Material Handling Review

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Contents

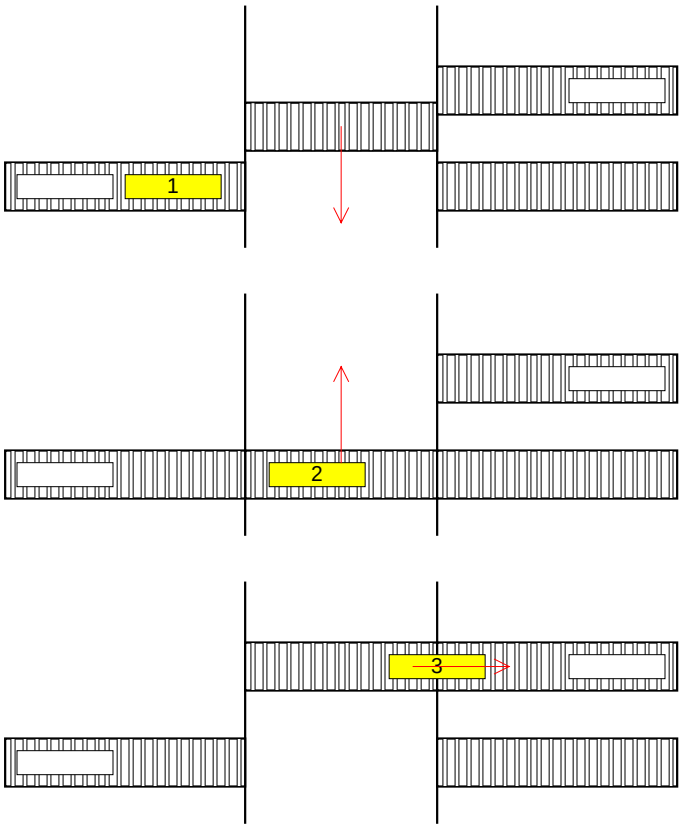
INTRODUCTION

Material Handling

Three typical modes of material handling often seen on site: forklift, wooden carts, and manual. Forklifts will always be required for moving bulk sheet goods from trucks to racking and then to machine in feed. The use of carts generally invites chaotic material flow unless strictly supervised. One method for doing this is to designate specific paths for carts to travel and park. This can be easily communicated via painted markings on the floor. In fact this is often an excellent prototyping method for those wishing to conveyorize. Due to the unconstrained nature of cart travel they are often difficult to organize well.

Conveyors are one tool to circumvent this problem and take control over material flow. In their simplest form they are simply lengths of static rollers 8”-12” from production floor. Each static conveyor system is interconnected with a least one rolling conveyor to transfer parts. The role of the conveyors is to:

1. Store In-feed parts to machines
2. Store Out-feed parts from machines
3. Hold parts between work centers (buffer space)
4. Transfer parts from work center to work center
5. Enforce a flow between machines



Conveyor example

Even though conveyors may be viewed as being rigid, what they actually do is fix inter-machine flow, which typically appears rather random. It suddenly becomes much easier to train people to move parts because each line is designated for a specific purpose (in feed, out feed, buffer, open, waste etc.), not necessarily by part type. Once this is known then the choices for part movement become limited. Identifying work center loading suddenly becomes apparent by the amount of material in the feed buffers.

Areas such as Custom assembly require more freedom due to the variability of items being fabricated but they can still benefit from conveyors. Use them to feed parts to the appropriate assembly area and then transfer to *Shop Carts*™ within that space.

Shop Cart™

Finished goods can also be transported using the same system. Thus the shipping area can utilize conveyors to store goods waiting to be shipped. These can be multi-level conveyors to increase storage capacity (this obviously requires a lifting conveyor). Also goods requiring finishing can be transported to/from *Finishing* area. Supplies such as hardware and tooling can be transported in the same manner. Ultimately all goods coming into, and leaving a work cell should be able to use the conveyor system.

Conveyors are relatively easy to purchase new or used. The only actual installation is fastening the track for the rolling conveyor otherwise the others remain free standing. The challenging part is selling the concept to your production workers and then getting them to actually use it. They are a radical departure from tradition methods and may require some time for acceptance.

Conveyor with Cross Transfer cart

Vertical stacking conveyors

FAQ – MATERIAL HANDLING & CONVEYORS

What is material handling?

Material handling is the action of moving goods within a facility. These goods may be unfinished raw goods such as sheet material and hardware to completed products ready for shipping. This includes every activity of moving items in unfinished form all the way to the loading dock in final product form. Many different tools may be employed to assist in this activity beyond manual lifting such as forklifts, various carts, pallets, conveyors, racking, containers, lifts and pneumatic tables.

Moving materials is often the most expensive and least considered activity in millwork production. Most estimators typically don't cost for material handling. Most production facilities favor equipment purchases over material handling. In either case only the costs or efficiencies at the work center are considered, not how materials are loaded or unload into these areas.

