Challenges of unmanned machining - Part 3

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With machine tools costing hundreds of thousands of dollars, it’s no wonder some shops want to run unmanned. Running unmanned can extend your machining hours without extending your payroll. As we’ve seen in the past two issues of Shop Talk, unmanned machining is quite a challenge. There are many serious issues to think about, including machine crashes and fires in the machine and the possibility of spending hours making bad parts.

One strategy to avoid all those bad parts is to set up a tool management plan which can allow you to run the machine for longer periods with less human intervention.

I know of two methods for setting up a tool management plan, the “slam bang” method and the “slow and steady” method.

Slam Bang Method

With the slam bang method, we are looking for the greatest possible production from the machine through the minimum cycle time – make as many parts in the least possible time.

When using this method you often hear both the slam and the bang from the machine. This method is employed by running the tools as fast as possible. The tools become highly stressed and then they break.

As this point people who use the slam-bang method know that the current speeds and feeds are too fast. These individuals lower the speeds and feeds just a tad, feeling they have now found the optimum cutting conditions.

There are problems when using the slam-bang tooling management method. You are operating close to the tool’s failure mode, resulting is rapid tool wear. When the tool wears out faster, the machine requires more human intervention to check the part size, adjust the offsets and eventually, change the tool.

This method is fine if you have someone to constantly watch the machine, but it is no way to run minimally manned or completely unmanned.

Slow and Steady Method

This tool management method is based on selecting cutting conditions that provide good tool life. Using this method, you must accept that the machine’s production rate will be less then with the slam-bang methods. However, tooling costs should be less and part quality levels should increase.

Our ultimate goal is to extend the operation time for the machine tool. To achieve this goal, the tool management plan must make the most of all resources.

If the CNC control has a tool monitoring system you can determine realistic expectations for the life of the tools. With this information you can install “back-up” tooling in the machine, which is called into use through the CNC program at a predetermined part count.

The slow and steady method is ideal for long running production jobs with a core set of 4-5 tools. Consider this example. On a CNC turning center with a 12-station turret we are running a long-term job that uses only 4 tools. The turret is loaded with 2 complete sets of tooling. Set a macro program for the machine that uses the first set of tooling to machine the parts until a specified part count.

Once the part count value is reached, the program then uses the second set of tooling. This is the sister-tooling concept when used with the slow and steady tool management system. The machine can run uninterrupted, without unnecessary intervention from an operator.

Disadvantages of sister-tooling

The slow and steady sister-tooling method has some initial start up costs. You must purchase at least two complete sets of tooling, plus the necessary tool holders. The initial set-up times are increased as each tool must be installed and tested.

Also, there must be adequate tool stations to make sister-tooling work. Keep in mind that you may not need to duplicate each tool. Some tool do very little machining for each part and therefore may last much longer then other tools.

As with any machining situation, the part size may drift out of acceptable limits. Some scrap parts may be produced. Use of an in-process measuring system (a closed-loop gauge) may help overcome size deviations. In some cases, the machine control can be set to send a page or email-type message when manual attention is needed.

When machining unmanned, the volume of waste must be weighed against the gains of machining without a constant operator.

Advantages of sister-tooling

The largest advantage is the ability to run the machine for more hours each day without the additional labor costs. As this is the goal of any unmanned machining situation, the sister-tooling management methods may be a benefit to many operations.

Try this tooling method cautiously. Set the machine to run for an extra two hours per shift and then refine the method from there.

We need to invest in technology to produce the maximum number of parts in a 24-hour day. The standard 1 or 2 shift operation is often not paying the bills in today’s economy. Since we can’t be the cheapest in making parts, we have to be the smartest. Managing tooling is one way to help accomplish this goal.