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Seven Challenges of Load Movement Systems

Every material handling solution has unique characteristics, which underscore the challenge of finding the optimal solution

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Choosing or upgrading a load movement system for industrial and manufacturing applications can be overwhelming. It's a complex issue filled with challenges, and it requires a significant investment of time, money and resources to complete successfully. A misstep or lack of consideration can jeopardize a company's bottom line.

Unfortunately, too many operations overlook critical questions and end up investing in a solution resulting in suboptimal productive capacity, inability to grow or flex with the operation and wastefulness that reduces efficiency. The chosen load handling solution must make sense not only for today's use-case scenario but also, and perhaps even more important, for future needs as well. To ensure the best outcomes, companies must consider and address the following seven challenges to make a selection that yields a workable, smooth functioning and cost-effective system.

	What load weights work best with the system (lbs)?	How maneuverable is the system?	What distance is ideal for the system?	What move frequency is ideal?	What is the rough, average cost?	How much training is required?	What is the safety risk of each system?
Air Casters	< 5k – 600k+	Highly maneuverable	Better closer	All frequencies	Low to moderate	Little	Low
Conveyors	< 5k – 20k	Inflexible	Better closer	All frequencies	Moderate to high	Little	High
Cranes	<5k – 400k	Inflexible	All distances	Less frequent	High to very high	A lot	Very high
Drag Chains	20k – 400k	Moderately maneuverable	Better closer	All frequencies	Low to moderate	Little	High
Forklifts	<5k – 20k	Maneuverable given extra space	All distances	Less frequent	Moderate to high	Moderate	Very high
Rails	20k – 400k	Inflexible	Better closer	All frequencies	Low to moderate	Little	High
Transfer Carts	20k – 200k	Moderately maneuverable	All distances	All frequencies	Low to moderate	Little	Low

Seven factors to consider when choosing a load movement system. Courtesy: AeroGo

The seven challenges

Weight: In general, the lighter the load, the more options available, including simple human push power. As the weight scales, however, many material handling options will have to be eliminated. For ultraheavy weights — objects over 200-tons and including airplanes, marine ships or caissons — large gantry cranes or air caster solutions may be the only practical options. A basic question to be resolved: can this load handling system work in this weight class?

Once the decision is made to eliminate potential material handling solutions by weight capacity, then companies can evaluate secondary considerations and begin segmenting their solutions further.

Distance: At this point, it's key to start looking at the logistics of the move. The first question: how far must the load move? Not all systems can manage the same distances. A gantry crane, for instance, likely would not be able to move continuously for 1,000 feet, especially when carrying heavier loads. Conversely, short moves can easily become inefficient if the load movement technology isn't suitable. For example, rails, drag chains and conveyor systems would be impractical at shorter ranges.

Short moves in a flexible assembly line benefit from an untethered load movement option, such as an air cushion vehicle. Courtesy: AeroGo

Timing: Another logistical challenge: considerations like move frequency, duration and process cycle time. How often does the load need to be moved? For a one-time rigging move, certain solutions like cranes or rails that require permanent installation obviously are immediately eliminated. By contrast, a permanent installation makes sense for loads that are moved on a regular basis as part of a manufacturing or servicing process.

Other issues: how long does the overall process last? How long does the load rest in each station, i.e., its dwell time? What is the targeted takt time? Imagine a manufacturing operation has eight stations and wants to make one product each day to match production to demand, producing inventory only as needed (its takt time). That means operators must be able to move the product once an hour. The overall move time when multiplied by the number of stations is the process time cycle.

If the operation is moving product frequently and dwell and/or takt times are brief, set up of the moving process should not be too complex because it will extend takt time and likely reduce production efficiency. Cranes, whose operation is often anything but immediate, exemplify this problem.

Safety steps, availability of crane and operator, the time to hook/unhook the load to the crane and the length of time to move the product all require careful planning for crane load movement. In some cases, a single move by the crane could take half an hour from start to finish. That's not bad if load

movement is limited to once a day, but a 30-minute process every hour is much too cumbersome, consumes valuable time and limits production capacity. The load movement application must reliably fit or, preferably, improve the targeted process cycle time if it is to truly be a solution.

Load-ability: The potential costly and time-consuming problem here is loading unwieldy objects onto the load handling system, especially if the objects grow in size or change configuration as they move through the manufacturing process. The specific issue: the amount of extra work and expense load-ability creates for this operation.

Two material handling options work in tandem here: an embedded air caster system moves a rebuild engine positioner below a crane. Courtesy: AeroGo

To understand this challenge, imagine a hypothetical manufacturing operation building air compressors across a ten-station construction process. During the building process, air compressors must be handled carefully because they can change in size and shape. What should be the process for moving the air compressors on or off the moving equipment? Secondary equipment such as skids, pallets or another type of framework or substructure may be required to hook up to a crane or load onto a wheeled vehicle. Such added considerations will increase both the logistical complexity of product handling and operational expense.

Maneuverability: By this point, companies should have narrowed the list of potential material handling solutions significantly, eliminating any system that cannot feasibly bear the weight or fit within the logistical constraints of the production or manufacturing process. From here, the facility itself can

present another challenge in that it could impose significant difficulties that affect the choice of load movement system.

