Care of Melt Pressure Transducers for Extrusion

Dynisco Instruments, 38 Forge Parkway, Franklin, MA 02038 800-DYNISCO

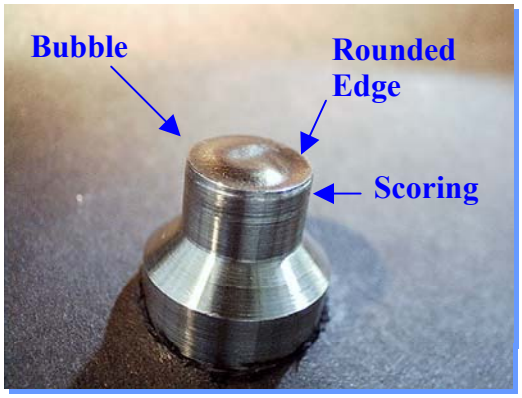
The eight tips in this article for installing and caring for the melt pressure transducers in your extruder will help you to realize their optimum performance and minimize problems in their use.

Melt pressure transducers are used to improve extruder output and melt quality, improve production safety and protect machinery. The achievement of product quality specifications such as part dimension and surface finish, met with minimal material waste, requires the maintenance of an optimum processing pressure during production. Stable output, with reduced scrap and material waste, will be maintained by transducers placed at the entrance to the die, in conjunction with a pressure control device. Pressure measurements across a screen pack and melt pump are also important for safety and optimum performance. A melt transducer downstream of the screen pack will alert operators if flow to the die restricted, while of upstream of the screen pack will warn a high-pressure situation that may produce excessive wear to the screw's thrust bearing. For processors using melt pumps, measurement of both inlet and outlet pressure ensures a constant melt flow at the die and signals a restriction in melt flow that could cause damage to the pump. Melt pressure instrumentation on an extruder can go from a single transducer measuring one pressure point to a series of transducers measuring the entire process, tied to instrumentation that will record data, sound an alarm, give warnings to take corrective actions and relay information to a process control system. If one knows both the correct installation and proper maintenance the optimum transducer performance and longevity can be achieved. The following installation and maintenance guidelines and recommendations will help to obtain the greatest number of accurate, reliable melt pressure measurements with a minimum of operational problems.

1. The Transducer Must Be Mounted Correctly!

Damage to a pressure transducer is commonly caused by their installation into an improperly machined hole. In forcing a transducer into a too-small or eccentric hole, the transducer diaphragm may be crushed and as a result the instrument will not function.

Tool kits available for machining the mounting hole will help to make sure the holes are properly sized. A mounting torque of 100 to 200 inch pounds (for ½-20 UNF) is essential to form an adequate seal, however, excessive mounting torque will cause seizing. To prevent problems with seizing, a high temperature anti-seize compound should be applied to the transducer threads prior to installation. Transducers installed at a mounting torque above 500 inch pounds will be difficult to remove even when anti-seize compound is applied.



2. Ensure That the Mounting Hole Thread Size is Correct!

The abrasion from screwing a transducer into a mounting hole with an incorrect thread size will damage the instrument's threads. This damage may prevent a good tight seal, resulting in material leakage, and the instrument will not function properly or safely. The proper dimensions for the mounting hole must be used to avoid thread galling. (The threads are, generally the industry standard of ½ - 20 UNF 2B.) A mounting well gage plug should be used to verify that the mounting hole is correctly machined and cleaned.

3. The Mounting Holes Must Be Clean!

It is important that the transducer mounting holes are kept clean and free of any plastic buildup. Before an extruder is cleaned all of the transducers should be removed from the barrel to avoid their being damaged. When they are removed, plastic is likely to flow into the mounting holes and harden. If this hard plastic residue is not removed extensive tip damage will result when the transducers are re-inserted. A cleaning tool kit can be used to remove the contaminant plastic. It should be noted that repeated cleaning may produce "too deep" holes and result in damage to the transducer tip. If this is seen, spacers should be used to raise the transducer.

4. Select a Good Location!

Transducers may be located in the barrel, before a screen changer, before and after a melt pump, or in the die. When a transducer is positioned too far upstream in the barrel, un-melted plastic pellets may abrade against the transducer tip, resulting in damage. If a transducer is positioned too far back in the mounting hole, a stagnant pool of melted plastic will build up between the transducer tip and the screw flights. Over time this plastic will degrade to carbon, which will prevent the transmission of an accurate pressure signal. On the other hand, if the transducer extends too far into the barrel the screw flights can shear off the unit's sensor tip.

5. Clean the Transducer with Care!

All of the transducers should be removed before cleaning an extruder barrel with either a wire brush or special cleaning compounds. Either one of these can ruin the transducer diaphragm. The transducer should be removed while the barrel is hot and tip wiped clean with a non-abrasive cloth. The transducer hole should be cleaned at this time with a cleaning drill/guide sleeve.

6. Keep Your Transducers Dry!

Although a standard transducer's electronic circuitry is designed to withstand the rigors of the extrusion process, most transducers are not watertight and will not operate when wet. Make sure there are no leaks, in the water-cooling jackets in the extruder barrel, which could damage the transducer. If you know that the transducer will be unavoidably exposed to water or moisture specify watertight transducers.

7. Avoid Cold Starts!

Both the transducer and extruder can be damaged if the extruder is not brought up to operating temperature before the machinery begins operating. A sufficient "soak time" must be provided for the plastic to go from it's solid to molten state. In addition, it should be noted that if a transducer is removed from a cold extruder, material might adhere to the transducer tip causing the diaphragm to tear off the unit. Make sure the barrel is warm enough, that any plastic present will be soft, before removing the transducer.

8. Don't Overpressure the Transducer!

Even though transducers are designed to withstand 1.5 times overpressure, avoid the risk of applying too much pressure by making sure that you are using the correct model designed for your range of extrusion operation pressures. A good rule of thumb is to use transducers that are built to withstand twice the rated pressure in your process. Then the extruder will have to be operating at an extremely high (and unsafe) pressure level for the transducer to fail.

Quick References!!!

1) **Threads must be machined to correct tolerances.**
2) **A metal-to-metal seal on the 45^{o}-seating surface is necessary.**
3) **Check the mounting hole, the recommended recess is flush to 0.010".**
4) **Apply a high temperature anti-seize compound to the threads before installation. A minimum 100 to 200 inch pounds of torque are recommended. Do not torque above 500 inch pounds.**