Determining maximum mold cycle counts

By Steve Johnson, ToolingDocs LLC

During my first production meeting with my current employer, I was told they wanted to establish a preventative maintenance program based on cycle counts for all of their molds. Before I could comment, though, I was hit with the question, "How many cycles do you think our molds can safely run before we need to clean them?"

Never having seen their molds before, I couldn't answer, which didn't exactly thrill them. They were also disappointed at the prospect of leaving the meeting without an immediate scheduling plan for production that would help their molds run better and eliminate tooling damage issues apparently caused by molds being over-run.

Not wanting disappoint them too much on my first day, I offered up my standard answer for maximum cycle counts: that 250,000 is typically a good starting point for the average injection mold, but that the number can vary greatly — up or down — depending on a variety of production characteristics, and on the mold design itself. I then expanded, telling them that these production characteristics included product type and specifications; resin type, additives, required temperature, corrosiveness, abrasiveness, and flash rate; residue (off-gassing) type, powder, flakes, gummy (tar-like) or oily consistency; vent locations, depth, and finish; vent dump size, location, and configuration (ring, channel, blind pockets, et cetera); static versus dynamic (moving tooling) vents; tooling steel types/hardness; tooling plating type and condition; tooling and running fit tolerances; inaccessible internal bushing and other actuating components; internal condensation level and mold plate steel type; O-rings and other internal water seal leakage history; and specific hot or cold runner issues.

Had I dug deeper still — which I didn't — I would have added that when determining maximum cycle counts, another critical factor is knowing the product part defect frequencies and positions that can be affected by many of the above criteria — in specific areas. Part defects "localized" by imbalanced fill or steel variations need to be recognized and considered when setting maximum counts. But, generally speaking, anytime you over-run a mold, you increase the risk of molding bad parts, through burns, shorts, weld lines, or dirty and flashed parts. Mold off-gassing, or residue, will end up someplace if it can't escape through clean vents.

Stopping and pulling molds for scheduled preventative maintenance is a good practice, period, but it's not always possible if you want to keep your customers happy and in parts. Obviously, if a mold was pulled for a good cleaning every time its maximum cycle number lit up, those responsible for mold maintenance would be happy campers. With scheduled maintenance, it's much easier to more accurately gauge the labor hours required to disassemble, clean, and return a mold to production, knowing that the tooling hasn't been worn prematurely with gummed up close fits. A surprise-free mold repair is always a good thing, but it seldom happens in the real world because — as noted above — maximum part production too often rules the day.

Molders are customer-driven, as they need to be, when it comes to running a mold to complete an order. If a few more hours, shifts, days and, in extreme cases, weeks are required to get an order completed, the mold will run or will lock up trying. On the other hand, molds that are subjected to many short production runs are also in danger of premature tooling wear if the tool room doesn't track total mold cycles for a series of short orders; it's easy, without a tracking system, to damage tooling simply because cycle counts get lost in the day-to-day affairs of pulling and setting lots of molds. And on the other other hand, over-maintaining molds wastes money too, and increases the chances of mold damage during repairs.

What you really need to know to set maximum mold cycles can only be determined through close visual inspection of mold plates and tooling after a production run, and by the ability to accurately answer a few production-related questions that will dictate maintenance requirements. These include the date and time the mold was started, what press did it run in, who started it, what tooling configuration is the mold running, the date and time the mold was stopped, who stopped it and why, how many cycles or hours did the mold run, and what was the condition of the parts in the last shot? It's also very helpful, when evaluating mold residue and tooling wear levels, to know if the production run was interrupted by stops for changeovers, unscheduled breakdowns, or weekend downtime; if repeated ejector counts were required to release the parts from the mold; if the mold was properly and regularly serviced in the press during the run; if the cycle time and processing parameters were consistent with past runs; and if there were any part defects related to flash in a vented area.

Efficient production of quality parts on time should be the mantra of every molder, but you can't satisfy it by allowing production requirements to dictate maximum cycle counts in every situation. Adherence to data collection practices and visual inspection of tooling and parts are the only methods that will allow you to balance maximizing tooling life, production capability, and mold reliability. **CPL**

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