

Conveying Systems in Robotic Integration



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WHY AND HOW CONVEYING SYSTEMS MAKE A DIFFERENCE

Conveying systems are essential to successful robotic integration. Why?



Robotic systems are being widely deployed to manage material handling functions in a broad range of industries. Manufacturing facilities, warehouses, and distribution centers have all benefitted from systems that have been properly specified, designed, and installed.

Improving throughput, quality, flexibility, and consistency while decreasing ergonomic hazards for workers are the reasons these systems are justifiable. However, using robots requires the appropriate conveying systems to manage the increased workflow.

The robotic integrator must select and install the best robot for a particular operation. The integrator is also required to develop a complete system process. This allows the end-user to take advantage of the optimized capabilities that robotic automation provides.

Conveying systems are a critical part in automated material handling. The conveying system specified must match the high degree of repeatability and accuracy required by the robotic operation. It must also be able to match the robot's rate of production and adapt to different products planned for a specific process. Customized and integrated conveying systems will mean the difference between a process that flows smoothly and efficiently and one that is fraught with errors and downtime.

As a robotic integration specialist, your expertise lies in understanding which robotic systems best address the requirements and goals specified for the project. That requires you choose both the right robots and the right conveying systems. Your challenge is to develop a turn-key system including all the equipment and controls to fully support the upgraded workflow.



Industrial Robot Types & Applications



There are four main types of robots suitable for industrial applications.

- **Articulated:** Articulated robots are typically used for assembly lines. These highly flexible machines have 6-axis or even 7-axis abilities that enable them to work around obstructions.
- **SCARA (Selective Compliance Articulated Robot Arm):** This type of robot is cost-effective and efficient for pick and place, packaging, assembly, and dispensing.

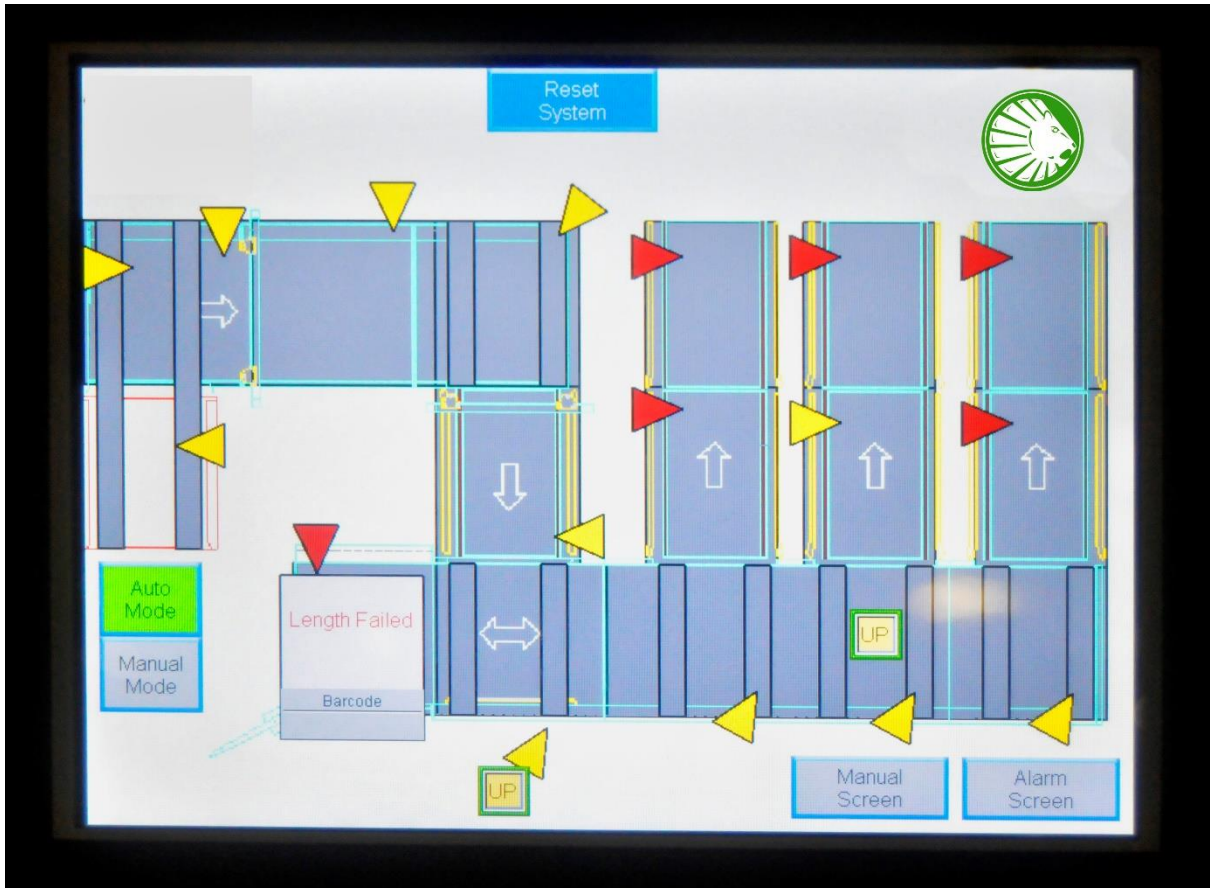
- Delta: A robot that uses parallelograms for three arms that guide a central effector. Used for the rapid picking and placement of light loads.
- Gantry: Used to position the robotic arm above a workspace. Highly effective for pick and place, inspection, and assembly. Take note that these cannot reach around obstructions.
- Collaborative: Also known as “cobots.” Highly flexible robots designed to share a workspace with humans for collaborative operations.

