GLIDE-LINE™

THINKING DIFFERENTLY:

THE GUIDE TO **CREATIVELY LIFT & ROTATE PRODUCTS** IN YOUR **ASSEMBLY AUTOMATION SYSTEM**

INTRODUCTION

Rotating products smoothly and gently in your automation system can be challenging. Inefficient throughput, prohibitive costs, herky jerky motion, and overly complicated customizations make many design engineers want to ditch product rotation altogether. Engineers we've worked with have come up with unique ways to avoid product rotation in their assembly designs, but let's face it: sidestepping a problem doesn't solve the bigger issue.

- This ebook addresses The Big Problems with automated product rotation:
- Abrupt motions while rotating products on traditional conveyor solutions
- Transporting large, unwieldy products or pallets around a curve
- Maintaining or changing product orientation easily
- Minimizing product damage due to pallet stops
- Controlling extra spending on ancillary equipment needed for inspecting and/or lifting and rotating products
- Rotating products directly in an automated conveyor line

If you're facing challenges with product rotation – sacrificing dollars along with loss of efficiency and low throughput, or designing around rotation – there is a better way to rotate products in your automation systems. Modular conveyors able to rotate products in-line are a simple, efficient, and creative way to overcome these challenges.

CHAPTER ONE

Introducing: An Innovative Way to Lift & Rotate Products

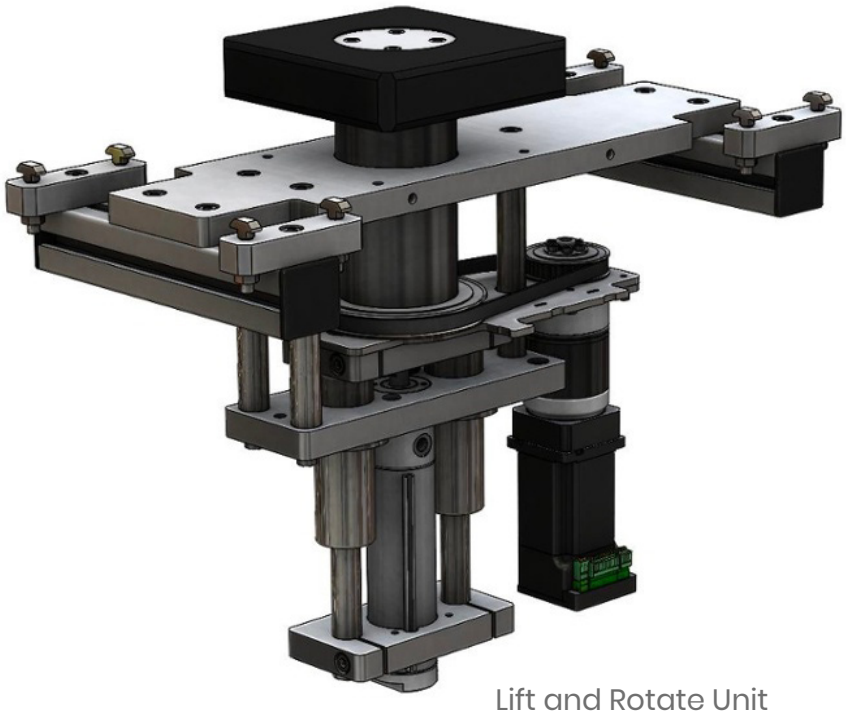
Glide-Line has developed a unique solution for rotating products and pallets in a motion-controlled manner within your pallet conveyor automation system. The units use pneumatics for vertical motion and step-servo motors for rotational motion, leading to ultra-smooth rotational motion and acceleration.

With this solution, you can:

- Rotate large pallets and panels in an automation system
- Efficiently inspect multiple facets of a product without leaving the conveyor and/or utilizing external devices to manipulate the product
- Improve throughput for products requiring 360° operations
- Control costs by minimizing extra equipment required to overcome shortfalls of traditional rotation methods
- Solve your clients' rotational motion needs without breaking a sweat

Glide-Line's Lift & Rotate Units (LRUs) and Drop & Rotate Units (DARTs) accomplish 90-degree turns, curves, or even continuous rotation within the automation system.

By using modular conveyors like ours, you can use Lift & Rotate Units and Drop & Rotate Units within the system to accomplish any product rotation, at any angle, and with multiple stops per rotation. We achieved this by applying a step-servo-driven motor directly to the lift and rotate unit, enabling you to lift or drop the conveyor itself within the automated system. You're no longer limited to simple transference using a conveyor; now, you can accomplish any motion your process requires using an innovative application of the conveyor you're already designing.



