

Effective Shop Layout

Making sure you can "go with the flow"

by Jim McDermott

How efficient is your shop layout? Can you work on several jobs or parts of jobs at the same time? Does your shop become clogged with work in progress? A little forethought here - and then maybe some rearranging of your machinery and work areas - will make your life more enjoyable and profitable.

Let's begin with the basics. Do you have all the square footage you need to work comfortable. Some people have made the mistake of leasing space for a shop and find out very quickly that their space requirements are double their original estimates. How can we avoid this misstep?

When we think of a layout for our shop, we can't forget to consider factors other than space for equipment. For example: How much board product or lumber are you going to keep in inventory? Do you limit your stock to only melamine and particleboard in 3/4 inch x 4 feet x 8 feet? What happens when you get a run of work requiring pre-finished plywood? Where do you put this unit of wood until you can get around to cutting it? What about finished cabinets?

We have all had the job that we rushed to finish, only to have the customer tell us, "The tile man (or electrician) has not finished yet. Could you put off delivery for a week or so?" What do you do now?

From my experience, you must take many factors into account when figuring out how to set up your shop.

Steps to a good layout

- List needs and equipment.
- Develop work cells.
- Make scale drawings.
- Use moveable cutouts, try different arrangements on paper.
- Consider in-feed out-feed spaces.
- Paint new locations on floor and make a dry run.
- Run new electric and run air lines then move equipment.
- Reevaluate layout when adding new machines.

First, make a list

To do your layout properly, make a list of all the things you need to consider before putting any machines in place. I assume at this point that you have a very good idea of the product or products that your company will offer and the equipment that you have or will purchase soon. This will help narrow the possibilities.

The first thing I look for is adequate electrical service for my needs now and in the foreseeable future. Without this necessary capacity, you can forget about adding that piece of high-tech equipment you saw at the last show. Make sure you use a licensed electrician to assess your situation and follow his recommendations.

The next area I look at is the physical shape of the space you will occupy. Is it square or rectangular in shape? Where is the primary overhead door or doors? Through which door will you receive raw materials, and through which door will you load your truck for deliveries? This determines a starting point for your layout.

I laid out my shop in a circular pattern. We ship and receive through the same door that is located in the back corner of my rectangular-shaped shop.

Next, let's look at the sequence of events in your shop. In the production of your product, do you cut all of the materials first and then proceed to assembly? Do you pre-laminate any of your panels? Do you have to rip lumber before you send it to the planer or moulder? If you list the sequence of events as they relate to your shop, you will get a better understanding of how to begin placing your machinery.

Now we can start to consider where to situate the machinery to best utilize the available space.

Sequence sets pace

In my shop, we follow a very specific sequence in building cabinets. We first cut all panels to size on a vertical panel saw. Once parts are cut, they are labeled and sorted by what machining or process is next for that part.

For example, we build with dowels, and the backs of our cabinets are set into a dado. This dado is cut on a panel router and is the second step in our sequence.

Once the parts receive a dado (cabinet sides and floors), they are separated again by the next process. We sometimes fit our cabinets with an integral toe kick, and this would be the time to perform this operation on a table saw.

The next step for us is line-drilling of all cabinet sides. (Some of you may be thinking that we should do this step after edgebanding, but we set the stop at 36.5mm, and this works well for us).

Setting up work cells

By grouping this sequence of operations together before edgebanding, it has allowed us to place the machines necessary for this work in a group, or 'work cell' Since all parts are sorted as they come off the saw, we don't waste a lot of time or effort moving parts or looking for them.

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All of the parts are placed on carts that we made in the shop. The top of the cart measures 36 x 48 inches and is 40 inches above the floor. The carts are on swivel casters and make moving parts from one operation to another effortless. However, I am looking forward to the day when I can integrate a CNC machining center into a work cell of its own. I will have to move the parts even less, and this will significantly shorten the process.

The next step in my shop is edgebanding. This is a separate operation or 'cell' allowing the edgebander to be separated from the other machines.

Once parts are edgebanded, our next step is drilling for dowels. This is done on a Gannomat drilling machine. As parts come off the edgebander, they are sorted by how they are drilled - horizontal parts on one cart, vertical parts on another. In most cases, this is done before the parts are banded. It is only when we are training a new employee that a part may be sorted incorrectly. This makes setups on the machine easier.

After drilling for dowels, the cabinet sides are drilled for base plates, and drawer slides are installed. I have found that it is much easier to install these hardware items before assembly; I would rather work on a flat panel than inside a box. At this time, base cabinet floors are drilled for leg levelers. We use leg levelers on all of our base cabinets, including the ones with an integral toe kick. So, our third cell contains the dowel drill, the base plate drill, the leg leveler drill and the cabinet containing the drawer slides. As you can see, there are a lot of steps we take to machine parts before we assemble.

After all of this preparation, all we have to do is insert dowels and assemble. Our fourth cell, consisting of a dowel inserter and case clamp, is in another area of the shop. Keeping this area separate from the others allows us to work on multiple jobs at the same time.

After the cabinets come out of the case clamp, doors are hinged and put on, and drawers are assembled and inserted. All that remains is final cleaning and inspection before the cabinets are wrapped in protective cardboard. This circular layout is very efficient, allowing several different jobs to be worked on simultaneously. There can be up to four completely different jobs in production at any one time. After this step, cabinets are placed on the truck ready to go, or are placed in our storage area.

How do you determine the cells that you need? It is only by looking at your process and understanding your sequence of events. If your shop matches mine, most of what we talked about earlier may work for you. Remember not to let any one tell you what is the best way for your shop; that is something that all shops must figure out for themselves.

Developing a floor plan

Now that you have figured out your cells, it is time to make a scale floor plan of your shop space. Make sure that you include the doors and any obstructions in the plan. This may be a good time to mark where your electrical panel is located, and indicate that on the plan.

One thing we did not discuss earlier was compressed air. Where do you want to put your compressor (and backup)? How are you going to distribute air to your machines? Pick a point on the plan where you think the best spot for the compressor is and think about running air lines. Do not finalize this part yet, because the final placement of your machines and work areas will determine the best location for your compressor.

You can make scale cutouts of your machines and place them on the plan. Make sure that you figure for in-feed and out-feed on all machines. Leave enough space around the machines for carts to pass and other workers to move about freely. I actually made scale cutouts of the parts carts, placed them on the plan and moved them about. Silly as this may seem, it's a lot easier to move a paper cutout than a machine with electric and air hookups.

Keep arranging and rearranging the plan until you have the best layout. Ask for input from the people that will be working there; they may pick up on something you missed

Trying it out

After you think you have the best plan, go into the shop and measure the location and space requirements for each machine, and paint an outline of the machine on the floor. Again, pay close attention to in-feed and out-feed requirements. Do a trial walk-through of a normal sequence of events and see if the cells will work.

If all seems ok, run your electric and air lines. After this is done, you can move the machines into place. If you have done your homework, all should go smoothly. If it doesn't, take the time to fix it now; when you are in the heat of battle, it will be too late.

The last piece of advice I have is if you need a tool in your work cell, make sure you have it in that cell. Do not spend any extra time looking for a tool. And if you use a tool, put it back where you found it. I insist on this policy at my shop, and I can tell you it saves a lot of time.