

The Value of an Annual Rate Check

Many converters have no idea what the output of their screw is at a particular rpm for any given resin. I frequently get calls that start off with, “my extruder is running too cold for good adhesion” or “I can’t run as fast as I used to”. My first question is has the extrusion rate changed from what it used to be? The feed screw may be worn enough to affect the product at this point.

I have heard many rules of thumb over the years of how to know when a screw needs to be reworked. One of these is a number of years, such as twenty. This is not a good measure as there are many considerations that will affect the wear of the screw such as resin type, melt temperature, additives and speed. I have seen screws that were worn out beyond repair after only 5 years and also screws that were still good after 25 years. The best measure I ever heard was from Jan Ivey, who always said the screw should be repaired or replaced when the output from a yearly rate check has decreased 10% from when the screw was new.

The rate check process is very straightforward. When a new screw is put into the extruder, a common resin such as LDPE can be put in. All processing parameters should be noted such as temperature, pressure, speed and resin. The rate check for the machine should be done at three different speeds such as 100 rpm, 150 rpm and 200 rpm or similar. The extruder should be run long enough at each speed to reach steady conditions, typically 10 – 30 minutes depending on extruder size and temperature control system. After the extruder stabilizes a polymer sample should be collected over a fixed period of time. The longer the time period used the more accurate will be the specific rate calculated. Care and proper safety precautions should be used in collecting and handling the hot polymer. The specific rate calculation is very simple, e.g. 12lbs collected over 3 minutes at 150 rpm would yield a specific output of $\{ ((12 \text{ lbs} / 3 \text{ min}) * (60 \text{ min} / \text{hr})) / 150 \text{ rpm} \} = 1.6 \text{ PPH} / \text{RPM}$. Once a year, the same resin and conditions should be documented to easily keep track of the screw wear.

What are the alternatives? The screw can be pulled and flights measured for wear. This is very expensive and time consuming. Or, the screw can be run until there are processing problems. This is very dangerous as the screw can become so worn that it can no longer be repaired but must be replaced. The annual rate check seems the best choice.