by Jerry Koskovich, P.E.

Automated material handling might be the key to help you go with the flow.

I don't know who said it first, or where I heard it, but it bears repeating. The main business of truss manufacturers isn't building trusses...it's material handling! I realize this view is an oversimplification, but just maybe it's not too far from the truth.

In past articles I've attempted to acquaint the readers with the virtues of automation. We've talked about the various computer-controlled saws that were really the foundation of the automation revolution that the industry has been evolving through. In saying so, I've accepted that if it hadn't been for the development of truss design software, there probably wouldn't have been a need for automated saws.

However, automated saws, computer-controlled jigging systems with pucks, and laser projection systems have all simplified—really, made possible—production efficiencies never dreamed possible only twenty years ago. If these systems are properly used and maintained, there's probably little that can be done in the immediate future to make these respective phases of the truss production operation much better. But what about the functions that go on in between cutting, jigging and pressing?

For the most part, it's called MATERIAL HANDLING! And for the most part, in the average truss plant it hasn't changed much in the twenty plus years since the first automated saw arrived on the scene. In truth, it hasn't changed much since the early days of the truss industry!

Problems/Obstacles/Setbacks in Material Handling

I remember in 1989 when we had just installed our fifth or sixth automated component saw at a large wall and truss plant in the East. The saw was positioned immediately in front of a large opening in the outside wall of the building. There was no live deck or any other type of lumber conveyance with which to advance material toward the saw. The material flow went something like this:

1. The sawyer would go to the alley, flag down a forklift operator, and tell him what he needed.
2. The forklift operator would find and deliver a unit of the required grade, size, length and species of lumber.
3. He would position the unit immediately in front of the saw, on saw horses.
4. The sawyer would process the required number of parts.
5. Upon completion, he would retire to the alley, flag down the forklift operator, who would retrieve what remained of the unit, and the process would start all over.

As you might expect, the time between flagging down the forklift operator, and either supplying or retrieving the lumber was tantamount to watching grass grow or paint dry! Amazingly, that "material handling system" continued for years after the installation of the automated saw.

On another occasion, our customer complained of not getting the promised production from his automated saw. We were stymied as to why, so we sent out a tech to check things out. What he found was only slightly more creative than my first example. In this case, they had several units of varied lumber dimensions stacked one behind the other, immediately in front of the saw. If the sawyer needed the material that was in the most distant unit, he merely dragged it across all of the intervening units until he got the wood to the saw.

My final example of how not to utilize an automated component saw involves the back side...where the finished parts come off.

Again, the plant manager complained of not getting promised production out of this expensive piece of equipment. Since the plant was located only a few hundred miles to the south, I decided to find out for myself why my pride and joy wasn't performing as advertised. I hadn't even gotten up to the saw when I spotted the problem.

In a moment of inspiration, someone at the plant had decided to weld some inclined extensions on the exiting material conveyors of the saw, capable of holding perhaps six 2x4s. The ends of these extensions had upward vertical fingers or lumber stops so the finished components wouldn't fall on the floor, thus sparing the worker the need to bend over and retrieve them for placing the components on a cart.

There was only one problem – the catcher was also the sawyer. He would load six pieces on the saw's in-feed deck, then retreat to the back of the machine and pull the finished parts off of the conveyor extensions and stack them neatly on a cart. True, it was a one-man operation, but needless to say, at a significant cost in production!

I've always compared the automated saw to a cash register... if you don't hear it ringing, you're probably not making any money! The same could be said of most any of the automated systems referred to above.

The upside of all of the aforementioned incidents, and others like them, is that they inspired us, and I assume some other equipment manufacturers, to create the production reports that all of our machines produce. Comprehensive production reports help both plant managers and equipment manufacturers monitor the machine's performance. If production isn't meeting expectations, the reports often help zero in on the problem. Many times—probably most—it will be material handling.

Why Automate?

Multi-blade component saws came about at a time when truss configurations seldom varied from truss to truss or even from roof to roof. Saws could set up and cut dozens, sometimes hundreds, of identical parts every setup. Now the average is around four pieces per setup. But wait! This average is a very misleading number!

In truth, only about nine percent of the time will exactly four identical parts be cut per setup. Most astonishing, multiples of four are even less likely. Statistics show that a single piece is cut between thirty to forty percent of the time!

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at a glance

- The challenge of automating material handling compared to other industries is the variation from component to component.
- Getting lumber to the saw is generally the most labor-intensive, time-consuming, and error-prone part of material handling.
- A straight line approach from the saw to the build tables with the conveyor running parallel to the press table is ideal.

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These numbers are not guesstimates, but are the result of studies done evaluating nearly one hundred thousand setups and over four hundred thousand cut pieces. Two truss plants (one in the Midwest and the other in the East) created the database. Both plants had automated component saws as well as linear feed saws driven by sophisticated optimizing programs.

My point is, when considering automating anything, have a good understanding of what is really happening, what is required, and if the intended machine fulfills the need.

The need to improve on the various aspects of material handling has long been recognized. Over a decade ago we began discussing the possibility of automated material handling systems with prospective customers.

