

Two Stage Extrusion Screws

[Print](#)

[\(10\)](#) » [Extruder Order Specifications](#) » [Extrusion Feeding](#) » [Two Stage Extrusion Screws](#)

Two stage extrusion screws
Vol. 26 #2, September 1999

Two stage screws are often designed to provide devolatilization zones where the melt pressure is completely dissipated, so that volatiles can be extracted from the barrel. The screw design, therefore, is based on the premise that the second stage of the screw has to have a greater melt conveying rate than the first stage, in order to facilitate the absence of pressure. The devolatilization zone then runs partially filled, allowing for an opening in the barrel.

The balance in conveying rate between the first and second stage of the screw is very important. First because it is necessary to assure that the devolatilization zone remains unfilled, but more importantly, the amount of fill in the second stage can determine the stability of the screw. The amount of fill depends on output from the first stage, viscosity, screw speed, screw design, and head pressure. The common practice in screw design of using a simple ratio of the metering depths between the first and second stage only satisfies one set of these variables. This can lead to either a flooded devolatilization zone, if the second metering is over filled, or a very unstable screw, if the second metering is only slightly filled.

Poor stability in the second stage of the two stage screws is a very prevalent problem in the industry, and is not understood by many processors. The second metering needs to be filled for at least several turns, in order to provide stable output. Due to the dependence on multiple variables, there is not universal design for two stage screws. Each application requires analysis to determine the suitability of the design. This requires someone knowledgeable in screw design to resolve.

There are, however, several symptoms of inadequate fill that can be determined from the extruder's performance:

- 1) Steady rhythmic surge that seems completely unaffected by temperature settings.
- 2) A large increase in back pressure tends to reduce the frequency and magnitude of the surge.
- 3) Motor amps do not follow the same surge frequency or magnitude.
- 4) There is no indication that there is a varying amount of fill in the devolatilization zone.

Not all surges in two stage screw are caused by inadequate fill in the second stage, as feeding and melting problems occurring in the first stage can also be responsible. However, it is probably the most prevalent cause. One should be particularly suspicious if the head pressure is very low, the viscosity is very high, or there is a large ratio in depth between the first and second metering section.

- Jim Frankland, New Castle Industries

See also:

- [Polymer devolatilization](#)
- [Two stage extrusion](#)

Return to [Consultants' Corner](#)