WHY SELECT A GEAR MOLDER VERSUS A NON-GEAR MOLDER?

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The effect of gear quality may affect the quality of the end product, impacting noise, vibration, and product life.

Plastic gear quality is usually determined by measurements of concentricity, roundness, involute profile, tooth spacing errors, axial hour-glass or taper, helix angle (helical gears) and size: arc tooth thickness, outside and root diameters. A plastic gear molder has invested in special measurement equipment/software and has trained personnel to provide assurance that each lot of parts is consistent.

Plastic gear quality is sometimes determined by analysis of material integrity. Some of the common areas that affect the quality of a plastic gear are lower than desired crystallinity strength, voids, internal stress risers, cold welds, residual stresses, and alignment of fibrous reinforcement along the tooth profile. A plastic gear molder knows the importance of analyzing materials and how they affect the "unseen quality" of the part.

Things that influence the measurable and "unseen quality" of a plastic gear are the injection molding processes and the gear mold design.

- A plastic gear molder knows which parameters in the molding process contribute to part variation. Some important controls must be held to the recommended process parameters, to prevent the material from degrading (degradation of materials result in reduced material properties). The controls are: plastic material conditioning, time/pressure for injection and mold cycle time.

  The non-gear molder may know these elements are important, but have not developed the database of information to arrive at the proper parameters. Development time may be increased and molding at less than ideal conditions, to meet timelines and cost pressures, may lead to

compromises. Many gear failures are due to fast cycle times that may be appropriate for non-gear molded parts, but not for gears.

- A plastic gear molder knows how to design a gear mold - based on experience. The key elements of design are the choice of cavity numbers, runner system, gates, ejectors, gear blank design features, cavity design (gear rings), venting and cooling. The effect of mold design on gear quality affects both measurable and unseen gear quality. For example:

Concentricity is controlled by the accuracy in the mold ring, core pin mounting, and clearance in the core pin support -- especially if combined with an ejector ring. Non-uniform cooling around the mold ring and non-uniform features in the gear blank results in non-uniform shrinkage.
Roundness is controlled by gate design -- the number of gates and gate location and size.
Involute profile variations are controlled by the selection of the correct material shrinkage in each portion of the tool and the accuracy of the machined electrode.
Tooth spacing uniformity is also controlled by gate design -- the number of gates, gate location and size, plus uniform cooling and the accuracy of the machined electrode.
Size or taper is a result of non-uniform cooling and selection of the correct material shrinkage.

Summary: A gear molder maintains a database – based upon experience, to minimize variations in the measurable and unseen quality of plastic gears.