Manufacturing and Engineering Bills

By Dave Garwood

This article is an excerpt from my new book, Bills of Material For A Lean Enterprise.

How many bills of material does a company need? Many insist the answer is two -- one for engineering and one for manufacturing.

Does this make sense? Engineering and manufacturing departments each have their own database of bills? In other words, if you search for the components for a given parent number, two separate lists exist. Oh sure, they are supposed to be kept in sync. We know how that really works. It doesn't. While this practice seems ludicrous, it is the norm in many companies. But why? There are no legitimate reasons -- only excuses!

Each department has legitimate bill of material needs. However, some of the needs are different. In most cases, the two separate bills are caused by a lack of communication and understanding from each department. Each group has not taken the time (or perhaps interest) to understand the other's needs with the bill. So they just agree to go on their own and act somewhat independently.

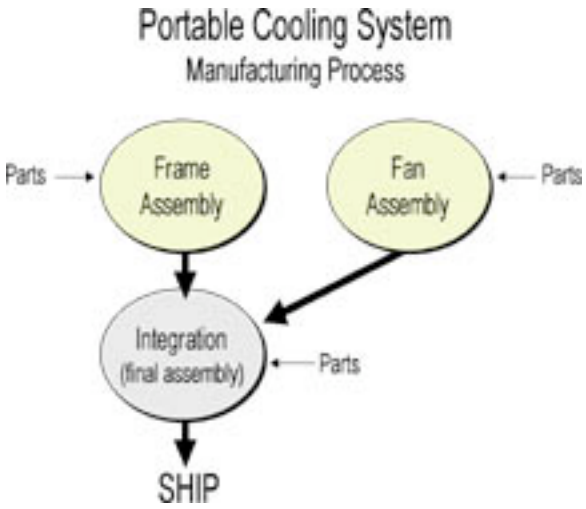
Another reason is sometimes lack of trust. The engineers are reluctant to allow another department to change "their" bill. So they just agree to update "their" database and allow manufacturing to maintain an independent data base. The same company has banners all over the walls about lean processes and stomping out non-value added activities! Go figure.

Root Causes of the Two-Bill-of-Material Mistake

Sometimes the problem is caused by manufacturing incorrectly adding extra levels in the bill to meet legitimate business needs. Engineering does not understand manufacturing's needs and wishes to avoid extra levels and complexity in the bills. Sometimes the problem is discovered after engineering release and they want to avoid changing what they have done. Can't blame them. However, the solution should not be to sanctify two bills. In almost all cases, when you compare the engineering and manufacturing bills, there are very few differences. The majority of the structures are the same. Avoiding the two-bill burden requires finding acceptable solutions to the few differences and meeting the needs of both departments from one data base. It can be done!

Cooling Off the Two Bill Fight

Cool Flow, Inc. makes a portable cooling system. The manufacturing process requires using various parts to make a frame and fan assembly in parallel. These two subassemblies are then brought together with additional parts and the final product is made. These three activities may be done in three separate departments. Hopefully, the physical flow has been "leaned" and all three activities are integrated into a single flow line. For purposes of this discussion, however, it does not matter. This is the way the product is made.



An engineering misunderstanding lead to a false conclusion that Cool Flow needed two bills! Engineering correctly created separate drawings for the frame, fan and final assembly. However, since the same digits (number) are used to identify the drawing as the part, the drawing number and part number were thought to be interchangeable. So a wrong conclusion was reached. If we created a drawing with it's number, we also, by default, have a part number and part numbers must be in a bill of material. Thus, a bill structure was created with levels for a frame and a fan subassembly going into a final assembly.

However, if the fan and frame subassemblies are quickly consumed after produced, i.e., "lean assembly processes," manufacturing does not have a need for them to have a part number and be in the bill structure. These are excess levels and make the bill more complex than needed. Manufacturing's solution? Create a separate, manufacturing bill database and leave out the fan and frame assembly. Bad idea! A better solution?

First, make sure everyone understands the difference between the purpose of drawings and part numbers and that bills only contain part numbers. Second, get engineering and manufacturing to agree to a set of rules (and document them) for legitimate and illegitimate conditions for the assignment of part numbers. In this case, the fan and frame assemblies are not legitimate conditions for the extra bill levels. Third, don't have separate engineering and manufacturing bills!

In some situations, manufacturing misunderstandings lead to a false conclusion that we need two bills. Here's why. When the assemblies require many, many parts and are not used all at once, i.e. within a few days of each other and are used at different final assembly areas, manufacturing has some legitimate business needs to:

a. Know the assembly area or operation number in the assembly routings where the individual parts are used and should be delivered (or located) on the assembly or flow line.
b. Know when in the assembly process the parts are needed to facilitate planning for the proper timing for parts delivery
c. Have a link to the assembly instructions or drawings with the appropriate parts
d. Account for the labor used for each subassembly activity to facilitate proper costing.

Adding the fan and frame assembly part numbers in the bill structure has been the traditional approach to accommodate all of these needs. A drawing for the fan and frame could be linked to their respective part numbers. The different lead times for the different subassemblies would cause the timing of part requirements to vary. Parts could be grouped and issued to the proper subassembly number. Cost could be calculated as work is charged to each subassembly part number during production. Unfortunately, this solution has serious downside effects. For one, it creates more levels to maintain when bill changes occur. Each level also implies that inventory transactions are needed for each level. In some cases, there are hundreds of subassemblies and many additional subassemblies that go into each of them. For example, blade and motor assemblies are first made and then are brought together to make the fan assembly.

I think you get the picture of where this problem is going! The magnitude of these disadvantages will skyrocket when the number of subassemblies expands from 2 to 200 to 2000.

The problem is exacerbated when the product is offered with several options. Some parts are different when a different option is selected and buried deep in the structure. The potential number of option combinations drives the potential number of subassembly numbers and bills off the chart.

Satisfying Engineering and Manufacturing with One Bill

The solution to the portable cooling system issues is to modularize bills and then add data to the bill of material records to satisfy the manufacturing needs of timing of requirements and location to issue parts.

Parts are grouped (modularized) by option. Engineering creates the parent/component data. Manufacturing maintains the operation used on and lead time offset data fields in the bill of material records. As the manufacturing process is changed, i.e. parts are added at different places, the bill is not changed and engineering does not have to be involved. Manufacturing has flexibility without adding unnecessary bureaucracy.

When a sales order is received, a unique bill is configured for that specific order. The appropriate parts are selected (electronically) and sorted in a sequence to satisfy the plant floor needs. The subassemblies are identified as operation descriptions in the routing, not unique part numbers. The list of parts is then sorted and grouped by operation number or areas. This helps identify where the parts are used in the assembly process.

The lead time offset data allows the planning process to stagger the timing of when parts are needed to align with when they will be consumed. Visual aids, i.e. drawings, instructions, etc., are then linked to the final assembly.

Duplicating the bills into engineering and manufacturing databases is a costly, unnecessary approach. Look carefully at the alleged reasons for two bills and find solutions to avoid this costly mistake. Hopefully, the result will be one bill fits all.

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