The shape, layout and configuration of the facility and the equipment it contains will make certain material handling systems more or less viable than others. The load path, for example, may need to vary or eventually be reconfigured while a permanent installation such as rails and cranes will limit reconfigurability. On the other hand, if the load always follows the same path, a permanent installation like a conveyor system will likely operate more efficiently with faster production times and lower costs over the lifetime of the equipment.

Should the picture change and management decide to reconfigure the entire assembly line to add stations, build different products or increase overall production, a permanent solution is out of the question. There is also the possibility that a product may need to be set aside e.g., a vehicle under construction that requires an extra part not immediately available may need to be temporarily parked outside the manufacturing line.

Another facility challenge has to do with space. This is a frequent issue with forklifts, which require significant open space to accommodate their size and turning radius. They may not fit into confined facilities with narrow corridors.

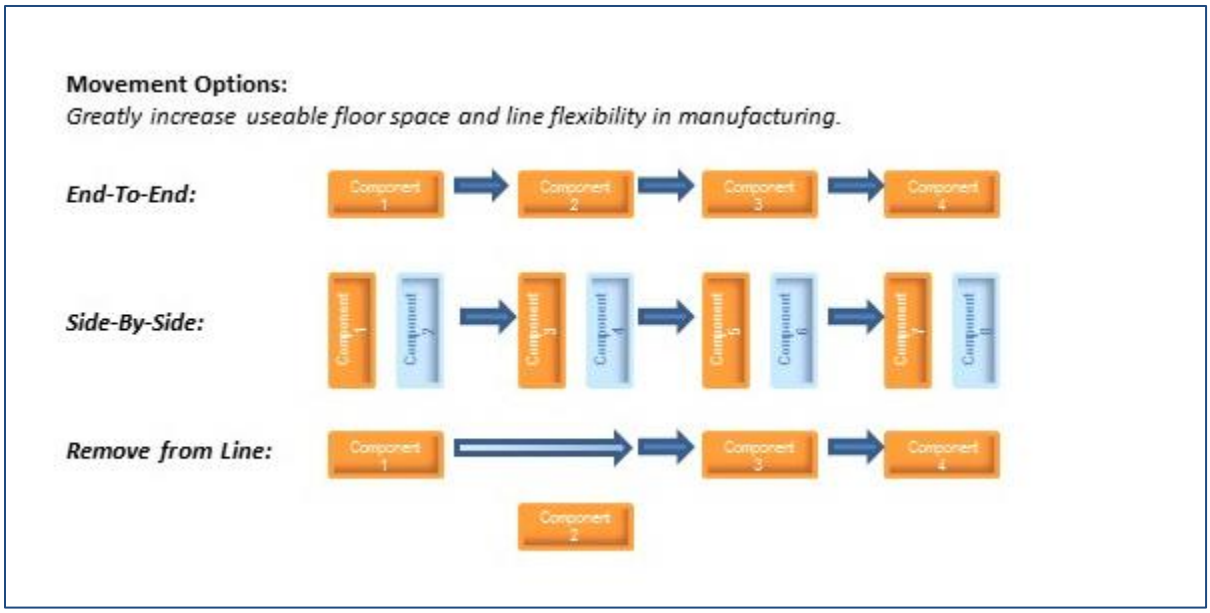
Facility condition: The conditions of the facility also impact the choice of load movement system. Is the floor surface capable of supporting the system? Raised floors could conceivably collapse under the weight of a simple wheeled cart, leaving only a few options. Is the facility capable of supporting cranes? Would the flooring surface require preparation or remediation for an alternative such as air casters? All of these questions can constrain what load movement systems are feasible and/or impose added engineering requirements, logistical complexity and costs.

Costs: It may seem strange to place cost considerations last in the list of challenges because it's probably first for many organizations. So why put it at the end? Because it makes more sense to evaluate pricing only after most options have been eliminated.

That said, cost will always be a major challenge for most situations whether it's the upfront price tag or the long-term cost of operation. Worse, a poorly chosen system could incur significant opportunity costs, a major issue at some facilities that choose a material handling system only to find it ill-suited for their situation. The wrong choice can end up limiting flexibility and capacity.

Start by considering capital expenses or the direct, upfront cost of the equipment. These costs can vary significantly and aren't always tied to weight. A crane large enough to move a multi-ton object might well cost a million dollars or more, but that doesn't mean all feasible options will cost so much. Air casters could move similarly large objects at much lower cost.

Next are the installation costs, which should include expenses tied to possible lost production. For example, if a rail system were to take three production days for installation, disruption to the production environment must be evaluated for both short-term and long-term impact. Then add the ongoing operating and labor costs, especially if the solution requires certified operators and training. Now come the maintenance costs. Every piece of mechanical equipment demands maintenance, so a thorough understanding of those costs over the lifetime of the equipment is mandatory.



Consider future opportunity costs to maintain flexibility and minimize downtime and production costs. Courtesy: AeroGo

Look at possible opportunity costs too, particularly if a load movement system results in unacceptable levels of downtime and production loss. Investments that open the door to future opportunities should be on the table to avoid future problems with flexibility, efficiency or capacity.

Do your homework on load movement

Every material handling solution has its unique characteristics, which underscore the challenge of finding the optimal solution for each situation. Research and study often require trade-offs while many challenges can be subtle and nuanced, which explains why they could be easily overlooked in the typical research and RFP process.

While this list of seven challenges is not intended to be definitive, it will help organizations follow a much clearer path leading to the ideal selection for their situation and needs in the present and

About the Author

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