, the PRC imported around 7.3 million tons of plastic waste worth US \$ 3.7 billion, which corresponds with 87% of all plastic waste from the EU. (Source: NTV online from 09.01.2018)

From the plastic collector to the recycler

When asked about the motivation to change the company strategy after 25 successful years as a plastic-waste collection company and exporter, company founder Peter Daalder looks back: "For a long time, like most of our competitors, we simply followed the market. Unrivaled low labor costs in China made recycling in Europe uneconomical. On the other hand, our location near Europe's most important seaports provided favorable conditions for low cost transport to Asia. Thus, a large part of the post-consumer plastic collected by us was exported. Doubts about this business model then came up in 2011 when one of our customers decided not to export everything anymore, but to start processing its own agricultural films and in this vein carried out laboratory trials at MAS-Austria. This made us aware of MAS. As a result, one day the opportunity arose to spend an evening with MAS founder Helmuth Schulz. We philosophized about the future of the recycling industry. He warned against an unwavering belief in the wage cost advantage in combination with low environmental requirements. If the next 5-year plan would define changes, the boom would be over. The consequence for Europe must be a turnaround to higher plastic recycling rates. Looking back, I am glad that I was impressed by his arguments. From that day on, I prepared myself mentally for self-processing and started in 2013. The prophecy of Helmuth Schulz, who died in September 2017, came true on January 1, 2018, when China closed its borders for used plastics with more than 0,5% impurities. This has torn deep holes in the balance sheets of plastic exporters with no in-house processing. Since we were already processing a large part of our collected plastic volume ourselves at that time, we were only marginally affected."

Errors drive you smart

However, before the concept was completed and production could begin, things had to be arranged and technical points defined. A major argument for contacting MAS was the waterless DRD (Double Rotary Disc) dry cleaning system. This was because Daly Plastics intended to work without a wet-washing process and the related expensive sewage sludge disposal when processing agricultural films. Since mainly granular soil particles and moisture had to be removed, attempts were made with the waterless DRD (Double Rotary Disc) dry cleaning system of MAS, which proceeded satisfactorily. In the meantime, Daly Plastics relies entirely on MAS machine technology when processing pre-sorted and flake-finished films. The cleaned film-flakes can be processed on the MAS cascade extrusion line, consisting of the conical co-rotating twin-screw extruder MAS 93 (Fig. 1), a TA-90 single-screw extruder and a continuous disc filter between the two extruders, into high-quality pellets.

But a short time after the plant went into operation, a Daly Plastics customer for plastic waste changed his strategy. Instead of continuing with the processing of agricultural films on his MAS recycling system, starting in 2013 food packaging films also began being processed, as this promised higher sales revenues. However, it turned out that the DRD-dry cleaning process can only separate a small proportion of food fats adhering to the films. This limited the throughput at the extruder, whose degassing system managed to "degrease" the plastic melt only up to a throughput of 350 kg/h – one third of the maximum output. The conclusion was that it would not work without changing the concept.

Specialization as a success factor

In 2013, it struck Peter Daalder. He bought the two DRD and after a call to MAS boss Schulz, who acted as a middleman, the cascade extruder and accessories. Thus, the technical conditions for the founding Daly Plastics sister company Caroda Polymer Recovery (named after Peter Daalder's daughter Caroline) were given. The commercial basis was the decision to specialize in the future on the processing of agricultural and industrial films (pallet wrapping, with a high proportion of LLDPE shrink films) (Figures 2 and 3).

The Caroda polymer plant, after some optimization and with the support of MAS, hit the ground running very well. Above all, the filter technology had to be optimized: At the end of the line, between the main extruder and the cascading extruder, is a continuously working disc filter (type: MAS CDF 500-D) which removes contamination down to 250 µm. A second filter after the cascade extruder removes remaining impurities down to 90 µm. In this configuration, the system, supplied with two DRDs, reaches an output of up to 1300 kg/h (Figs. 4, 5 and 6 and Factbox MAS recycling technology).

When an English recycling company ceased operations due to economic problems, Daalder acquired a second MAS-93 cascade line and purchased two more DRD dryers. A

short time later, he invested in the third MAS-line, achieving a total annual production capacity of 33,500 t of polyethylene granules with an MFI of 0.4 to 1.4 g/10 min (190°C and 2.16 kg) for blow molding applications in the colors gray, black and light brown, referred to as "tea color". The recycled materials have a high tensile strength and are suitable for the production of tear-resistant garbage bags and drawstring bags.