Lift and Rotate Unit

CHAPTER TWO

Servo-Driven vs. Pneumatic Motion

On a Lift and Rotate (LRU) or Drop and Rotate (DART), there is a lifting motion and a rotational motion. The lift is pneumatic to raise or lower the pallet or the entire conveyor.

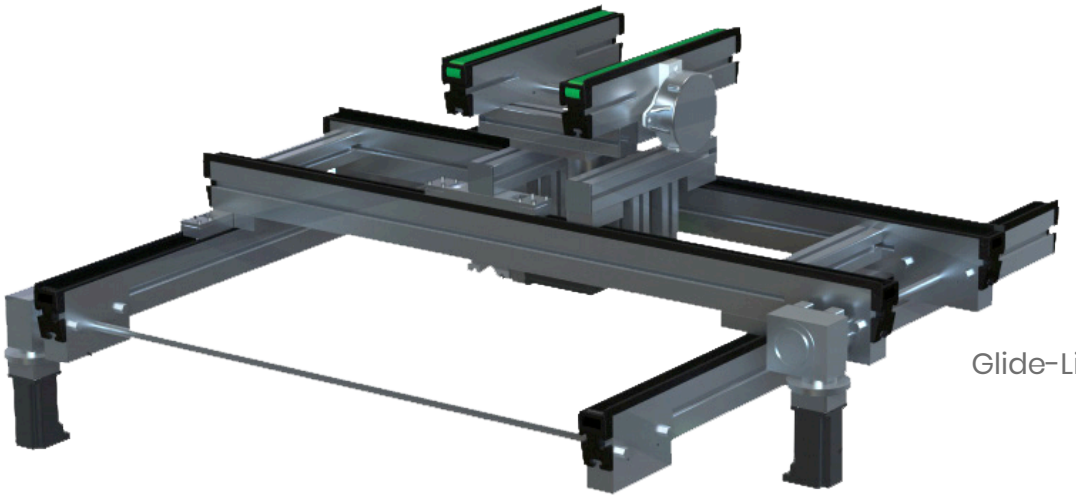
The rotating section of both devices is step-servo-driven, enabling acceleration and deceleration movements and precise positioning, giving the operator complete consistency of motion and controlled, smooth movement.

Programmable Step-servo-powered Rotation

Often, electrically driven servo motors are thought to be more complex to operate than pneumatic motors. However, that's not the case with Glide-Line's LRU and DART rotation units.

The step-servo motor is programmable and can be pre-configured to make it as easy to operate as a pneumatic motor. We've added a simple interface to re-program the position, acceleration, and deceleration of the unit.

Instead of simply actuating and retracting between two degrees of rotation as a pneumatic cylinder does, a step-servo motor allows for smooth acceleration and deceleration, plus you can stop at any incremental angle within a rotation – as many times as needed in a process.



Glide-Line 360

Limited Product Disruption

Pneumatic rotational motion can have the unfortunate effect of dislodging products on a pallet since it's difficult to control the speed with which the pallet acuates. This isn't the case with an electric servo motor.

With the step-servo, you have added flexibility and control over the speed of the rotation. The stops can be precisely dictated through programming. This provides consistent, reliable motion control and stability of the pallet and the products on it.

We've simplified the process of lifting and rotating (or dropping and rotating) conveyor modules to save space and increase throughput in our engineers' automation assemblies. We've found the best way to accomplish this consistently is with a servo-driven motor operating the motions.

Custom Lift and Rotate Unit

CHAPTER THREE

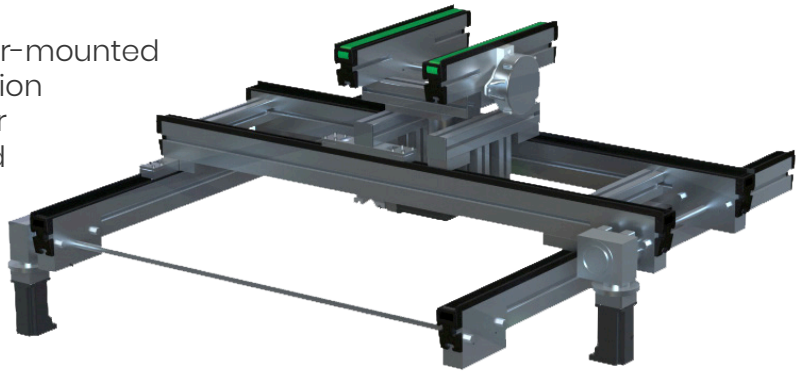
Motions Accomplished with a Moving Pallet Conveyor Application

A standard lift and transfer or lift and rotate application requires the device to rise between the conveyor strands, directly contact the product, physically lift the product, and rotate the product to its new position. A pallet-shifting conveyor application (where we actually rotate the entire conveyor) added to your design avoids that extra contact, reducing risk of damage. It can also simplify the process while making the process smoother. There are four common motions accomplished using various moving pallet conveyor applications.