It is possible for the appropriate robot type listed here to accomplish the following tasks:

- | | | |
|---------------------|----------------|--------------|
| • Assembly | • Coating | • Cutting |
| • Dispensing | • Gluing | • Inspecting |
| • Material handling | • Packaging | • Painting |
| • Palletizing | • Pick & place | • Testing |
| • Welding | | |



Conveying Systems Servicing Robotic Operations



Robotic automation is an ideal solution for the operations detailed above in a variety of industries. Robots produce at higher rates, deliver greater accuracy, do not fatigue, and can perform complicated maneuvers that may be difficult for humans. Since the consistency, repeatability, and speed of a robot will be so much greater than that of the less automated process it is replacing, successful integration will require a reworking of the entire workflow. Robotic integration requires a conveying system that can match the capability of the robot. The conveying system should address the following factors:

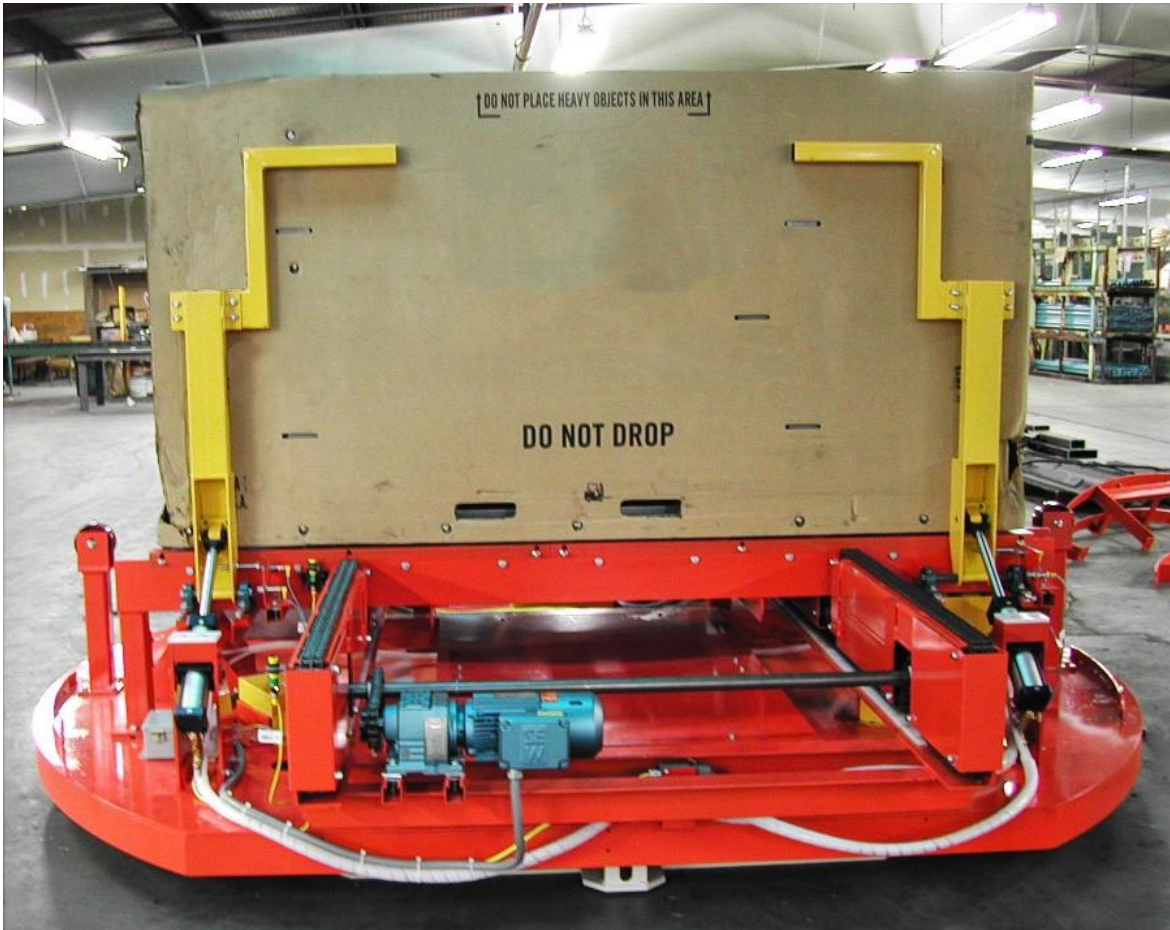
- Material requirements of transferred items such as weight and dimensions.
- Product positioning at the robot interface points.
- Matching flow rates of product in and out of the cell with the desired robot cycle time.
- Need to accumulate product before and after the robotic operation.
- Interface of conveyor system with other material handling functions such as manual interface, forklifts, AGVs or other conveyor equipment.
- Efficient use of space within the work cell.
- Control system integration compatibility with robotic system controls.

The best conveying systems are custom designed to work seamlessly with the robot, optimizing space and increasing productivity. When working with a conveying system manufacturer on a robotic integration project, important questions to ask include:

- How can the conveying system controls be integrated with the robot controls?
- Is the conveying system adaptable for multiple processes?
- Can the conveying system be customized to meet specific requirements?



