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Until a few years ago commercially available gear pumps and associated controls were not adequate for use inserted between plasticating screw extruders and dies for most applications. Now several manufacturers can furnish dependable gear pumps that effectively minimize surges and fluctuations in extruder output. Furthermore, where high pressure dies are used, these pumps often can operate with just a few hundred psi. inlet pressure. The reduction in extruder discharge pressure can reduce the exit melt temperature and increase output per RPM. Also, the lower discharge pressure often can solve a vent flooding problem for vented two-stage screws if such a problem exists.

However, there are both advantages and disadvantages to using gear pumps, and their cost is by no means always justified. It can be quite costly to use a high quality gear pump in combination with a microprocessor controller to coordinate extruder and pump speeds so as to maintain constant melt temperature, output, and inlet and outlet pressures. One manufacturer offers such equipment for a 3½ inch extruder at about \$25,000, and the costs for large extruders may be double this amount.

Often some other expenditure for the same or less money can be more advantageous. For example, in sheet extrusion there are many cases where high quality sheet is being produced at high output without a gear pump. When an appropriate extruder screw is used with a modern well-designed extruder and die together with uniform feed stock, the results are very often entirely satisfactory.

If the extruder screw is not well designed, there may be a serious problem with excessive melt temperature, inadequate melting or poor mixing that cannot be corrected with a polymer melt pump. Investing in a well designed screw at far lower cost may correct these problems, as well as correct a surging problem. Furthermore, if the sheet die is not well designed, well adjusted, and well temperature controlled, then the gear pump may be of little help in making good sheet. It may be better to spend the money on a new sheet die or apply it towards better downstream sheet line equipment.

Even if none of the above equipment deficiencies exist, it may be better in some cases to apply the money toward purchase of sheet gauge-scanning equipment. However, by no means do I want to imply that gear pumps should be last on the equipment list. Instead, I merely wish to point out that there are many approaches to improving commercial extrusion operations, and all should be examined to determine which are most cost effective in relation to deficiencies that exist in each individual case.

- George A. Kruder

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