

### Part 3

#### Reducing the Time Spent Getting Ready, Eliminating Twos and Threads in your Setups

By Jerry W. Claunch

Last month we examined the third and fourth steps in setup time reduction-Step 3, Setting Your Goal and Step 4, Implementing the 30 Percent Reduction List. This month we continue this important series with Step 5, Reducing Time Spent Getting Ready for Setup, Step 6, Eliminating the Twos in Setups and Step 7, Methods for Eliminating Threads During Setup.

Those of you reading this article that are automobile racing fans can relate to setup time as the pit stop in racing-the faster the car can be serviced, the better the crew's chance of winning. Yet most people talk about the speed, driver and engine manufacturer. Reducing your setup time will allow you to outdistance your competition and win the battle.

#### Step 5

Reduce the Time Spent Getting Ready to Changeover Imagine your favorite race car driver pulling into the pit and then the crew starts looking for all of the tools, fuel containers and jacks. Your favorite driver wouldn't be your favorite driver for long.

Far too often there is little or no work done before a setup begins. Many times the job is completed and then the setup for the next job starts-with the operator having to find out what the next job is. This leads to mental preparation and physical preparation-gathering all of the tools, fixtures, gages and other change parts. Much of this work is a waste of time since it could have been done while the previous job was running.

#### Plan Ahead, But Not Too Far

Ensure that the next job to run at each machine is made known while the previous job is running. The operator can then begin to think about the setup and begin gathering all of the tools, fixtures, gages and other change parts prior to the completion of the current job.

One method used by many companies is only posting the next job for each machine/operator, not jobs for the next week. Don't plan so far in advance that employees get frustrated due to schedule changes. Schedule the next job so employees can begin mentally preparing for the job. Figure 1 (page xx) shows a schedule board/information panel used at one company.

#### Provide the Tools, Fixtures, Gages and Other Change Parts to the Machine

One setup time reduction project in a Fort Lauderdale, FL plant involved a crush grinder operator who always had to review the print and fill out a form for all of the items needed for the new job. He began making the list as soon as he completed the previous job and the part had been verified for quality. He then walked to the tool crib to give them the list and wait while all of the items are pulled from stock. He carried those items back to the grinder and began setup.

The entire time he was doing this, the machine was stopped. I'm sure you're saying, "That's unacceptable in our plant!" But don't be too quick to criticize. This is actually more normal in shops than unusual. Maybe your operators don't have to go get all of the change parts, but most

operators have to go get something needed to complete the setup.

The policy should be to identify all of the tools, fixtures, gages and other change parts required for a job in advance; and that those items be delivered while the previous job is running. Have a detailed changeover procedure with a checklist that includes all of the required tools, settings, documentation, steps, baseline settings and average time to complete each step and prepare those ahead of time either by the operator or the tool room.

Everyone committed to setup time reduction needs setup carts that hold all of the required hand tools, clamping devices, tooling, fixtures, other change parts and raw materials. All of these are brought to the machine while the previous job is still running. These same materials left from the previous job should be put on the cart and returned to their appropriate location after the new job is producing. Because the operator needs to be at the machine while it's running, it may be necessary to have the tool crib attendant, expediter, supervisor or other employee fulfill this function.

Clean up is another task which needs preparation---including chemical clean up with solvent or alcohol such as wiping the table, stoning of the fixtures prior to use and removing chips from the fixtures and T slots. Any clean up of the tools, fixtures, gages or other change parts should be done after the machine is producing the new job. Any stoning required prior to use of a fixture should be done while the previous job is running.

Eliminating chips from getting into places where they must be removed is another cleaning task. There are many methods for eliminating chip cleaning from fixtures and T slots. Figure 2 (page xx) shows some of the possibilities. Using magnets to hold parts during machining is an option, which creates difficulty for setup primarily for two reasons-(1) positioning the magnets during setup and (2) cleaning the T slots, which become packed with chips due to the magnetism. A simple solution for both of these problems is to use templates made from sheet metal or plastic sheet. The templates should be open wherever a magnet should be placed and the rest of the table should be covered by the template-keeping chips out of the T slots (see Figure 3, page xx). In addition to T slots, any areas of the machine or fixtures that build-up chips should be reworked to eliminate the build up.