1 Change Product Orientation with a Lift & Rotate Unit (LRU)

A Lift & Rotate Unit (LRU) is a conveyor that lifts up a pallet from the main line, rotates to 90° or 180°, then drops down again. (This is a common device on the market.) The purpose of the LRU is to change the product's orientation without making physical contact with the product. This minimizes the risk of jarring the product or damaging it while changing its direction.

Another variation on the LRU is a floor-mounted Lift & Rotate Unit. Instead of the rotation unit being mounted on the conveyor to move a pallet, the unit is mounted to the floor for extra stability. This unit is built to accommodate heavy pallets, which require more leverage.



Glide-Line 360

2 Maintain Product Orientation with a Drop & Rotate Unit (DART)

Dropping the conveyor under the product while the product is suspended on stands or rubber "feet" allows the product to maintain its orientation onto a lateral conveyor as it turns a corner. This is called a Drop & Rotate Unit (DART). This is a unique Glide-Line device.

This unit has many applications, including transferring products to transverse conveyors that are positioned at any angle. Because of the servo motors controlling the angle at which the conveyor rotates, customers are able to program any angle needed to accommodate their process and products.

DART Drop and Rotate Transfer Unit

DART: Solar Panel Customer Case Study

One of our clients, a manufacturer of solar panels, devised an effective way to use a Drop & Rotate Unit (DART). Since they create solar panels in a wide variety of sizes, a center line adjustable conveyor is used to transport the large glass panels through the manufacturing process. They have multiple turns within their line, and to avoid damaging the product, it's imperative that the glass panels make it around those curves without changing orientation.

Prior to developing the Drop & Rotate Unit – in fact, before we had established Glide-Line as a company – we did a lot a work for a different company that made solar panel assembly equipment. We built some very expensive and complicated custom devices that did what DART does.

Now, DART simplifies the process for our customers with multiple product sizes. It enables the largest panels to be transported through the process without changing orientation, no matter the size.

3 Continuous Revolution

Rotating pallet conveyor applications can also revolve continuously. This is especially useful for continually moving a product to add a 360-degree label, wind cord around a spool, or create screw holes in building materials. Whether moving large or small pallets, continuous revolution can help you configure a more efficient process layout.

Think of this scenario: a product, such as a special spool assembly, is coming down the line on a pallet and you want to rotate it 180 degrees to apply an etching. The pallet stops and then rotates while being etched. The continuous revolution capabilities of an LRU mean the etcher can be in a fixed position, saving you the expense of a robot or custom mechanism to circle the product.

Lift and Rotate Unit

4 Consistent Rotation

A programmable, step-servo-driven rotating pallet solution – consistent rotation within a revolution – is also available with a Lift & Rotate Unit from Glide-Line. This is more than simple oscillation back and forth with a pneumatic motor. The turning servo-driven LRU conveyor pallet moves within a revolution at any angle in unlimited increments and even varying speeds. It's programmable to accomplish defined, accurate, precision pallet stops within a process. There are two main applications:

- Present a product for visual inspection in front of one camera at multiple angles
- Access a certain product feature to complete a function

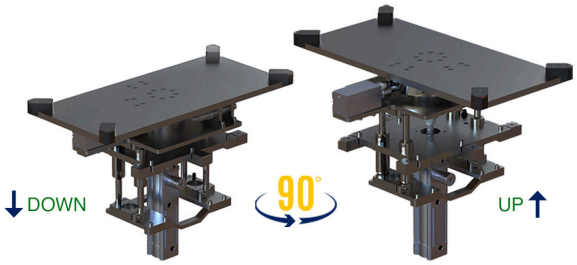
Instead of designing, engineering, and paying for multiple cameras, multiple stations, multiple screw machines, or multiple label applicators (examples of a few workarounds we've seen), the LRU condenses the system space, making the system more flexible.

