

Press Release 2014

HERBOLD MECKESHEIM GmbH

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100 % Film Made from Post-consumer Waste: a Challenging Application

For the production of film made from post-consumer waste, HERBOLD MECKESHEIM GmbH in cooperation with EREMA has designed a model plant for POLIGROUP in Bulgaria, in operation since September 2013. High quality film is produced there, partly with thicknesses down to 30 my made from plastic waste only. This mix consists of LDPE film waste from agriculture as it is used in crop forcing or silage film. A further component comprises LLDPE film waste also coming from the agrarian sector, e.g. for wrapping bales. A third component is film from household waste arising in automatic sorting plants. Why this film mix? The principal material is LDPE from agriculture that, to a large extent, forms a homogeneous material with an unchanging melt flow index (MFI). The LLDPE improves the physical properties, and films from household waste are particularly well-priced materials available on the market.



Fig. 1: Herbold film washing line

With different film waste obviously a different demand is put on the single recycling steps. At first glance, agricultural film is highly contaminated; partly the degree of contamination attains almost 50%. This means that as many contaminations enter the film washing line as films. With agricultural film the main contamination is sand. But also pebbles, as well as small screws can be wrapped in the film. In order to separate this type of contamination from the film, downstream of the preliminary size-reduction step of the washing line a pre-washing unit, especially designed for this task is used with Poligroup. The advantage of agricultural film is that the material is always exactly the same raw material, with the same colour and the same properties.



Fig. 2: Contaminated agricultural film

Film from household waste is a different case. It is a mix of several different plastics. The real challenge here is the separation of unwanted plastics. In order to achieve this task Herbold is the only operator in the field of wet film recycling who opts for a separation by means of a hydro-cyclone separation step. Plastics that are heavier than water will be separated from plastics that are lighter than water. This process ensures that heavier plastic components can be separated from the polyolefin, which is the good material of a film washing plant.

A further advantage of the hydro-cyclone separation step is the high amount of water present in the water circuit, ensuring together with the revolving forces arising due to the hydro-cyclone, a very good washing result of the films. Deposits of organic substances, a frequent feature of film from household waste, are easily removed by washing. In contrast, films from supermarkets often have a high percentage of paper in the form of affixed labels. It is a real challenge to separate this paper from the film since these LLDPE films from supermarkets are ideal as a feeding material for recycle used for the production of new film.

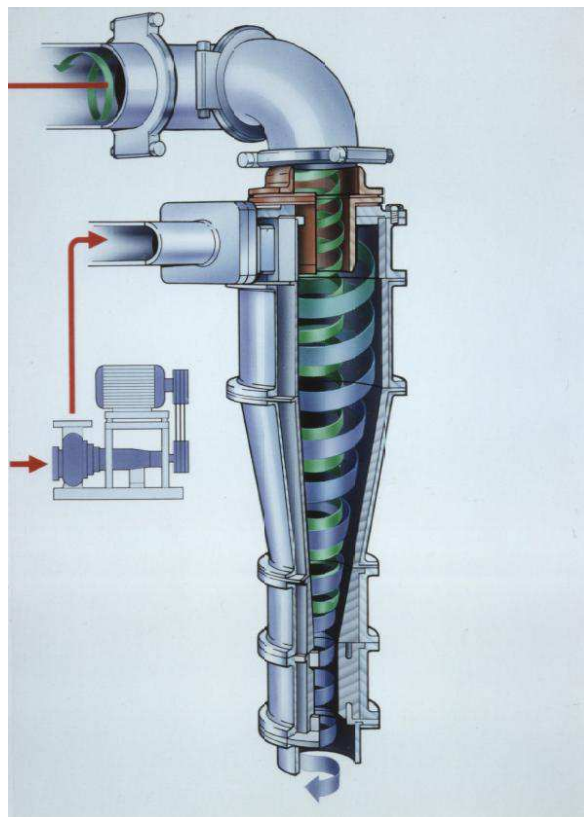


Fig. 3: Schematic diagram of a hydro-cyclone

The most important question is the one concerning the required quality of the end product. From this question the necessary recycling steps will depend. Economically speaking, only certain waste can be used for recycling. Operators increasingly turn to materials that are available on the market for a very reasonable price. That is one of the reasons why plant manufacturer and operator should work hand in hand. The more precise the specification of the input material is, the more cost-efficient the design of the plant can be since unnecessary process steps or room for misinterpretation can be avoided. The operator of a washing plant will also have to find a solution for the collection of film waste.

An existing collection and separation system is the ideal starting point. Without such a system, a recycler of plastics waste can only use material flows that have been imported from countries where these materials are collected and recycled accordingly. Obviously, it is also possible to collect mixed post-consumer waste and to separate preliminarily as much organic matter as possible in order to obtain a plastic fraction. That however, is the most expensive way and the quality of the recycled material will be affected.



Fig. 4: Film flakes

The washing line at the Poligroup site transforms agricultural films and films from supermarkets into recycled material that will then be used for the production of bin liners, protective sheets and construction foils. It is not necessary to add new plastic material; the three new products are made up of 100% recycled plastic material from the HERBOLD film washing line.

Many basic conditions for the economic operation of a washing plant for plastics waste are set by the market such as the costs for the procurement and the transport of the input material or the attainable prices for the finished product. With an optimal machine configuration, the operator will be able to process a bad-quality input material or to obtain a high-quality end product. It is also extremely important to have well-trained personnel for the operation of the plant. It has also been proven several times that Germany can also be an economic location for the operation of such a plant.

The overall cost effectiveness of a washing line for the recycling of film is determined by the recycling costs. The greatest part of them is the energy cost. An economic, efficient plant design can reduce this part of the costs.