How are conveyors different from *Carts*?

Carts vs Conveyors

The primary difference as can be seen from the above picture is level of mobility. Carts are individual equipment pieces which can be maneuvered anywhere whereas conveyors their own govern the flow.

Controlled Flow: Even though carts are highly mobile, that very nature invites chaos for production flow. Conveyors dictate the flow such that areas for in/out and buffer space may be allocated.

System Dependent: The very nature of a controlled flow is that a system for moving parts is created. Thus everything has a place within then system. Carts are dependent upon operators to place them at the correct locations.

Process Centric: Carts usually contain all parts for individual products which is a good view from the assembly point of view but inefficient for machining. The panel saw would need to cycle through all species to complete the carts before machining can commence. Conveyor systems will stack parts, which visit similar work centers. When the first cutlist is complete the parts can move onto the next work center. Thus they are already sorted for the in-feed for successive machine centers. The very last operation will be to sort them back to assembly order. Being process centric is the move from being a cabinet manufacturer to a panel processor. Cabinet making is simply a by product of assembly not machining.

Highly Scalable: Carts are typically organized by elevation or small product collections (less than 10) and are often used by small shops as means of keeping the group of products together. The batch sizes are constrained by the number of carts, which can be placed on the out-feed area without impeding the loading of the saw. Conveyors use buffer zones as staging areas. By increasing the buffer space, larger batches can be run.

Less Product Damage: Conveyor movement isn't prone to damage as carts colliding with posts and other carts.

Effortless Movement: Carts require clear pathways unobstructed with tooling, hoses and debris. This often results them in being parked wherever space might be found which may not be near the work area. Conveyors use their own pathways and a stack of 40 panels can be moved with one hand.

Status Awareness: Since distinct conveyor lines are used for machine centers' in/out lines it becomes very easy to visually see the current state by the size of each buffer. Carts don't offer this because one doesn't know where the carts may be positioned or what the status of the parts within may be.

Why do we need buffer space?

Buffer space is a requirement to ensure continuous flow. At the work centers, in/out buffers are required to enable the operators to simply focus on their tasks as opposed to the movement of material to/from their workspace. Buffer space is also required between work centers to allow load balancing. The machining centers don't all operate at the same pace and allowances need to be made for machine stoppages. Thus quicker machines are allowed to fill buffer spaces rather than slowing down or stopping.

Will they work for short runs?

Conveyors are merely a method for efficiently moving parts from one work center to the next. The parts still need to visit the same machines. Short runs are often a result of not batching jobs together. Optimal batch sizes require more information such as machine setup times, material availability, engineering and project readiness etc. JIT production allows for batch sizes of one.

What about capacity?

Capacity is a function of the total length of conveyor available.

L_Conveyor / L_Part * H_Stack

L_Conveyor = Length of conveyor
L_Part= Length of average part (include spacing)
H_Stack= Height of Stack

Thus for 100' of conveyor with 4' parts and 35 part stack heights we can load 875 parts which is approximately 145 sheets of material. In order to maximize the effort moving parts the stack sizes should be maximized ~40-50 panels. The equivalent number of carts is about 15.

What about large parts?

The size of parts to be accommodated is matter of knowing what the typical part mixes required are being manufactured. Conveyors need to accommodate for the most likely sizes. Wider lines can be built for specifically for wide panels or wired panels could even straddle 2 lines.

What about other supplies?

Conveyor systems should be the key transportation mode once the forklift has supplied bulk supplies to the manufacturing space. Thus not only should the actual parts being manufactured use the system but also:

- Tooling
- Hardware
- Supplies
- Waste
- Subassemblies
- Finished products

SUMMARY

Manufacturing improvements can come from a variety of ideas. Many simply cost some time to make changes. A general cleanup of the entire plant should be done regardless. It will return an additional 20%-30% of space overall. After that one could focus on each individual area and assign specific regions for certain activities. This will keep work focused. Other topics not addressed which also should be considered:

- Designing for manufacture
- Other drawer methods
- Batch optimization (size, product mix)
- Preventing jobs with insufficient materials
- Completing lay-up prior to job start
- Optimize work cell layout
- Scheduling

Material handling is only one source of production optimization but is one that is often overlooked because first choices are often machines, which give the illusion of quicker processes. Remember that an individual machine only addresses a single process whereby material handling addresses all processes and transforms them into a unified system.

DISCLAIMER

These views are opinion based from visiting similar shops and are intended as guidelines to future business decisions only. All drawing dimensions approximate machine placement and need to be confirmed. Conveyors are generic and actual size and positioning need to be confirmed with vendor. Any reference to machinery or software vendors is for example only as no specific vendor is being solicited. plogic solutions ltd. is not liable for any business loss due to the contents of this document.