

# Assembly Cell or

## How to evaluate your shop to determine if you're using the best frame fitting process

By Joe Nevers, CMFGT

If you're like most production framers, you've probably wondered which type of frame fitting process—cell or assembly line—would be best for your shop. There's no simple answer to this question because every company is different. However, by carefully analyzing a number of factors in your operation in a step-by-step manner, you can determine if you're on the right track—or if you could benefit by changing to a different fitting process.

The analysis of factors can be broken down into seven areas:

1. How much room do you have?
2. Do you do large production runs, small lots, or a mix?
3. Do you have automated equipment?
4. Do you have full-time staff or use mostly temporary labor?
5. How much are you willing to spend?
6. How much time do you have to make a change?
7. How committed are you to changing your current process?

By answering these questions, you'll develop a clear picture of which process is right for you.

### Production Categories

First, a few definitions are in order. There are three categories: the assembly cell, the assembly line, and the hybrid assembly line, which is a combination of a cell and an assembly line. It's not uncommon for a production framing facility to use one or more of these options at the same time.

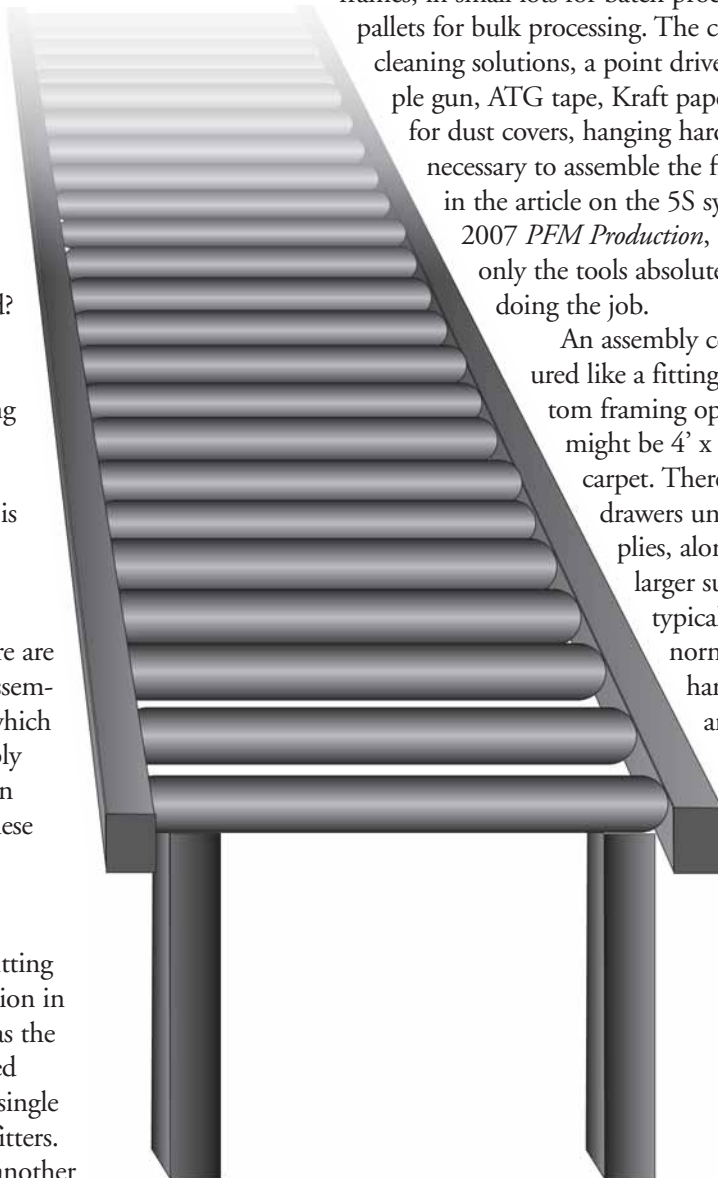
#### Assembly Cell

An assembly cell typically consists of a fitting process set up in a semi-circular orientation in which a frame moves from left to right as the components are assembled into a finished frame. A cell can be small and run by a single fitter or larger and run by two or three fitters. The assembled frame is then moved to another

location for packaging (adding corner protectors, cardboard trays, or shrink-wrap) or it can be done within the cell. Typically, though, assembly cells in the framing industry pass the frame along for packaging to be done elsewhere in a facility.

