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Calculating Manpower Requirements

Coming to the right number means you're not overstaffing or under-staffing your operation.



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A common question in the manufacturing field is: Is there a way to know how many people I need, or is there a way to calculate it?

The short answer is yes, but it can be a daunting task.

Virtually all employers, manufacturers, and service providers alike have asked this question at one point or another. Owners and managers are often faced with this challenge – especially in the world of manufacturing.

During busy periods when workers are badly needed, the hiring often is left to supervisors who are the same ones responsible for achieving the production goals. So the hiring begins. But, when you couple the stresses of production and shipping demands with the training and oversight of all of the new employees, people can get lost in the shuffle.

On the other hand, people can be added gradually over a period of time in a much more subtle manner. Eventually, someone in management wakes up and realizes that you may have too many people.

When this happens, it can set the stage for mistakes. Usually it begins with a hiring freeze. Then supervisors are told that each area must lay off “X” number of people across the board to achieve the dictated headcount reduction. These cuts are usually done without regard to the actual manning required to do the work, nor how certain reductions will impact the quality, production schedules, overtime, scrap, safety, or anything else. Many times these mistakes are made, people are cut, and the money

is spent anyway on the collateral damage that occurs as a result.

For purposes here, we will be focusing on direct labor (production workers) only, although the principles can work for indirect labor (inspectors, material handlers, etc.) as well, but it is a bit more difficult.

In its simplest form, the base calculation is as follows:

$$\frac{\text{Labor hours per unit} \times \text{units req'd per day}}{\text{Hours req'd per day} \div 8} = \text{Number of workers req'd}$$

Let's discuss the components.

Labor Hours Per Unit

Labor hours per unit refers to the time study data that is collected and assigned to each manufacturing step. This would be the amount of time it takes to produce one part or one unit at that step. Time study data is usually done in minutes and then converted to hours-per-unit for the calculation.

We will use this simple routing to help explain the process (see Figure 1 below).

The time data is the most important component, and some folks untrained in time study might have difficulty coming up with representative times – especially if your workers use different methods or work at various speeds. Industrial engineers are trained in time study and would be the best choice for developing standard times for your operations, as they use proven time study techniques and

Figure 1: Brace Assembly

Operation #	Description	Machine	HRS/PC
01	Form	Hydraulic Former	0.01
02	Drill 10 holes	Drill Machine	0.04
03	Assemble & Pack	Assembly Table	0.12
			0.17 total hours

know how to employ performance rating and allowances to ensure accuracy of the assigned times. Just make sure the time includes all the work for that step and for only one piece, or for one unit.

In the example mentioned earlier, the assemble and pack operation is the most labor intensive. For that reason, we will use it in the following calculation examples. You may want to spend your time study and calculation efforts in your most labor-intensive areas also, especially if you aren't already doing times studies and establishing labor standards on all of your operations.

Units Required Per Day

This figure is simply the amount of these specific units that you are required to produce each day (each 24-hour period, not per shift). For the brace assembly example, let's say that they are required to produce and ship 1,500 units per day.

The Calculation

So, to complete the calculation for the manpower requirements in the assemble and pack area, you would multiply 0.12 hours-per-piece times 1,500 pieces required per day, to get 180 man hours required per day in that area for that product. Then, to arrive at the number of workers needed, you would divide 180 man hours by the number 8 to get 22.5 workers required. You would then round the figure up or down to represent a whole person. In this case, we will round up to 23 workers needed to assemble and pack 1,500 units per day.

The number 8 in the formula represents eight hours, which is the normal number of hours associated with one worker for a five-day, 40-hour week. If you run shifts of a different length, you would divide by that number instead of 8, such as for four, 10-hour shifts, you would use the number 10 in the formula.

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in the example, you would be producing 1,875 units per day for four days to achieve the same shipping requirements for the week. The manpower requirements will calculate out to be exactly the same.

If you need 23 workers and only have the floor space for eight work tables, then you will have to either expand the building size, rearrange the facility layout to make

“Labor efficiency is another factor that should be considered in your manpower calculations, if you are able to accurately track it. Hopefully you have systems in place where you can measure

more space, start work on a second and third shift, develop a much more efficient manufacturing process, or outsource some of the work.

If you were calculating the number of workers required in an assembly area producing a variety of different items with differing times, you would simply create a spreadsheet listing the different products along with their assembly times and their daily volumes. Then calculate the hours required per day for each item, and then total all the required hours, and use this total hours required per day to divide by the 8 to get your total manning.

Other Factors

There are other factors that can and do affect the final calculated number of workers needed and they should be considered or your calculations could be off. They are:

- Absenteeism
- Labor efficiency
- Method changes
- Sanity check

Absenteeism

Absenteeism is very important when considering your staffing levels. If you have an absenteeism problem, you may never have the right number of people to do the required job each day or each week. This can cause overtime, quality problems, worker fatigue, and even missed or late shipments.

Using the same example, if you need 23 people to achieve your 1,500 units per day volume, but you have a documented historical 9 percent absenteeism rate, then you are short an average of two people per day. This can have a significant impact on your ability to produce.

If you are not currently tracking your absenteeism, you should start immediately. This will not only help you in your manning requirements, but may point you toward other problems such as: poor supervision, safety issues, low pay rates, or other problems you need to fix. Analyze and implement everything you can to reduce your absenteeism, but if faced with an ongoing problem, you must staff up to compensate for it.

Efficiency

Labor efficiency is another factor that should be considered in your manpower calculations, if you are able to accurately track it. You need systems in place where you can measure and track the actual production efficiency of your workers by operation, or at least by area.

Using the same example, if you need 23 people to achieve your daily production – but your efficiency records indicate you are running 115 percent efficiency – you should adjust the manpower downward by the 15 percent. If you don't consider the efficiency in your staffing levels you will be overstaffing, thereby wasting money, or simply providing an easier days work for the workers you have. As an example: 23 workers required ÷ 1.15 efficiency rate = 20 workers required.

Method Changes or Automation

When calculating manpower, it is always important that your labor standards reflect any implemented method changes, automation, tool improvements, or changes to the products themselves. Changes like these can either make a job easier, and thereby more productive where you need fewer workers, or they can make a job harder, and less productive than you originally thought, causing you to need more workers to achieve production requirements. When such changes are identified, you should restudy and adjust the time standards accordingly so that your manning will be correctly reflected.

Common Sense & Sanity Check

Regardless of how you calculate manpower, never fail to “sanity check” the final answers before embarking on cutbacks or a hiring effort. It is always good to review the results with your team, along with your actual staffing numbers, and discuss them.

Sometimes you simply have to apply common sense and override the calculations and go with what you know about your situation. For example, temperature extremes in the shop can adversely affect productivity, or an expected spike in volume could alter your immediate staffing actions, which would not be reflected in your calculations.

Final Thoughts on Calculating Manpower Requirements

This tool, when used frequently and with accurate time data, can really enhance your ability to make wise staffing decisions that will help you control labor costs and avoid the problems associated with across-the-board head-count reductions.

If you feel your manpower numbers are right, but your productivity and quality is still falling short, you should consider bringing in an impartial third party who is familiar with improving manufacturing processes to review and assess your operations looking for wastes, inefficiencies, process problems, bottlenecks and/ or any such reasons that could be causing the problem. Once these issues have been identified and corrected, you will be able to see the difference in your shop operations and in the books.

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