## Step 6

### Identify and Eliminate the Twos

Many setups have what can be referred to as Twos. Be on the lookout for change parts where there are two options. This could be parts that run with two types of liquid-coolant and cutting oil. The easiest solution may be to leave some of your machine tools setup permanently-some with coolant, others with cutting oil. Then schedule the jobs appropriately-based on the need for coolant or cutting oil.

Another area to search in your plant is the location where you have two methods to clamp fixtures. Many companies use both manual clamping with fasteners and hydraulic clamping. You should work to eliminate clamping with fasteners and always use hydraulic clamping in this case.

One shop had two independent fixtures that were periodically setup on a Matsuura twin-spindle machining center. Whenever the two fixtures were used, the shop would spend an enormous amount of time lining them up with a dial indicator in the spindle. One solution involves mounting the two fixtures on a sub-plate. This eliminates the use of a dial indicator to line them up during setup. Next, the sub-plate is located using ball locks. The location repeatability is .0005" and setup time was reduced by 18 minutes.

Another setup required changing a sprocket by removing four socket head cap screws. One solution involved installing a dual sprocket and simply moving the correct sprocket into place on the drive shaft without having to change the sprocket. One company had two vacuum manifolds that were used on its machine. Depending upon the size of the raw material, the company had to change the manifolds frequently. The difference in the manifolds was studied, which then allowed the company to develop one quick-adjusting manifold, thereby eliminating this part of the setup (see Figure 4, page xx). One shop in the Midwest used an indexing head for certain parts and years ago set a goal to put the index head on once a month and run all of the product that required the use of the indexing head. Basically it had two fixture types-the indexing head and milling machine table. It was possible to leave the indexing head permanently setup by putting on an addition to the table shown in Figure 5 (page xx). The machine manufacturer verified that doing so would not in any way harm the machine, cause stress on the table or affect their tolerance capability. For six years, this company has not had to remove or replace the index head and it is available to run any parts at any time-rather than once a month as before.

## Step 7

### Eliminate Threads Used to Setup -The Easiest Challenge of All

On many occasions when working with companies to reduce setup time, the following question is asked, "Can you Find examples in our shop where we can reduce setup time?" The use of threads during the setup is then identified and alternate methods are recommended. You can walk up to any machine in your shop and identify threads used during setup.

Threads are typically used during setup for clamping, attaching, connecting or adjusting. The problems you incur with threads include stripped, lost or damaged heads as well as different lengths. There are so many methods available to eliminate threads. If you clearly identify the use of threads during setup, the reasons threads are used and the location(s) of stress forces that need to be overcome, you can then work to eliminate threads.

Why are Indy car pit stops faster than NASCAR? One major reason is that Indy cars have one lug nut per wheel while a NASCAR has five lug nuts per wheel. As mentioned previously, the elimination of threads for setups is a huge step in setup time reduction and sometimes the first solution may be to simply reduce the number of fasteners used on a setup. Here are four steps to get you started in eliminating threads for setup:

1. Get plenty of fasteners that are needed today. If threads are used, you will lose time while the setup expert has to find a fastener, nut, screw or bolt while the machine is stopped for setup.
2. Standardize the head type and size. Doing this will reduce the time spent finding the correct fastener and wrench or hand tool to loosen or tighten the fastener.

3. Identify the stress forces during the run.
4. Eliminate threads for setup.

In developing possible solutions for threads in setup, it is recommended that you classify them into the following categories, then examine the possible solutions:

1. If used for clamping, solutions may include dowel pins, toggle clamps, air and hydraulic clamping, pallet systems, vacuum and magnets for holding, quick change tooling, quick change chuck jaws, ball locks and quick acting nuts.

