Polymer Filtration III

This is the third of a series on polymer filtration. The first article briefly described the need for filtration in some processes while the second article mentioned a few of the filter media available for extrusion applications. This article will overview the array of screening and filtering devices available to the extrusion converter.

The filter processes listed are not a complete survey of devices one can purchase for an extruder. The author will encourage the reader to submit any unlisted concepts for inclusion in future issues of the newsletter.

The processes will be listed in approximate order of their entrance into the extrusion market.

Breaker Plate and Screen By far the oldest and still the most common approach to melt filtration is the screen pack which is fixed in a breaker plate which, in turn, is mounted at the discharge end of the extruder. It is usual that the breaker plate is located in a female recess in the barrel and clamped in place with a gate which is latched by swing bolts, tapered clamp, or a conventional flange with studs and nuts.

The problem caused by using a conventional breaker plate and screens for melt filtration include the following:

1. The surface area for filtration is limited to that of the diameter of the barrel.

2. Particle size retention is limited by the finest screen size which can be mounted in the breaker plate.

3. The discharge pressure drop will climb as the screen is plugged by retained contaminants.

4. The die attached to the end of the extruder must be moved or removed to gain access to the breaker plate.

Each of these limitations has a negative operational and economic effect on the extrusion process. The limited area of a breaker plate causes screen changes to have to be made frequently. If fine filtration of gels or very small particles is required porous media is a better selection than screens. Porous media does not adapt easily to the conventional breaker plate. Extruder performance is affected by a change of discharge pressure. Finally, it is often time consuming and expensive to move equipment to gain access to a dirty screen pack.

These limitations have led to the development of the following alternatives:

1. Remotely mounted screen pack and breaker plate mounted downstream of the extruder. The design normally al lows the filter element to be changed without removing the die.

2. Providing two paths to parallel filters which are either flat or cylindrical in shape. Valves allow a dirty filter to be depressurized. removed, changed, purged, and put back on line without stopping the process.

3. A back flush mechanism has been incorporated in a filter to allow plastic to flow backwards through a portion of the filter media. In theory, the reverse flowing plastic will dislodge the contaminant and carry it out of the process.

4. Slide plate screen changer uses a hydraulic cylinder to rapidly push a clean screen and breaker plate to replace the dirty unit. The design of these units is similar to the photographic slide projector.

5. The continuously moving "constant pressure drop" filter offers an answer to most of the objections of a conventionally mounted breaker plate. Some of these units use plastic pressure to power the filter material across the melt stream while others use hydraulic pressure to control the traversing rate.

The most used method of sealing the moving filter against leakage of molten plastic from the process is to use cold water to partially freeze the plastic which would leak at the filter entrance and exit. This sealing method may cause some thermal gradient in the process unless the seals are isolated from the main melt stream.

Each of the five advance methods of filtration have advantages and disadvantages which should be carefully weighed before purchasing a system. The polymer filtration market is ripe for innovation. A new filter design which will improve melt quality at a minimum of capital and operating cost will have a ready market in plastics extrusion.

- Robert B. Gregory

See also:

- More on polymer filtration
- Polymer filtration
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- Screen pack pressure drop
- Screen pack selection

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