Economizing in the Drill Room

In this department, a little effort goes a long way.

Moiz Balkhi

The circuit board drilling process appears deceptively simple, but its inherent complexities provide numerous cost-cutting opportunities for today's fabricator. In this article, we'll outline some relatively easy-to-implement process/equipment configuration options that will help reduce expenses in the drill room over the long run.

Handling Reduction

A cardinal rule in drilling economy is to minimize bit handling and the potential for damage/breakage. The primary object here is to avoid discovering, after the fact, that a flawed (broken) bit has been engaged into the production cycle, generating scrap and down time. Handling can be reduced by using precollared bits or automated ring setters. This enhances machine productivity and saves setup time, while ensuring proper bit setting. Drill bit collars should never be reused as their benefits may be substantially reduced if they're used in a worn state.

Broken Bit Detection/ laser Measurement

Costs add up quickly in the drill room if the operator accidentally inserts a wrong tool into the cassette or tool changer. If the machine doesn't have some type of diameter check function, the wrong bit can be set into motion. In the case of a run consisting of three-high stacks on five stations, a total of 15 panels, backup and entry material, and operator time may be wasted. A laser measurement system that checks drill bit diameter can greatly reduce the likelihood of this problem.

Similarly, it's easy to inadvertently set a broken bit into motion, particularly when using smaller-diameter tools. For most standard machines, a laser-based broken-bit detection system is recommended to reduce scrap and rework time.

Diameter/Runout Measurement

This mechanism provides a system check that ensures pickup of the correct tool. The laser device measures the dynamic runout of the drill bits at the programmed spindle's speed, thereby serving an accuracy and productivity control function.

Repainting

Another way to economize in the drill room is to use repointed drill bits. For production applications, up to three resharps can be used effectively. After the third resharp, however, it's usually time to discard the bit.

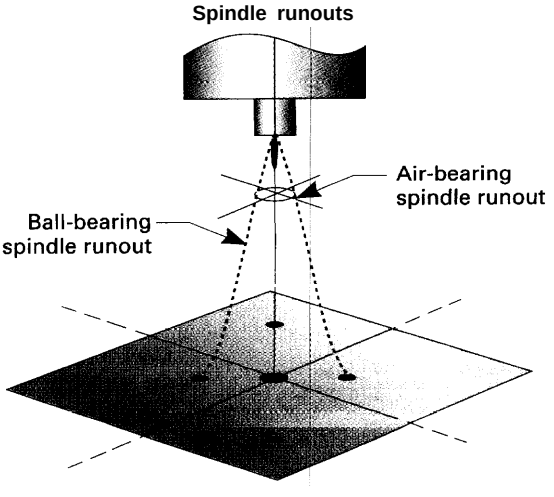

Figure 1. Air-bearing vs. *ball-bearing spindle runout.*

Air vs. Ball-Bearing Spindles

The PCB industry has become more demanding over recent years, requiring spindles capable of operating at higher speeds and able to drill smaller holes at higher feed rates. Ball-bearing spindles, in many respects, are unable to meet these demands. The key features of air-bearing spindles include greater rotational accuracy, minimal vibration, resistance to highly abrasive PCB dust, improved hole quality, and an overall increase in productivity (Figure 1).

Drill Path Optimization

Minimizing the length of travel during the drilling process yields substantial cumulative savings. Machine run time can be greatly reduced by ensuring the smallest possible deviation from the axis orientation. Path optimization programs are available that search for x, y coordinates, resulting in the least amount of travel throughout a particular drill run routine.

Preventive Maintenance

To maximize cost savings, the fabricator must ensure that his/her drilling machine is maintained regularly; otherwise, operating costs can skyrocket. Minor repairs and adjustments made on a periodic basis can avoid disastrous down time and extend the useful life of the machine. In the case of drilling equipment, this means regular servo tuning as well as lead screw monitoring and lubrication. Air-bearing adjustment must be performed religiously, and spindle runout checked. It's also crucial to be sure that the tooling plate meets the user's specifications. Many of today's machines have system diagnostics with real-time error description on screen and detailed correction procedures. The payoff: reduced machine diagnostics and down time.

Conclusion

Although there are additional measures that may be taken to reduce drill room expenses, it's best to complete a general assessment of your current product/process flow and determine the best cost-reduction scenario for your specific application. Assessing the variables addressed in this article is a good start. FAB

Moiz *Balkhi is a senior applications engineer with Advanced Controls Inc., Irvine,* CA.