Expectations fully met!

Looking back on three years of practical experience, MAS technology has fully met the expectations set. Peter Daalder again: "Not only the output and the stability of the production system has met our expectations, but also the long-term performance, after all, our systems are operated around the clock in a 4-shift system. Our first line has now completed more than 30,000 hours without major problems. (Fig.7). That motivated us to invest in the fourth plant, which has gone into full operation by the end of 2018. Overall we see an approval of our approach to rely on the local production of recycled granules. We want to continue on our path by expanding our offer to recycling natural-based plastics as well as PP, PS or PS impact-resistant. By 2020, we want to expand production capacity to 100,000 tons per year. Because in Europe the recycling-future has just begun."



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Figures:



Photo: TECHNOKOMM

Fig.2: The Daly Plastics collection system ensures the continuous supply of raw materials with agricultural films and commercial films largely separated by type and quality.



Photo: TECHNOKOMM

Fig.3: The film bales are dissolved at DALY Plastics. They then go through a sorting process that eliminates foreign material and separates the films into color classes or material quality. This is used to produce unmixed bales, which are processed into granules in the recycle plant.



Photo: TECHNOKOMM

Fig.4: The un-mixed film-bales are processed into film flakes in granulators, which are then fed batch wise to MAS DRD dry cleaners where loose soil, sand, other granular grit and moisture are removed.

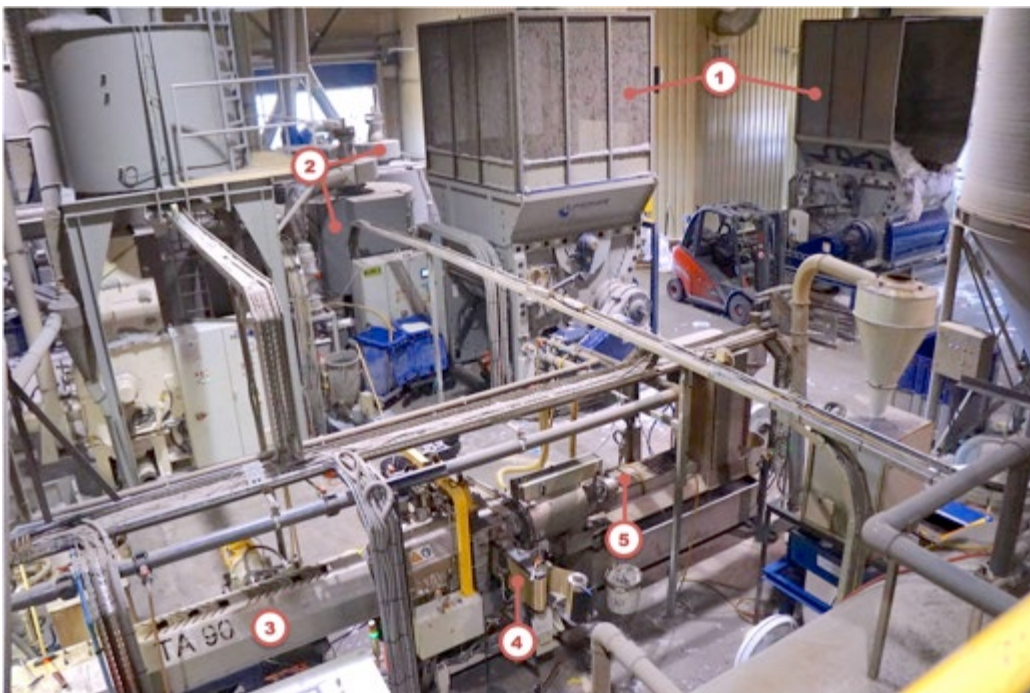


Photo: TECHNOKOMM

Fig.5: The cleaned and dried film flakes pass through buffer storage to the MAS cascade extruders (1 = bale shredder, 2 = DRD double rotary disc dry cleaner, 3 = extruder 2 of a cascade extrusion line, 4 = fine filtration, 5 = granulation)