A note of caution: Whenever you consider alternate methods for clamping, you must understand the stress forces that are being overcome. It is recommended that you enlist the assistance of a qualified engineer to determine these stress forces, the source and direction of the stress forces and to evaluate a solution to ensure it will work in your application. Many suppliers provide this assistance if you do not have the capability within your own organization.

2. If used for attaching, solutions may include a quick adjust system, quarter turns, latch clamps, magnets and quick disconnect master link.
3. If used for connecting, solutions may include quick disconnects for air, electrical, water and hydraulic lines, quick disconnect system, quarter turns and latch clamps.
4. If used for adjusting, solutions may include position indicators, position guides with standardized positions and quick adjust system.

If you have a desire to eliminate threads during setup-and do so-you will have great success in your initial efforts.

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Next month we will look at Step 8, Hand Tools Used in Setup and Step 9, Tweaking During or As A Result of Setup. We will look at how you can either eliminate or reduce the time they take during your setups, and what products are on the market that can be used to reduce these two aspects of your setup time.

## PULL-OUTS

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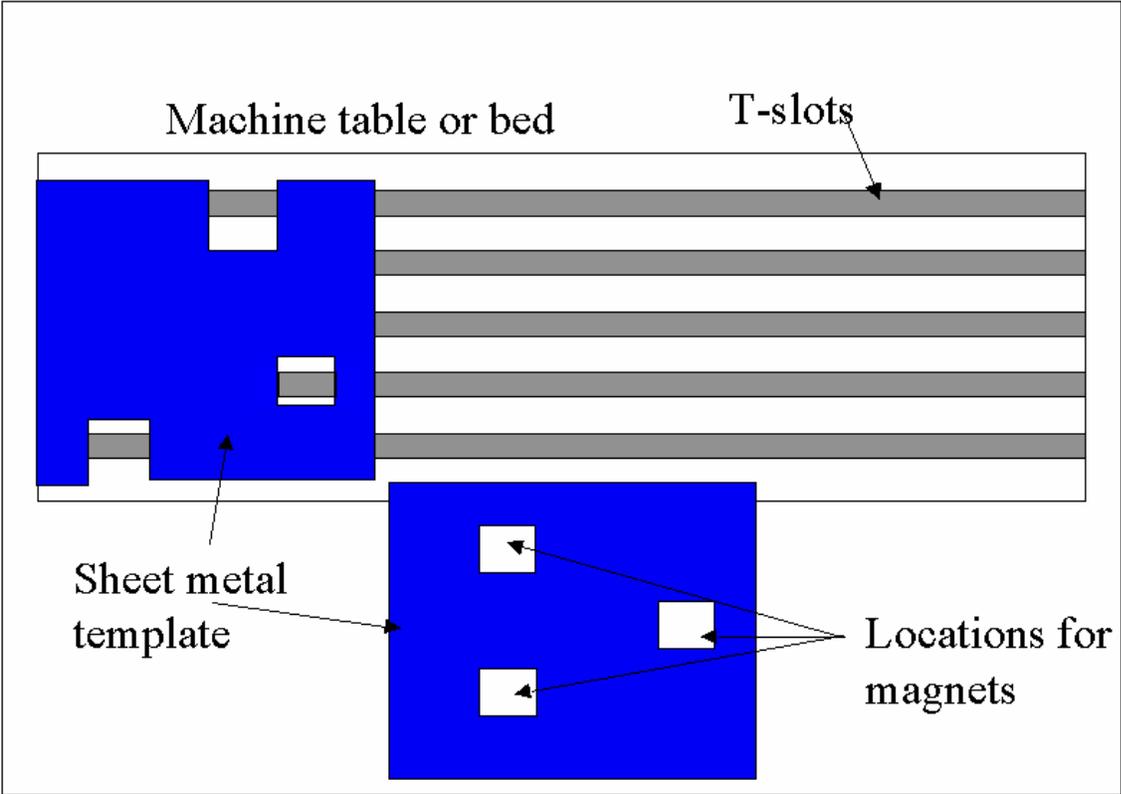


