Training

Choosing the Right Drill

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What You Need to Know

Drilling in the mold making industry often differs from conventional drilling with respect to several key factors.
A variety of strategies can be employed to minimize deflection and/or improve hole precision.
Choosing the right drill for your application can be a complex affair.

Drilling in the mold making industry often differs from conventional drilling with respect to several key factors. For one thing, there is a greater frequency of drilling contoured surfaces. For another, the industry employs tougher materials than are typically encountered in general machining. Successfully dealing with these conditions requires an application-specific machining strategy.

Contoured surfaces or interrupted cuts can present problems whether you are using an indexable drill, a replaceable point drill, a solid carbide or even a high speed steel (HSS) drill. That's because the more irregular the surface, the greater chance of deflection.

Before looking at deflection, though, let's consider which type of drill to use. The answer depends on both technical and business considerations. Holes 0.5 in. diameter and under with depths up to 70xD are best suited for solid carbide drills. When confronted with larger diameter holes, indexable drills often provide the most efficient solution for holes up to 5xD. Above that, up to 10xD, replaceable tip drills are the prime candidates. For all of these applications I always recommend coolant-thru drills.

There is also the economics of the application to be considered. For very low volumes where cycle time and cost per hole are not critical, an economical HSS drill might suffice. For higher volumes, a solid carbide drill could be advantageous because even though it is more expensive, it can run at higher speeds with higher cutting parameters. This provides lower cost per hole and higher productivity.

However, for holes from 0.5 in. diameter and up, and for depths up to 5xD, indexable insert drills will typically provide the best cycle time and cost per hole. This is because they bring less cutting tool material into contact with the hole wall, so there is less friction, allowing higher cutting speed. They also have an advantage, since unlike HSS or solid carbide drills, reconditioning is not necessary. The tradeoff is in precision (i.e., hole location and diameter tolerance). That's because indexable drills are more prone to deflection than solid carbide drills.

A variety of strategies can be employed to minimize deflection and/or improve hole precision. You can use precision ground rather than production inserts on the periphery of the tool to reduce tolerance stack up. Also, offset toolholders can be used. Inner inserts encounter higher cutting forces than do the outer ones, due to the lower cutting speeds, thus promoting higher deflective forces. Insert placement within the tool can be adjusted by the tool design engineer to compensate. Regardless of drill type, irregular surfaces can be pre-machined then pilot drilled. Strategies like these can improve performance, depending on the customer's needs and priorities.

Because the mold making industry employs tough materials, insert grades and geometries need to be evaluated for the best combination. The inner insert encounters higher cutting forces than the outer, so here you will typically want a very tough grade and a geometry not prone to chipping. In the outer

pocket, running at higher speed, use a more wear resistant carbide. This mixing and matching can optimize the process.

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That's why the final tip is: Choose the right drill supplier, one with the applications engineering expertise needed to help optimize your holemaking operations.

Key Takeaways

- Holes 0.5 in. diameter and under with depths up to 70xD are best suited for solid carbide drills. When confronted with larger diameter holes, indexable drills often provide the most efficient solution for holes up to 5xD. Above that, up to 10xD, replaceable tip drills are the prime candidates.
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