ROBOTIC AUTOMATION WITHIN A WORK CELL

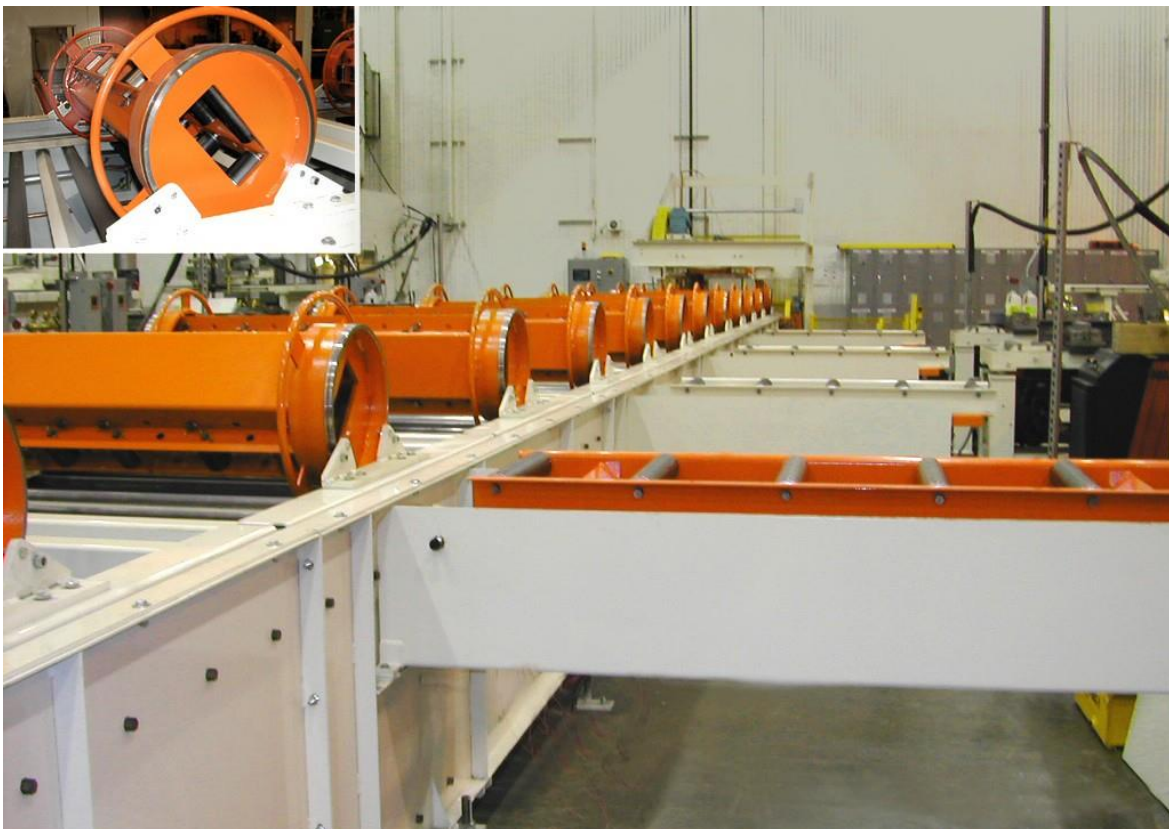


In applications involving robotic automation of processes such as welding and other types of precision operations, material positioning is critical for success. Precise positioning is required for repeatability and accuracy in the work performed. This is not only to assure product quality, but also to develop a dependable and productive workflow. If the process lacks the reliably precise positioning provided by a high quality, custom conveyor system, the result can be rejected product, wasted materials, and costly downtime.

The correct conveying system will mean the difference between robotic integration success and failure. Conveying systems for robotic integration should incorporate devices that position material for extreme accuracy in processes and packaging. Positioning devices include:

- Diverting arms
- Stops
- Squaring clamps and platens
- Turntables
- Roll-over and load tilters
- Machine Vision*

The conveying system should offer automation software with programmable controls to achieve the highest degree of integration accuracy. Air-operated conveyors and positioning devices provide smooth movement and precise control.



When specifying a conveying system for a robotic integration project that requires precise maneuvering within a work cell, important questions to ask include:

