Routing Standardization

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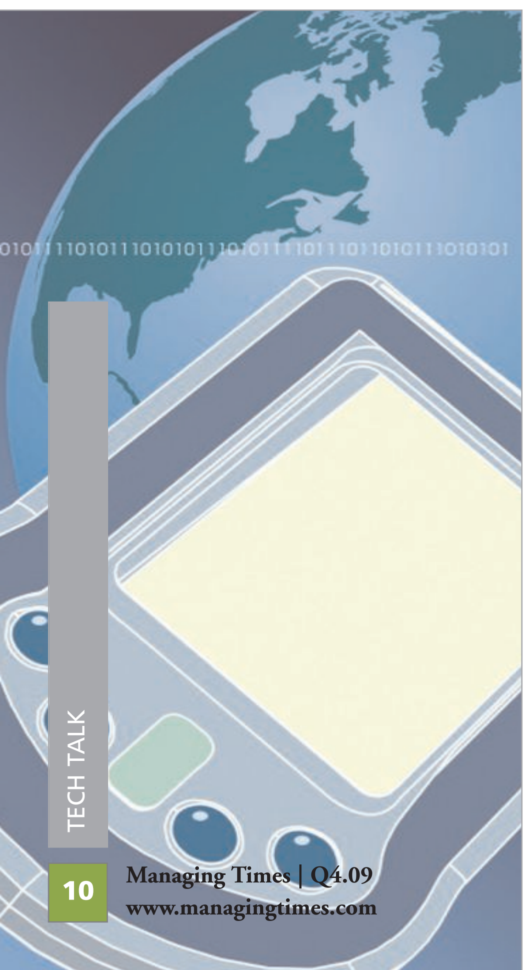
Would you like to increase productivity by 50 percent, increase the ability to be on time with components to close to 100 percent, reduce your need for floor space, improve quality dramatically, reduce lead-time by 70 percent to 80 percent, and reduce your inventory substantially?

Then routing standardization is the tool for you.



Routing standardization is a tool employed by organizations in need of a product or process family focus; it works particularly well in organizations with high-variety, low-volume processes and creates flow where none existed before. Unlike cellular manufacturing in the 1980s and 1990s, routing standardization uses the kaizen breakthrough methodology to form the product/process families; assign the equipment; and develop the takt time, staffing, and capacity of the cell.

Product family cells are based on process similarities, not end-item or geometry, and using such cells enables an organization to focus its factory and improve performance by creating small, manageable work areas.

The biggest impediment to starting on this journey is understanding how to begin. The routing standardization process has several steps:

- analyzing part quantities
- analyzing the routing of each process
- grouping routings
- simplifying process routings
- calculating takt time
- assigning equipment
- developing operator and machine cycle times
- analyzing process capacity
- developing potential layouts
- developing an implementation plan

Part Quantity Analysis

The first step is the part quantity analysis, which allows the team to start to understand the scope of the project and start making decisions about the method that will be used to work on the product/process groupings. The part quantity analysis is used to view the part numbers that represent 80 percent of the total volume and place those into product families. Every part must be placed; the thought process is that if you find a home for the part numbers that represent 80 percent of the volume, then the rest of the part numbers will most likely fit into one of those families.

Process Analysis

The second step is to analyze the process. In order to reveal similar process routings, you need to understand the level at which to analyze the process. You could have turning–milling–deburr or N/C turning–N/C milling–deburr, or going into even more depth, Mazak 6 Horizontal N/C turning–Mitsui 5 Vertical N/C milling–brush Deburr–hand deburr. All are correct, but the more specific you get with the machine group categories the more difficult it will be to have similar product families drop out of the process. At the same time, you must separate the machine groups into capability in order for all the parts selected for a product family to be able to be run in a cell.

Group Routings

The third step in the process is to group similar process routings. There are several methods to do this, including using spreadsheets or strips on a wall.

If you have 300 part numbers to segregate into part families, writing out the routings on pieces of paper, cutting them into strips, and placing them on the wall will allow the team to get a picture of the cells. If you have 10,000 part numbers, strips will not be as effective when trying to complete the process during one week.

In the case of many part numbers, the best approach is to use a coded spreadsheet constructed in Excel. Although a spreadsheet is helpful for handling large numbers of parts, this method also has some shortcomings because it will be more difficult for the entire team to assimilate the data and the cells will not be as obvious to the team.