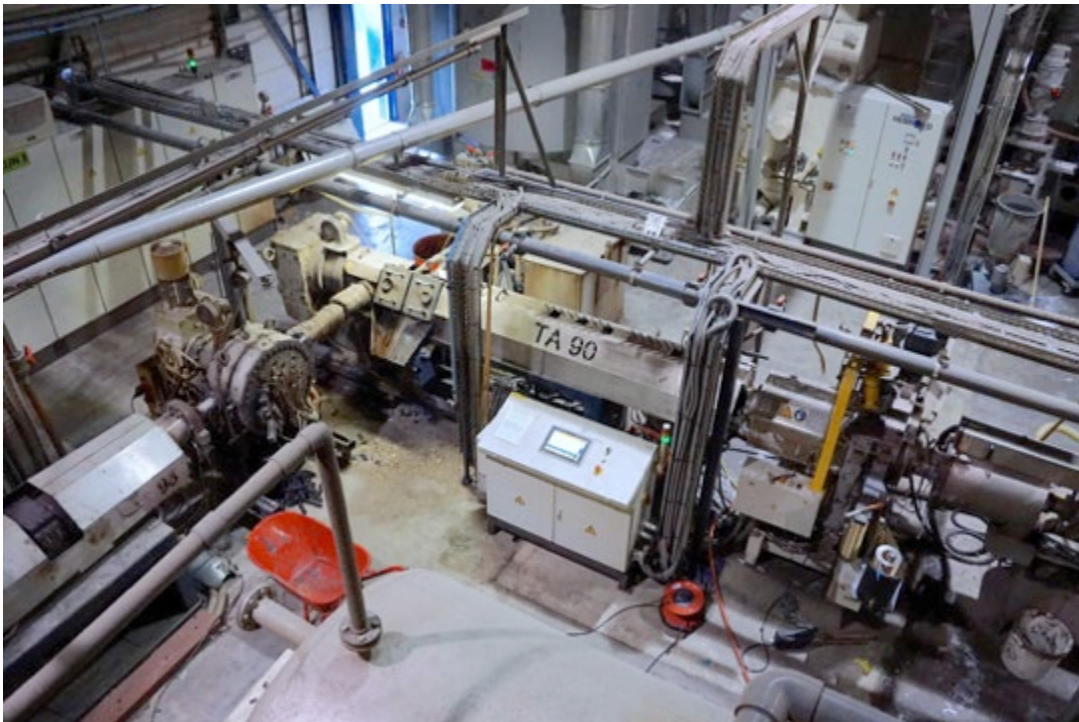


Photo: TECHNOKOMM

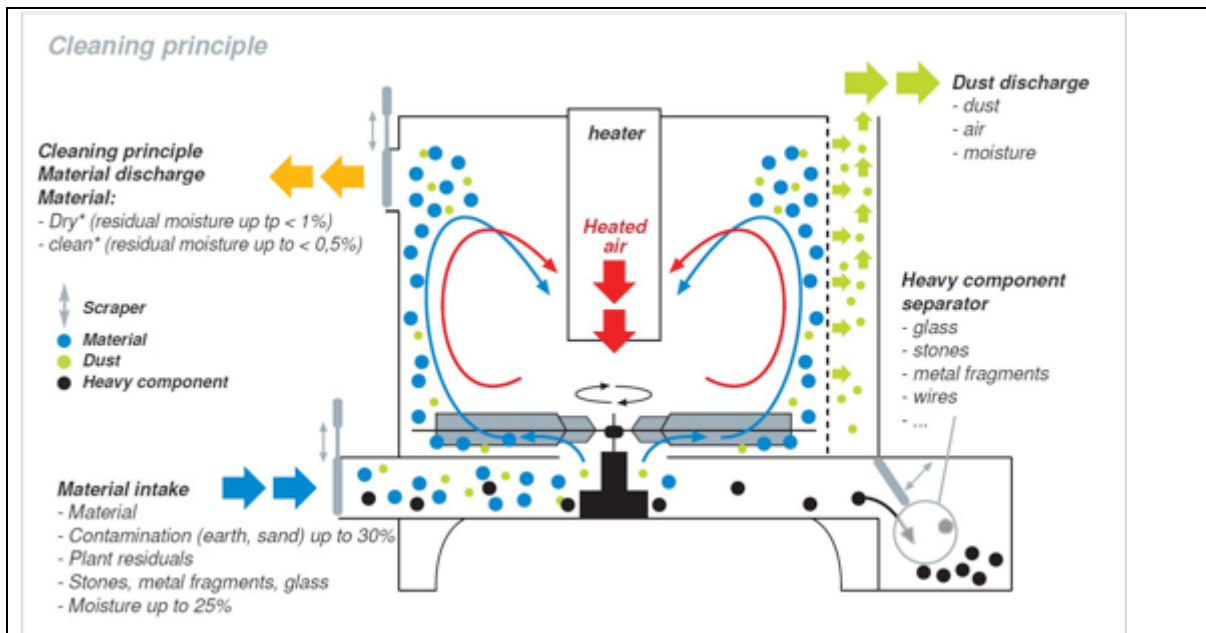
Fig.6: Partial view of one of the three operating MAS cascade extruders. From left to right: MAS 93 extruder, MAS disc filter, MAS TA90 extruder followed by a fine filtration system and pelletization.