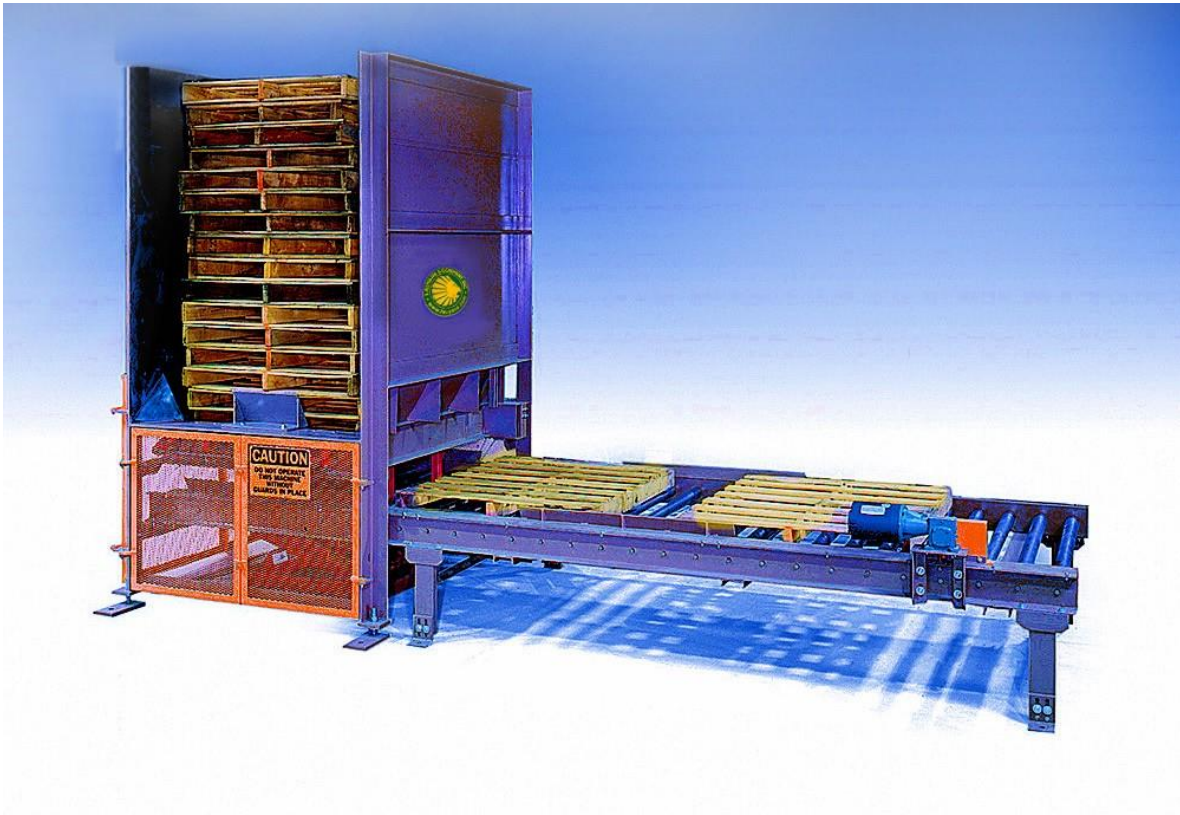
- Can the conveying system match the rate at which the robot operates?
- Can the conveying system present the product to the robot with the required accuracy?
- How are the conveying system controls integrated with the robotic controls?
- Can the conveying system adapt to handle multiple processes?
- Is the conveying system customizable to application specifications?



*With the advent and increasing sophistication of artificial intelligence (AI), Machine Vision is becoming an important factor to consider for any robotic operation. From the standpoint of this paper, Machine Vision can be used to identify misaligned or missing products entering a work cell. The robot will adjust accordingly. Machine Vision can play an important role in robotic control.



PALLETIZING AND MOVING OPERATIONS



The increased production levels that come with robotic integration create new logistical complications on the factory floor and in work cells. There is more product to transport, as well as the need to clear and restock work areas at a faster pace. Practically speaking, the speed of a new robotic system is only as fast as the rate at which work can move through it. In most cases, manual labor is an unsafe option. Or it may be simply insufficient to manage the demand. Remember, the basic justification for robotic integration is that human labor is a costly and valuable resource which is better and more safely applied in other capacities.

Automated conveying systems provide a fast and efficient way to handle burdensome and repetitive material handling operations. Specialized equipment like custom pallet dispensers assure that pallets are ready for product placement. Similarly, depalletizers clear and stack pallets to maintain a clear and functional work area.

A customized automated conveying system should be developed in concert with the robotic system. In addition to palletizers and depalletizers, other custom material handling equipment can include:

- Dumpers
- Lifts
- Tote collectors and dispensers
- Transfer cars



An effective conveying system includes automation software to achieve the highest degrees of accuracy. It also allows for programmable control to be integrated into the robotic work cell.

When specifying a conveying system for a robotic integration project that requires palletizing and moving operations, important points to consider include:

- Integrating the conveying system controls with the robotic controls.
- Adaptability of the conveyor to handle multiple processes, different sizes of pallets or totes, etc.
- Ability to customize the conveying system to match application needs.