One of the time-honored traditions that needed to be changed if an automated system was to be feasible was minimizing the variety of grades, species and lengths of material intended to be processed by the manufacturer. The reduced number of varieties stocked would accommodate all jobs, but of course would mean that some jobs would be built with materials that exceeded called-for specifications. The additional costs incurred would be more than offset by the efficiencies realized in carrying less varieties. And, not unimportant, better grade stocks have fewer defects and thus are more compatible with automated cutting and processing.

Because getting lumber to the saw is generally the most labor-intensive, time-consuming, and error-prone part of material handling—and because there's a high potential for the lumber to be "not on time" rather than "just in time"—we chose to work on the in-feed side of the saw first. If the material isn't flowing to the saw continuously, your cash register isn't ringing.

Go with the Flow

Today there are a number of in-feed material handling systems available for linear fed saws, with varying degrees of sophistication and cost. The more exotic systems, while more costly, will often assure that the saw, not the operator, controls the production of the machine. Since the material feeding is done automatically, the saw is never waiting for lumber to process. Such systems also make possible a one-man operation.

The more sophisticated automated feed systems will typically pay for themselves in less than two years. If you are running more than one shift, that payback time will likely slim down to a year or less.

Prior to automated saws, automated stackers for the back side of component saws were created. While in some situations currently existing automated stackers may be appropriate, other options recently being made available may be better suited to the onesie, twosie setups of today. Or, just maybe, what you are already doing may still be the best option.

About ten years ago, we began looking into the possibilities of using a robotic arm in the truss industry. Robotic arms are typically used to do repeatable operations within very controlled environments. We've all seen them at work on the History Channel, typically in the automotive industry. In those instances, the key to success is that the car bodies are identical and precisely located while the robotic welder does exactly the same routine, with the same quality and precision, on every car body.

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The challenge for the truss industry is to adapt robotic technology developed from other industries, like automobile manufacturing. Given the nature of wood, as typically produced and used in this industry, you can begin to see the problems. Crook, bow, wane, precise cutting and exact positioning are just a few of the conditions that would need to be addressed in order to utilize robots.

With that in mind, we felt the one area robots might best be suited was behind a component saw. Some of you may remember seeing one at a past BCMC show positioned behind an Omni simulating the stacking of completed parts coming from the saw. After about six months of working with a well respected robotic supplier, we abandoned the project for later study. There were a host of challenges.

With the advent of linear-feed automated saws and their ability to sequentially process the components for a single truss efficiently, the idea of utilizing a conveyor to move the finished parts directly from the saw to the building station became more practical. However, as the number of build stations or press lines is increased, the challenges become somewhat greater, but not unattainable.

The challenge once again, when compared to other industries, is the variation from component to component. Normally when we see conveyors used in high production applications, again on the History Channel, they are moving large volumes of beer bottles or some other uniform product at high rates of speed from one process to another. Truss parts just aren't uniform!

Component Variables

Other wood industries and some companies in this industry are already successfully utilizing conveyors to move less-than-uniform parts. The challenges come in the extremes—moving parts ranging in length from a few inches to twenty feet. Having moved them, the next challenge is to have them removed from the conveyor at the correct build stations so they're available and, ideally, organized for the workers.

Ideally, a straight line approach from the saw to the build tables will be preferred, with the conveyor running parallel to the press table.

Linear-feed saws appear to present the best opportunity for utilizing automated conveyors directly from the out-feed side of the saw with no operator interaction. At various times over the years there have been some attempts at doing so behind component saws, but to the best of my knowledge have not met much success. We, like a few others, have given some serious thought to that process, but have thus far not come up with the silver bullet. Conveyors are another story and will become more prevalent under the right conditions and applications.

If you plan to automate your material handling, be prepared to spend some time thinking about the challenges mentioned above. Unless you're designing the system for a new facility, you will likely be challenged with the positioning of saws, conveyors, and pressing stations, so as to minimize directional deviations in material flow. Ideally, a straight line approach from the saw to the build tables will be preferred, with the conveyor running parallel to the press table.

In some instances you may be able to feed two parallel tables with the same conveyor and saw system. The challenge then is to assure that the saw has the capacity to adequately feed the number of workstations you plan to service.

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Finally, I'd be less than honest if I didn't bring up the dreaded "down time" that inevitably affects all machines, automated and otherwise. If the material handling system is tightly packed into your available floor space, how do you get finished parts to the workstations if the conveyor isn't working, or worse yet, if the saw is down for maintenance or is having a problem? "Just in time" can quickly turn to "never in time!"

As I've said so many times in the past, if you intend to reap the advantages of a totally automated system (which are many), make sure you have the technical support to keep it all running. Preventive maintenance is often the key. Remember, you can buy a 747 from Boeing, but you're not in the airline business until you have the entire infrastructure.

Give it some thought. While your particular plant or application may not justify a totally automated system, it's likely that parts of the total system could be utilized to great advantage. Eighty percent of a good thing is better than one hundred percent of nothing! SBC

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