Photo: TECHNOKOMM

Fig.7: MAS sales engineer Gerald Badegruber and DALY Plastics shareholder Peter Daalder, visibly satisfied with the long-term performance of the MAS systems, the first of which has been running for more than 30,000 hours in 4-shift operation.

Factbox: MAS-recycling technology



Graphics: MAS

Fig.1: The functional principle of the MAS dry cleaning system for film flakes: The batch-wise processed film flakes are forced through a 2-stage rotor into a turbulent warm air flow. In the process, moisture is separated off and dirt particles are detached and separated by centrifugal force due to the resulting frictional heat.

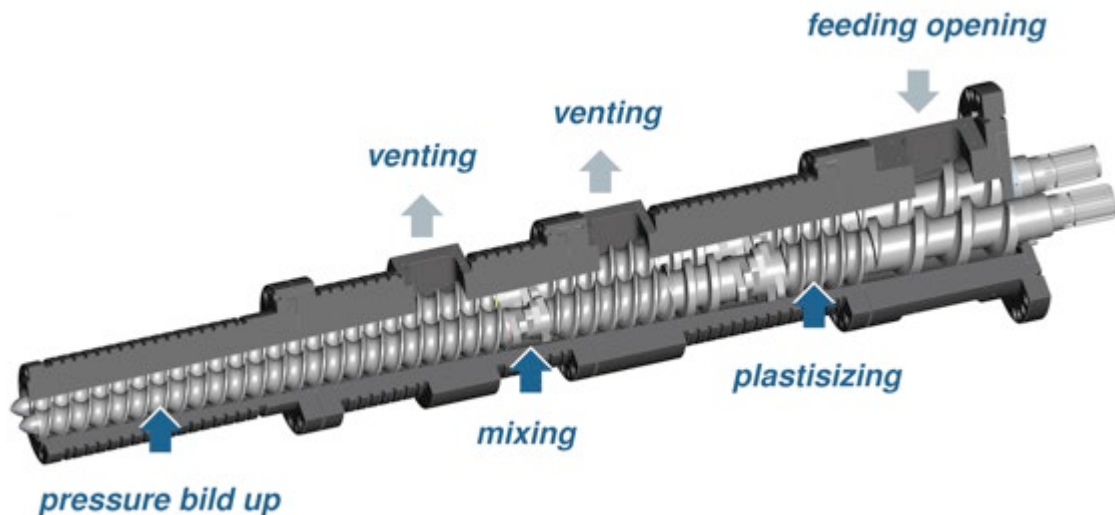


Fig: MAS

Fig.2: At the heart of the MAS extrusion technology is the conical twin-screw extruder with co-rotating screws developed by its founder Helmuth Schulz. Advantages of this type of extruder are the large feed opening, which allows the efficient intake of raw materials with low bulk density, as well as the low-pressure plasticization – both prerequisites for gentle recycling.