Figure 3 - 3 Templates for magnets

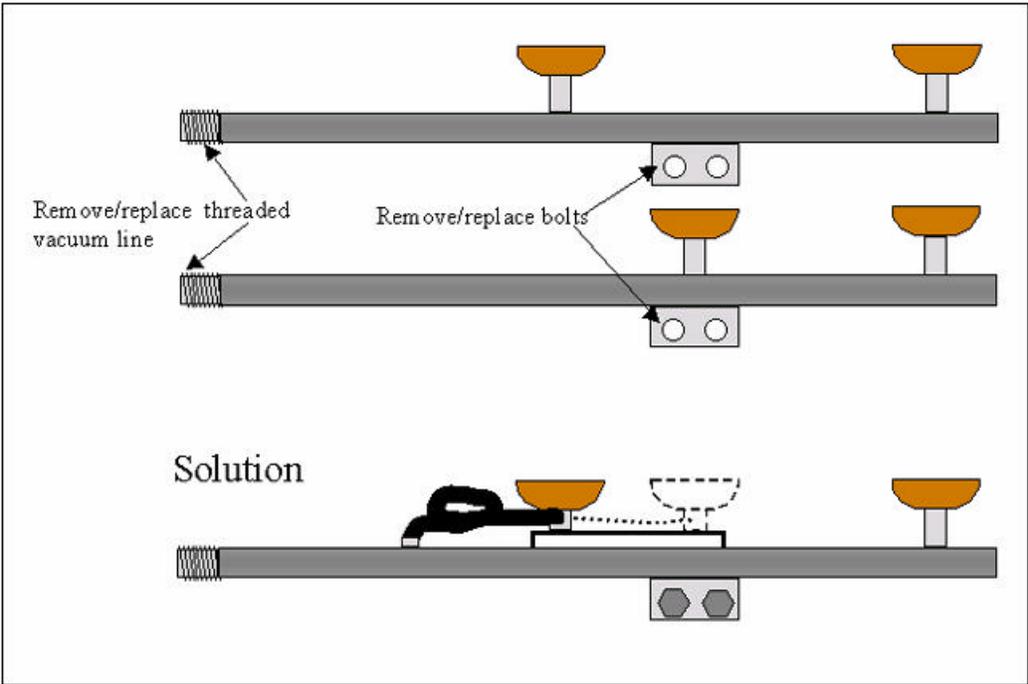


Figure 3 - 4: Vacuum manifold

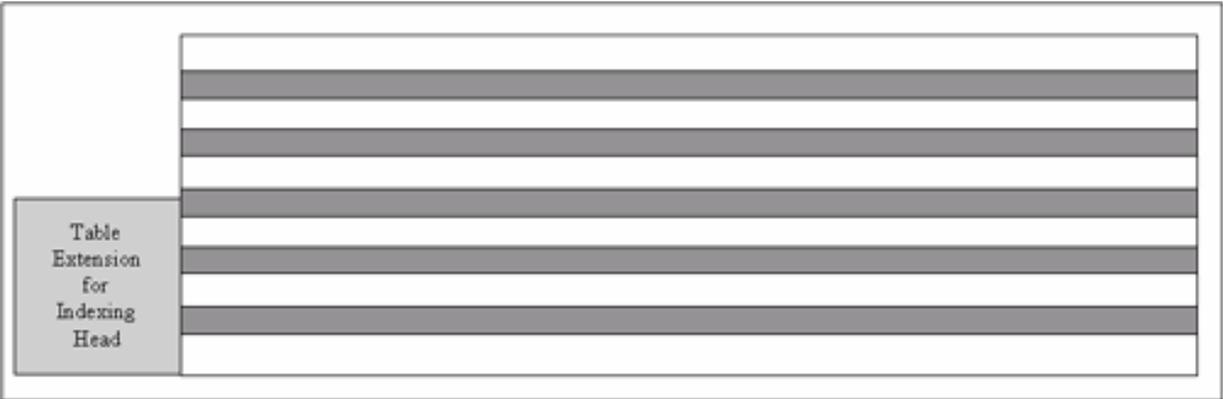


Figure 3 - 5. Extension for indexing head