A cell is typically provided with all the finished components for the frame job: frame, glass, mats, art package (art mounted on foamboard, for example), and backing board. These components can be provided for assembly of single frames, in small lots for batch processing, or on large pallets for bulk processing. The cell should contain cleaning solutions, a point driver and points, a staple gun, ATG tape, Kraft paper or other material for dust covers, hanging hardware, and all tools necessary to assemble the frame. As pointed out in the article on the 5S system in the Spring 2007 *PFM Production*, a cell should contain only the tools absolutely necessary for doing the job.

An assembly cell is typically configured like a fitting station in any custom framing operation. The table might be 4' x 8' and covered by carpet. There are usually some drawers underneath for supplies, along with shelves for larger supplies. The table typically has a backboard, normally a pegboard for hanging tools. There are often bins hanging from the pegboard for easy access to such common items as hanging hardware. Finally, the table might use a tool balancer for the point driver and a pneumatic screwdriver or staple gun to help reduce employee fatigue.



# Assembly Line?

## Assembly Line

Assembly lines typically move components down a production line from operation to operation until the product is completed. An operator usually performs an individual task before passing a frame on to the next operator. The process can also use equipment to facilitate the process, such as roller conveyers or automatic conveyer belts, which can also be used to set the speed and to control production “takt time”—the maximum amount of time allowed to assemble a single frame (from the German “taktzeit”).

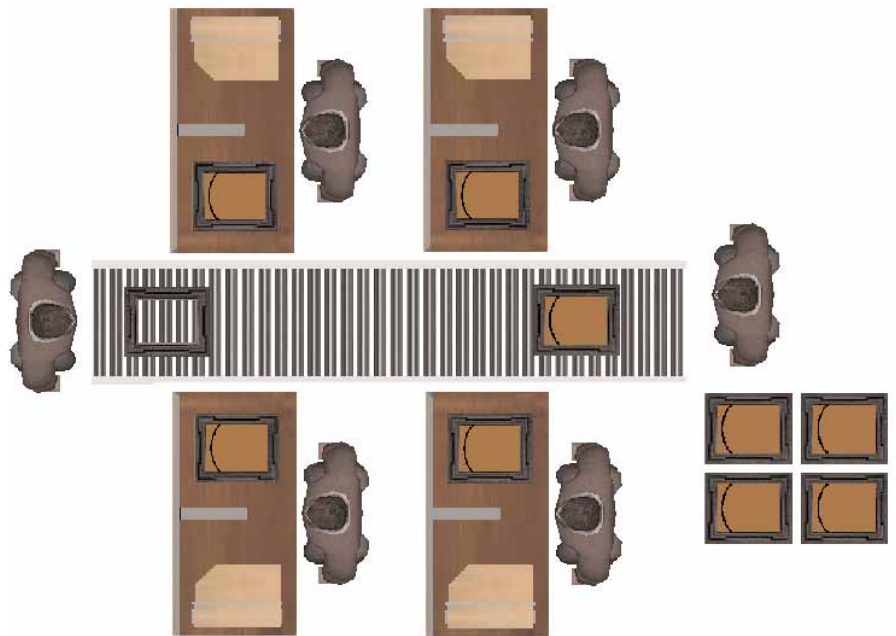
Assembly lines sometimes use something called a curtain quantity. For example, say you are assembling a 16"x20" frame that requires D-rings and wire, and that creates a bottleneck. To alleviate this, you can assemble D-rings and wire off-line using a fixture. On the assembly line, this sub-assembly is attached to the back of the frame. This eliminates running and crimping wire on the assembly line, which normally lowers the unit-per-hour production rate.

## Hybrid Assembly Line

A hybrid assembly line is a combination of an assembly line and assembly cell. Typically, the frames are staged at the front of the assembly line and presented to the assembly cell via a roller-type conveyer or an automated conveyer. The frame is tipped over, the glass is installed, and the art package is placed inside before this sub-assembly is sent down the line, where an operator pulls the sub-assembly off the conveyer and finishes assembling the frame by adding a backing board, points, dust cover, and hardware. The finished frame is then put back on the conveyer and a new sub-assembly is worked on. At the end of the line, corner protectors and other packaging is added.