WHAT TO LOOK FOR IN A CONVEYOR SYSTEM SUPPLIER

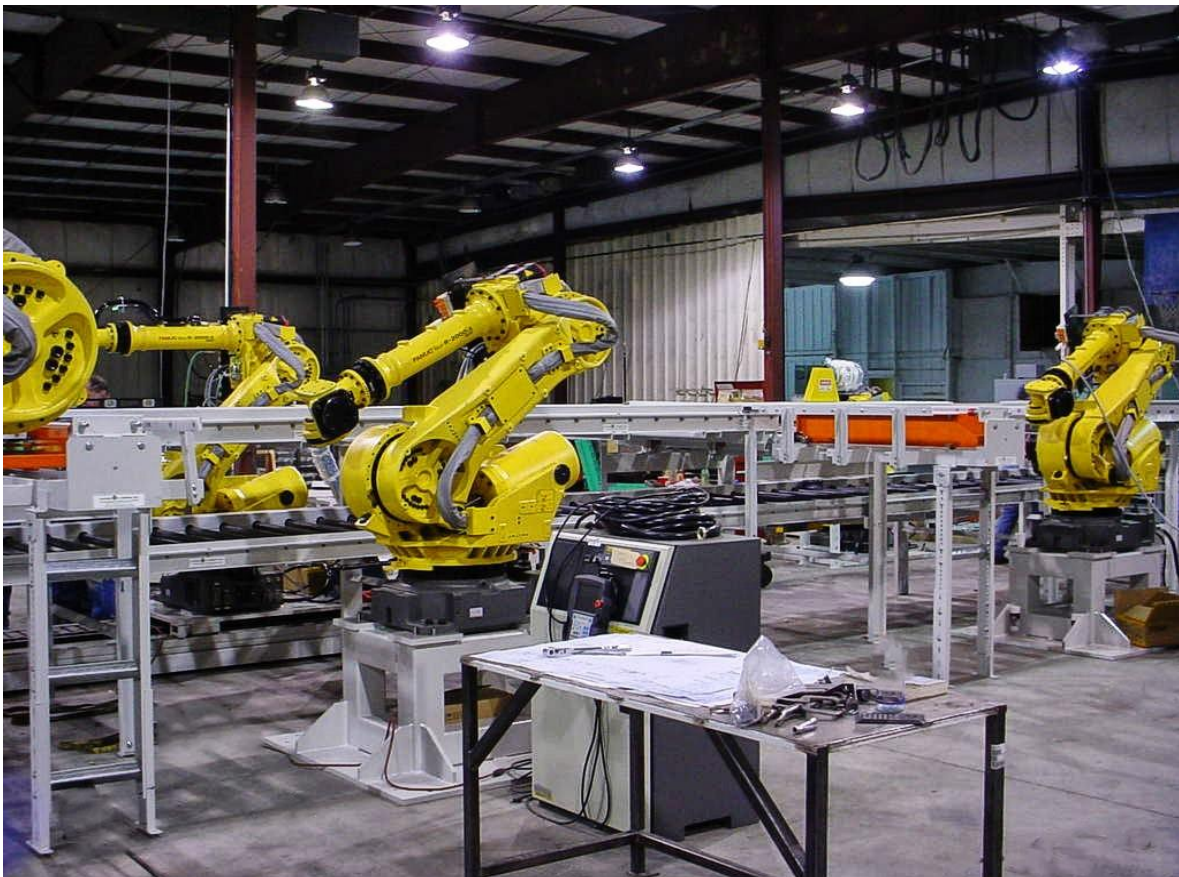


Selecting the right conveyor system supplier is essential to make the robotic integration process easier, for seamless implementation and to leave you with a successful project. The right conveying system supplier will have the application experience to assist you properly. They will work closely with you on the assessment, planning, and development phases all the way through to the installation, implementation, and support phases.

In evaluating a conveying system supplier, look for those who offer advantages such as:

- A custom engineering capability.
- A proven track record.
- A culture of innovation.
- Experience that allows them to bring new ideas to the design process.
- The ability to adapt to your and your customer's needs.
- The ability to provide custom equipment at a reasonable cost.
- Excellent project communication and collaboration.
- A diverse product offering.

Partnering with the right conveyor system specialist will continue to bear dividends for you long after the project is complete and signed off.





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