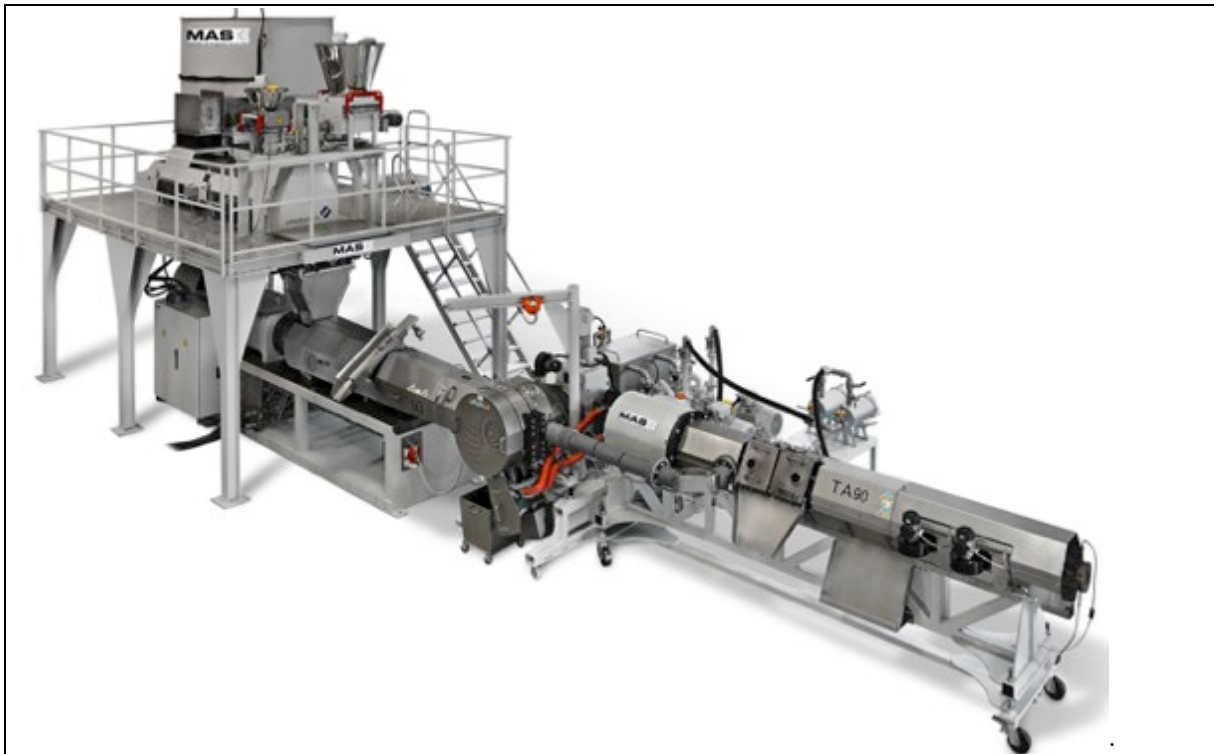


Photo: MAS

Fig.3: The configuration of a 2-extruder cascade system consisting of a twin-screw extruder, a MAS disc filter and a MAS single-screw extruder is not only suitable for reprocessing recycled plastics, but also in combination with coordinated conveyors for direct compounding of primary and recycled plastics and additives.

about MAS-Maschinen- und Anlagenbau Schulz GmbH



MAS was founded in 2006 by Ing. Helmut Schulz, who has more than 40 years of experience in plastics engineering and holds numerous area-specific patents.

The core competences of MAS are:

- > Conical synchronous twin screw extruders in five sizes
- > CDF - Continuous Disc Filter systems for continuous melt filtration
- > Construction of combined recycling / compounding plants
- > Systems for waterless old plastic processing with the DRD system (Double Rotor disc) system.

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about DALY PLASTICS BV:



The DALY PLASTICS company in Zutphen in the Netherlands was founded in 1985 by the founding of Peter Daalder as a plastic collection company whose parents were active in the waste paper trade. After initially collecting and exporting agricultural and pallet shrink films, in 2013 Peter Daalder founded his sister company CARODA POLYMER RECOVERY, also based in Zutphen, and began producing polyolefin recycled granulate. Currently, 4 production lines are in operation and produce polyethylene granulates in three colors, mainly for the blow molding production of garbage and drawstring bags. By 2020, production is planned to be increased to 100,000 tons. In addition, Peter Daalder is stake holder in the trading company SIDALCO B.V., for the distribution of press compaction systems for paper or plastic, as well as specially coordinated transport vehicles.

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