## Assessing Your Current Position

When determining which type of fitting process is the best for you, use the following seven-step process. Each step con-



*A plan view of a hybrid assembly line shows four assembly cells fed by a single roller conveyer. Empty frames are loaded at the front of the conveyer, pulled off the conveyer and assembled, and then placed back on the conveyer and sent down the line.*

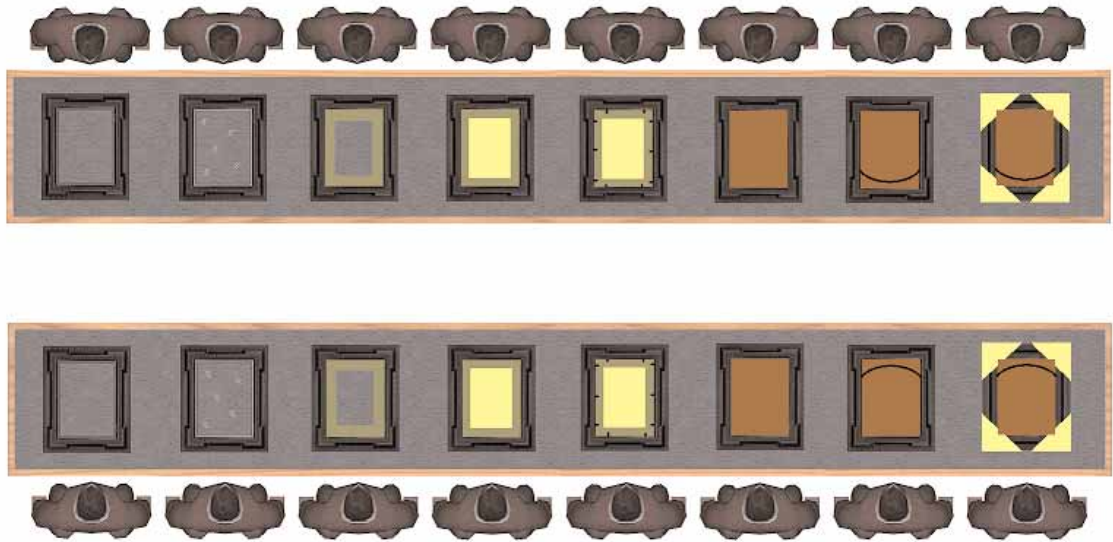
sists of answering a question, which leads to the next question. This helps you determine the best overall fitting process no matter your company size.

**Step 1.** How much space do you have? If you are in close quarters, your only choice may be to use an assembly cell. In this case, there's no need to look at other layouts because they won't be effective. If you're considering moving into a larger space, however, you will want to continue the evaluation process. If you already have ample room, you can go to the next question.

**Step 2.** What is your production mix? You may do a combination of small and large runs or strictly have small or large ones. If you produce mostly small lots of 25 pieces or less, you will most likely end up with a cell or hybrid assembly line. If you do mostly large runs, with an average lot size of 250 or more, you should definitely consider an assembly line. If you do both small and large lots, you might look at a combination of cell, assembly line, and hybrid.

**Step 3.** What equipment do you have? There are several pieces of automated and semi-automated equipment available for assembly lines. For example, Kraft makes the

A plan view shows a set up of two parallel eight-station assembly lines. The process starts with an empty frame and finishes with a packaged product.



Champ III for installing saw tooth hangers, AMS offers a pneumatic two-hand press to install saw tooth hangers, and The Fletcher-Terry Company offers the Saber 250-A for saw tooth hangers. QuickCorner offers an automated corner protection installation machine. There are also pneumatic crimping guns, staplers, and point drivers. Most of such equipment can be used in either a cell or assembly line.

**Step 4.** What is your available labor pool? If you are using your own highly trained staff, you can easily pick any of the three process types. However, if you are using a significant amount of temporary labor you need to simplify all your processes so you can effectively use that labor when you need to increase your capacity. Any step that can be simplified or automated will improve your throughput while maintaining acceptable quality.

**Step 5.** How good are your cash flow, budgets, and forecasts? A cell or assembly line can be thrown together for almost no cost, but this can lead to inefficiency caused by time lost looking for tools, not having the right tools, or just having a bad flow of materials. To set up an efficient cell or assembly line, good layout and proper equipment is necessary. This can take the form of installing worktables at a correct ergonomic height complemented by a rubber pad for the operator to stand on. Also, proper placement of tools is important so they can be reached when needed. Plus, any equipment that can increase production, control costs, and lead to repeatability are good investments.