The power demand of the film recycling plant installed for Poligroup is some 0.8 to 1.0 MW per tonne produced end product which corresponds to 0.8 to 1.0 kW per kilo end product.

In the whole system, there is a high amount of circulation water that is continuously reused. As little as 1 to 2 m³ of fresh water per tonne input material are needed for the regeneration of the circulation water.

In order to guarantee a long-lasting operation of such a plant, issues such as maintenance and servicing have to be considered as early as the first design steps. Without a good and precautionary maintenance, the treatment of abrasive materials such as sand will not be possible. The greatest attention has to be paid to wear-prone areas, they will have to be protected. Therefore, these wear zones are equipped with exchangeable anti-wear plates.

The decisive argument for the purchase of the HERBOLD Meckesheim washing plant, for Poligroup obviously has been the high variability of the plant. This plant can cope with highly contaminated film as well as with extremely thin-walled film. The prewashing unit and hydro-cyclone separation step that are part of the washing line are the outstanding construction features of the plant.

The plant according to its design provides washed homogeneous high-quality film flakes that are ideal for further treatment in an EREMA extrusion system.

With Poligroup, downstream of the HERBOLD washing line, the washed and recycled film flakes are then treated with the reliable plastics recycling technology from EREMA. The Poligroup plant system consists of a EREMA TVEplus® (throughput: 1,100 – 1,200 kg/h) with laser filter LF2/350 (fineness of filtration: 110 µm and the die-face granulating system HG 244.

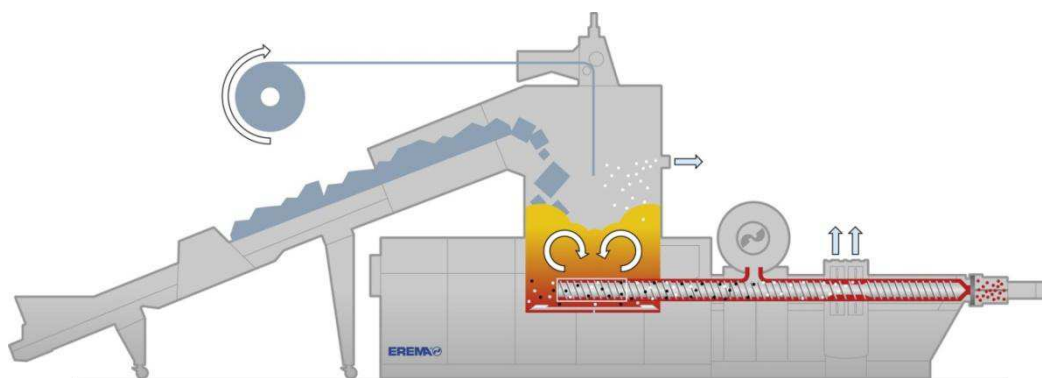


Fig. 5: The well-proven basic principle of the *TVEplus*® technology is: the melt filtration is before the degasification of the extruder



The extrusion system with the patented TVEplus® technology has especially been optimized for the treatment of materials that are difficult to process such as in the present case washed mixed post-consumer film waste with a high percentage of residual humidity between 8 and 12% and a high degree of contamination. Poligroup GmbH is thus able to recycle the PE washed film flakes (from LLDPE stretch agricultural film and LDPE industrial waste) into high-quality granulates.

At the core of the plant, on the multifunctional cutter compactor with patented air flush module, the material with still a small amount of residual humidity and remaining contaminations is optimally recycled. Cutting, homogenizing, heating, degassing, densifying, buffering and dosing – everything in one single step.

The well-proven principle of the whole TVEplus® system is the arrangement of the melt filtration BEFORE the degasification of the extruder with the two important advantages: one is that the minimal shearing impact during the melting process prevents a further size reduction of the contaminations before the filtration and thus increases the efficiency of the filtering process. Another advantage is the fact that contaminations due to their early removal from the recycling system cannot prematurely outgas and thus additionally reduces the accumulation of odours to a minimum in the produced regranulate.

The optimized threefold degassing process of the TVEplus® plant additionally ensures an efficient degasification of the filtered fusion. The thus produced regranulates are transformed by up to 100% into bin liners, protective sheets and construction foils by Poligroup GmbH.

Nikolay Tomov, Production Manager with Poligroup GmbH, underlines further advantages of the EREMA system: “The system also stands out through its easy handling and long service life of the wear parts such as filter screen and pelletiser knives. Generally, one can say that this plant is really tailor-made just for our application. To sum it up, for us it means a maximum of efficiency. “

With the successful operation of the film washing line for Poligroup, Herbold has marked another milestone and strengthened their position as a leading manufacturer of hydro-mechanical recycling plants for film waste with throughputs between 500 kg/h and 3,000 kg/h.

Poligroup GmbH has an efficient recycling plant at their disposal, ensuring a well-priced resource supply for film production from film waste.

A close cooperation of the two companies ensures the information exchange between plant operator and plant supplier, crucial for the further development of plant technology and paves the way for the successful conclusion of future joint projects.



Herbold Meckesheim GmbH

Industriestr. 33
D-74909 Meckesheim
Tel.: +49/6226/932-0
Fax: +49/6226/932-495
herbold@herbold.com
www.herbold.com

**EREMA Engineering Recycling Maschinen und Anlagen
Ges.m.b.H.**

Unterfeldstr. 3
4052 Ansfelden, AUSTRIA
Phone +43 732 3190 - 0
Fax +43 732 3190 - 23
erema@erema.at
www.erema.at

Poligroup Ltd.

North Industrial Area
4230 Asenovgrad
BULGARIEN / Bulgaria
Phone +359 33166100, +359 33166101
Fax +359 33166103
info@poligroup.eu
www.poligroup.eu