Simplify Process Routings

The fourth step is to simplify the routings. Often routings for similar part numbers are different simply based on who created the routing, and when. Simple steps like re-arranging the order of processing, eliminating redundant operations, and splitting or combining across CNC work centers can have a profound impact on managing the complexity of the business.

This is also the step were you start looking at the "cats and dogs" (routings that do not fit the cells as defined in step three). At this step, you may be combining cells or adding processes to cells. This step and the following four steps are usually worked together because they commonly have an effect on each other.

The fifth step is to develop a takt time for each of the new cells. This is a small step, but an important one if the team is to begin to understand each cell.

Assign Equipment

The sixth step is to assign the appropriate equipment to each cell. This is where the trouble begins. Several issues can arise at this point: not having enough machines, having machines that are in a poor state of operation, and not having the correct machines.

At this point, understanding the equipment in the operation becomes paramount. Often companies will color code their equipment, red–yellow–green to indicate the process capability or the reliability of the equipment. At this step, the team must be creative in solving each issue as it comes up. The last resort is to share a machine. This step is closely related to the next two steps in the process.

Develop Operating Cycle Times

The seventh step in the process is to understand the operator cycle times and machine cycle times. Operator cycle times should be measured, if possible, but sometimes you must use educated guesses in order to move forward. It's best if the machine cycle times are based on actual data as well, but often educated guesses are used here too.

Guard against using tape times in place of machine cycle times—these are almost never accurate. At this point it may become obvious that there can be many machine cycle times, and it's tempting to use weighted average cycle times as a guide. Avoid this if possible, because for product to flow smoothly through the cells, the manual time and the automatic time for every part, number must be below the takt time; otherwise, you will have to use mixed-model logic to manage the flow, and this is not the most desirable method. The automatic cycle time on machines can almost always be reduced—often substantially. Cycle times will be used to calculate the process capacity of each cell, so this is a very important step to insure that each cell can perform as required.

Develop Machine Cycle Times

The eighth step in the process is to calculate the process capacity for each of the cells using the equipment and machine-cycle-time data collected in the previous step. You may have to make adjustments at this time to the equipment or products if there isn't enough capacity in the cell for the product family assigned to it.

Target Staffing

Once all the parts are assigned to cells and the manual and automatic times have been balanced, calculating the target staffing is possible. Staffing requirements should be based on the load–unload–inspection/gauge time and not on the set-up times. Do not be surprised if direct productivity doubles; this is very common and although it can seem unbelievable to teams, trust the numbers. The process capacity sheet can also be used to calculate the lowest lot size in days that can run through the process without running out of capacity, and if you do not like the answer, then targets for setup reduction can be set.

Develop Potential Layout

Once you have the cell organized to meet takt time, have the correct process capacity, and the team understands the staffing required you are ready for the ninth step in the process: developing suitable layouts for each of the cells identified. Scale foam blocks are helpful during this process, but full-size cardboard models work best.

Things that must be taken into account are machines that require a foundation or other special needs. The team needs to assess the need for each foundation—in most cases, the number of machines that require a foundation is small, and some companies just have a culture of putting a foundation under all machines. Why waste the funds?

Implement the Plan

The last step in the process is to develop an implementation plan. Many things must be taken into account for the implementation plan to be effective, including the overall flow of the building, any foundations required, and any special needs of an individual cell, as well as any precedents of one machine needing to move before another can move.

There are pitfalls to the process that you must also take into account. Not every part fits into a family grouping easily, and such parts can be dealt with in one of several ways: change the routing, change the engineering, or move the part to a supplier. The natural reaction is to create a "general cell," but this can be a mistake for many reasons. Issues with shared resources must be dealt with to proceed with product family cells. The last pitfall to consider is the cultural changes required. Issues always arise when fewer employees are needed, especially regarding what the organization is going to do with the excess operators. Another issue is the need to have operators operate several machines instead of just one.

A Powerful Tool

The process steps for routing standardization are logical and powerful. They allow the organization to focus their activities on small manageable sections of the business; link processes together; and manage resources such as manpower, inventory, and floor space. Each step plays an important part in the organization's transition to cellular manufacturing. Routing standardization also applies lean manufacturing techniques to the organization throughout the process.

The benefits to the employees include the expansion of their skill sets and job security through better performance of the organization. The tight focus of a product cell gives each employee a sense of pride and belonging.

Routing standardization is a powerful tool for an organization that is trying to become more effective and profitable. By using routing standardization, an organization can hope to improve its productivity, reduce inventory, reduce lead-time, and improve the availability of their product. By following the ten steps, an organization can become more agile and responsive to its customers, and that's a formula for success. ■