**Step 6.** What are your time constraints? If you're heading into your busy season, it may not be a good time to change your process. On the other hand, if you have a solid staff and need the additional capacity, it might be prudent to add new work cells or shift to an assembly line process. Depending on what equipment you already have, your average lot size, and the new equipment you may need, an assembly line can be set up in a very short period of time. In some cases,

it might take only a few days.

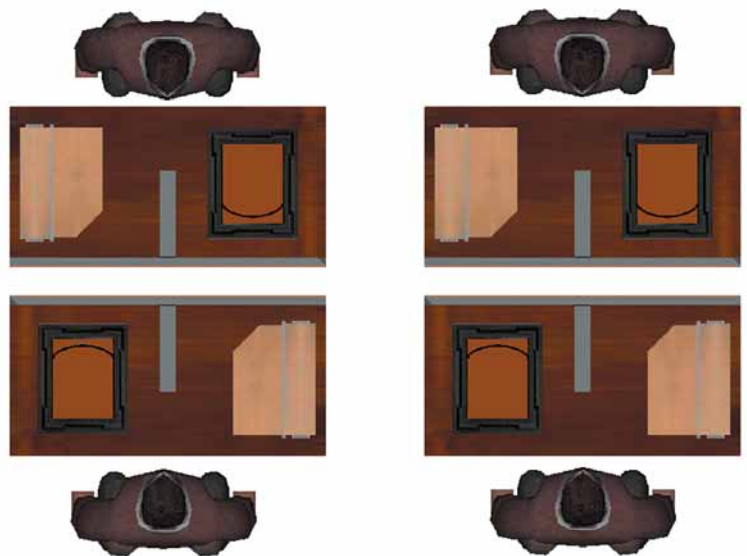
**Step 7.** How committed are you to change? Like any other change in your business, it takes commitment at all levels of the organization to make a change in production methods successful. If you change from cells to an assembly line because you thought you would increase throughput but you didn't spend the time to lay it out well or buy the right equipment and provide enough time for your operators to learn how to use it, any change will most likely fail. It takes a "champion" within the organization to drive the change if it is to be successful.

## Some Examples

The following examples are hypothetical but show how to apply the seven-step procedure for evaluating which fitting process makes sense for different size operations.

### Small Production Facility

Bob has a shop producing 150 frames a day. His largest lot is 15 pieces. The facility is small, 2,500 square feet, with no room for expansion. Bob's customers are hospitality, store-



A plan view shows four assembly cells run by a single operator each.

front retail, and local municipalities. He does very well with his current business model and would like to expand. He also wants to keep the smaller lots as this gives him the competitive advantage of being very responsive to customer needs.

Bob currently uses four assembly cells with one operator each producing an average of 37.5 frames per day. Given that the mix is custom and ranges from small to large frames, he can produce more or less in a given cell depending on what frames need to be assembled. For example, Bob does some oversized pieces that require two people to assemble, which really impacts overall production. However, the two other cells are still running and producing frames while this takes place.

Here's how Bob would use the seven-step procedure to analyze his needs:

1. His space is small and he has no immediate plans to move.
2. He prefers small production runs, as he can be very responsive.
3. He does not currently own any automated assembly equipment.
4. He currently employs 18 people.
5. His forecast and budget are on the mark, but cash flow is a little tight.
6. He just came off a busy period and timing is good for a change.
7. He is committed to his business and improving it any way possible.

Based on Bob's answers to the seven questions, he should continue using the assembly cell method. This gives him the most flexibility and lowest cost for short runs. If an assembly line were implemented, the changeover time between lots would be cost prohibitive. If Bob were to install an assembly line, he would create a bottleneck if he tried to produce oversized frames. The only way to prevent this would be to take the larger frames offline and build them in a specially designated area.

#### **Mid-sized Production Facility**

Kim's shop is a little larger than Bob's. She produces 2,000 frames a day, with an average lot size of 100 pieces but she can have runs of up to 1,000. Kim is in a 15,000-square foot industrial space with room for expansion. Her customers include retail chains, hospitality, and discount stores. She is thinking of expanding her offerings to other retail chains in the hope of increasing her average lot size.

Kim is also using four assembly cells with one operator each, and she also runs an assembly line for the higher volume jobs.

