Extrusion with Plugged Vented Barrel Extruders

Extrusion with plugged vented barrel extruders - a potentially hazardous operation
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It is common practice to plug a vented barrel extruder and use it in the same way as a solid barrel machine. Unfortunately, there are a number of recent cases where the internal barrel pressure exceeded the strength limit of the bolts retaining the plug and the plug parted violently from the barrel. Operators have been struck by the plug and/or they have been severely burned by the molten resin/gas mixture exploding from the barrel.

To prevent this type of accident a number of safety precautions should be taken. First, the bolts retaining the plug should be of sufficient strength and number to retain the plug under normal operating pressures. The machine supplier can be consulted to make sure the plug is securely fastened and safe to operate. In one accident of which I am aware, the number of bolts was reduced from six to two and the bolt size was smaller than required!

A second precaution one might take is to rotate the barrel so the plugged vent is pointing downward or away from the operator. In case a vent plug does give way there is less chance of operator injury.

Precaution number three is to use a pressure gauge at the head of the extruder and establish a maximum pressure at which the machine can be safely operated. Shear bolts or a rupture disc might be installed to insure excessive melt pressure does not develop. Since one cannot predict the pressure which might develop near the vent port, it seems more appropriate to install a rupture disc in this region.

The fourth precaution is to make sure the machine is heated adequately so the metal temperature in the front end of the extruder, e.g., gate, adaptor, head, and die, is above the freezing point of the resin being processed. Thermal insulation should be used to cover exposed metal surfaces where heaters cannot be placed. Also, the temperature control settings should be correctly adjusted for the resin being extruded. This is especially important when the extruder is being used to process various types of nylon, polyester, or other classes of resins which have a wide range of melting points within the class.

A recent accident illustrates some of the points made in the above paragraph. In this case the operator was extruding nylon in a plugged vented machine. The nylon was designated by trade name and the nylon type was not printed on the package. It so happened that nylon-6 was extruded first and after the desired amount of product was made another trade name nylon was added to the machine. Since the operator was unaware that the new material was nylon-66 he made no temperature adjustments. Thus, when the nylon-66 was pumped to the breaker plate it solidified and excessive melt pressure developed. Because the pressure gauge was inoperative the machine operator was not aware of the problem and the vent plug parted violently from the barrel. Unfortunately, the operator was splashed with molten nylon and he received serious burns.

Finally, it seems to me that manufacturers of vented barrel extruders should issue a warning about the hazards of plugging the vent.

- Robert M. Bonner

See also:

- A bomb, a gun, or a useful tool
- Extrusion and safety

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