

Plastic Extrusion Machines

Every day we use or eat an item produced through a method known as “extrusion”. There are many methods of plastic extrusion all with a unique product: sheet or film extrusion is self-explanatory. Blown film extrusion produces the ubiquitous plastic bag. Conductive wires gain a protective insulating layer through over-jacketing extrusion. Guess what product is produced using tubing extrusion. Coextrusion provides multiple layers of different materials. Generally, solid material enters at one end of the extruder machine, melts and is pushed out of the other end through a die. The temperature in the mix and melt section of the extruder must be monitored in several locations. The pressure at the ejection end of the machine must be monitored and controlled based on the material and the qualities desired in the final product.



Resistance Temperature Detectors (RTDs) installed in the barrel chamber monitor the temperature of the melted and melting plastic as it moves toward the ejection end. RTDs provide the accuracy required in the temperature range used in the extrusion process. The barrel is heated and has to be finely controlled due to heat produced by the friction and pressure inherent in the process. Strain Gauge sensors are used to measure the pressure in the barrel and at the die. The pressure may exceed 5000 psi. The pressure controls the rate the plastic moves through the die. The pressure is a result of the amount of plastic in the barrel and the speed of a screw that feeds the plastic from the hopper through to the die. A valve controls the rate the plastic is allowed to fall through the hopper in to the barrel. The valve is controlled by an analog output, typically a 4-20 mA signal. There is a range of pressure and temperature that produces a repeatable product. If one parameter moves outside this window the polymer degrades and the final product is worthless.

Machine controllers that are used for these applications are very good at controlling temperatures with sufficient RTD inputs and digital outputs. They also control the motor speed and the valve that feeds the plastic into the barrel. Many of these controllers are not equipped with an input to sufficiently measure the output of a strain gauge. A strain gauge uses a Wheatston bridge to measure small deflections that are measured as a change in resistance. The bridge requires a highly regulated DC power source that does not affect the measurement. The output of the bridge circuit is presented in millivolts. As little as a 30 millivolt span represents 5000 psi or more in extruder applications. Accuracy and response time are very important. ioSelect offers a range of strain gauge signal conditioners that provide a highly regulated excitation voltage to the bridge and accurately convert the millivolt bridge output to a robust DC signal the controller needs to produce the best result at the lowest cost.



AP4051



SP448



UP448



A6-2CF

The AccuPak AP4051 provides filtering with its <100 millisecond (ms) response time and offers accuracy of 0.15%. The SelectPak SP448 response time is selectable from 167 to 40 ms and offers an accuracy specification of 0.02%. The UniPak UP448 response is adjustable from 80 to 6.6 ms with an accuracy of 0.02%. The e.bloxx A6-2CF offers an adjustable response down to 1 ms with an accuracy of 0.05%. Each unit provides the flexibility to work with any strain gauge and any control system. The plastic extrusion machine engineer is able to balance price with performance to optimize the cost and ensure the quality of the final product.