She always seems to be more productive on the assembly line but has not decided to shift more work to that process.

Here's how Kim would use the seven-step procedure to analyze her needs:

1. Her space is adequate and has room for immediate expansion.
2. She is trying to increase her average production run size.
3. She currently owns several pieces of automated assembly equipment.
4. She employs 21 full-time employees that she supplements with temporary labor.
5. She has consistently beaten her forecast and budget numbers and is having a phenomenal year.

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6. She does not seem to have a slow time of year. Time will need to be made for any proposed change.
7. She is committed to aggressively growing her business.

Based on Kim's current business model and future growth plans, an assembly line process seems to be called for, probably two assembly lines running in parallel. Based on the average lot size of 100 pieces, automated conveyers wouldn't be needed. What would probably work best would be large carpeted tables where frames would be moved down the line by the operators. Making the tables double wide would allow Kim to run parallel lines as needed to increase capacity.

### **Large Production Facility**

Bill's factory produces 10,000 pieces a day, with an average lot size of 50 pieces. He has occasional runs of 1,000 or more pieces of the same frame, but it is more of a job shop with small lots. Bill is in a 45,000-square foot facility and employs 45 full-time employees. When his backlog is high, Bill uses temporary labor to increase his capacity. His customers include retail chains, wholesale, hospitality, and galleries. His product mix includes regular framed art, canvas transfers, giclées, and some high-end pieces. Bill is happy with his business size but would like to see moderate growth each year.

Currently, Bill uses 10 assembly cells with two operators each. One operator stages new work and removes finished work from the cell. The second operator does the actual assembly of the frames. Bill doesn't use any assembly line processes but has been thinking about installing one for his high volume runs.

Here's how Bill would use the seven-step procedure to analyze his needs:

1. He needs to evaluate his current space to see if he can lay out the production floor for both assembly cells and an assembly line.
2. His average lot size is small; however, he does many high volume jobs.
3. He owns several pieces of automated assembly equipment and is willing to buy more if necessary.
4. He currently employs 45 full-time employees and supplements that with temporary labor.
5. He is having a good year and has cash to reinvest.
6. His slow season is just ahead and now would be a good time to make a change.
7. He has already driven change in his organization and is up to the challenge.

Based on Bill's business model and future growth plans, a combination of assembly line and cell manufacturing looks like a good solution. Because his facility produces a combination of small and large runs, he should try to split up the production—cells for the small lots and assembly lines for larger lots. Bill might be able to reduce his number of assembly cells to six while adding two assembly lines.

### **Extra Large Production Facility**

John's company produces 30,000 pieces a day, and his average lot is approaching 1,500 pieces. He is in a 150,000 square foot facility with offsite storage and sales offices. He employs mostly temporary labor along with a staff of 30 full-time employees. His customers include outlets, discount chains, and big box retailers. He produces mostly inexpensive framed art, photo frames, and pre-matted frames for multi-opening designs. John is always looking to grow his business by adding more high-volume framing.

Here's how John would use the seven-step procedure to analyze his needs:

1. He has plenty of room to expand his operations.
2. His average lot size is large and would be well suited for an assembly line process.
3. He already owns the necessary automated assembly equipment to run an assembly line.
4. He currently employs 30 full-time employees and supplements that with temporary labor.
5. He is on track to meet his budgetary and forecast numbers. John also has free cash to reinvest.
6. He does not have a slow period, so he will need to plan any transition he may make.
7. He has a great operations manager who can institute any change necessary.

Based on John's current business model and future growth plans, a full assembly line operation with automated conveyers is in order. The automated conveyers will allow John to set the pace of the frame assembly process.

## **The Bottom Line**

The seven-step methodology is one that you can use to answer the question, "Which frame assembly process is best for me?" As with any other important decisions, a thorough analysis must be done. Some of your analyses and decisions may require only a few seconds; others will take some time. When evaluating your manufacturing operations to determine the best type of work flow, keep in mind that you need to ask yourself the questions and then use the answers to develop a workable action plan.

In the final analysis, the last question is probably the most important. It takes a lot of time and energy to develop a good action plan. It would be a shame to have great ideas and a detailed plan but not have the personal commitment to implement them. By using the seven-step procedure to analyze and plan any changes, you can feel confident that any change you make will be the right one. ■

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