FOUR MOVING PALLET CONVEYOR APPLICATION MOTIONS

1

CHANGE PRODUCT ORIENTATION

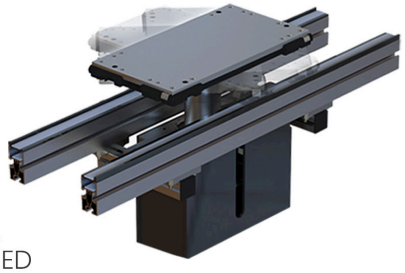
SMOOTHLY LIFT AND ROTATE PALLET 90-180°



2

MOVE PRODUCT THROUGH PROGRAMMABLE ROTATION STOPS

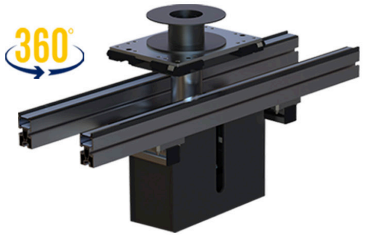
PALLET ROTATES SMOOTHLY IN UNLIMITED INCREMENTS, RELIABLY RETURNING TO THE EXACT ANGLE PROGRAMMED



3

CONTINUOUS REVOLUTION

PALLET REVOLVES ENDLESSLY FOR PRODUCT ASSEMBLY OR WINDING



4

CONSISTENT ROTATION

PALLET ROTATES AT ANY DEGREE, WITH AS MANY STOPS AS NEEDED FOR INSPECTION OR OPERATION

CHAPTER FOUR

Challenges Solved with a Turning Servo-Driven Conveyor Pallet

Rotating an entire conveyor is especially useful for manufacturers with center line adjustable conveyors or those with multiple setups for different product sizes. Whether your client is looking for a different product orientation, better visual inspection methods, or continuous rotation, the DART and LRU options can meet these challenges without requiring a conveyor tooling changeover. The moving pallet conveyor application makes it simple to manage all types of differently-sized products. There are six common challenges solved with these turning pallets.

1 Assembly Operations

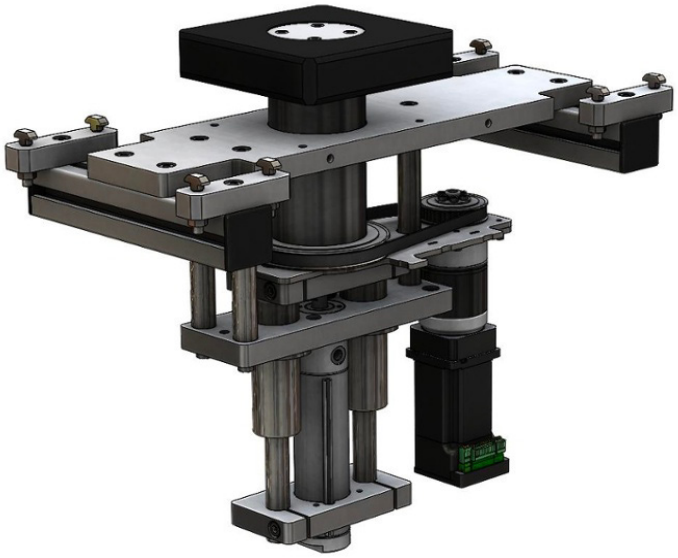
Assembly operations are simplified and precise with a turning servo-driven pallet. The precision and smoothness available with a Lift & Rotate Unit can also aid in other processes in an automation system such as positioning. These operations may include:

Wrapping stickers, barcodes, or other labels around containers
Continually rotating products while applying labels is an efficient way to keep products moving through a line.

Laser preparation
The Lift & Rotate Unit is useful for laser preparation. It works by rotating a ring or other object at a constant speed under a laser to prepare a surface for welding. You're able to completely control the rotation angle, speed. and revolutions.

Winding spools
With the capability to rotate continuously, winding spools of product can occur directly on the pallet as part of the automation process.

Adding multiple screws to a single product
The LRU's precision abilities can position a product under an automatic screw installer and rotate the product as needed to install additional screws.



2 Speed

"How fast can you rotate my product?" This is often the first question engineers ask when considering the LRU for their automation systems. The quick answer: we can rotate the pallet faster than the pallet or the product can handle. Any speed you'd like to accomplish without disruption to the product, the Lift & Rotate Unit can go.

Servo-based motors can achieve a faster velocity than pneumatic-based motors, since they have an inherently higher RPM. But more importantly, a servo will include controlled acceleration and deceleration.

When considering this solution for visual presentation, the important thing to remember is that the LRU has the ability to keep the product on the line, and inspections can be done on the fly, without having to manually inspect it away from the station.

3 Visual Presentation

The highest volume use case for the LRU with consistent rotation is visual inspection. This is impossible with other lift and rotate conveyors. In the past, you may have avoided designing this altogether, or the solution may have been to design multiple stations with a camera at each one inspecting various points on a product. Camera systems like this can be very expensive.

Instead, with consistent rotation available with the LRU, you're able to present the product in front of just one camera for visual inspection, rotating the product to any angle necessary within one station. This enables you to to condense your system and make it more flexible.

Lift and Rotate Unit

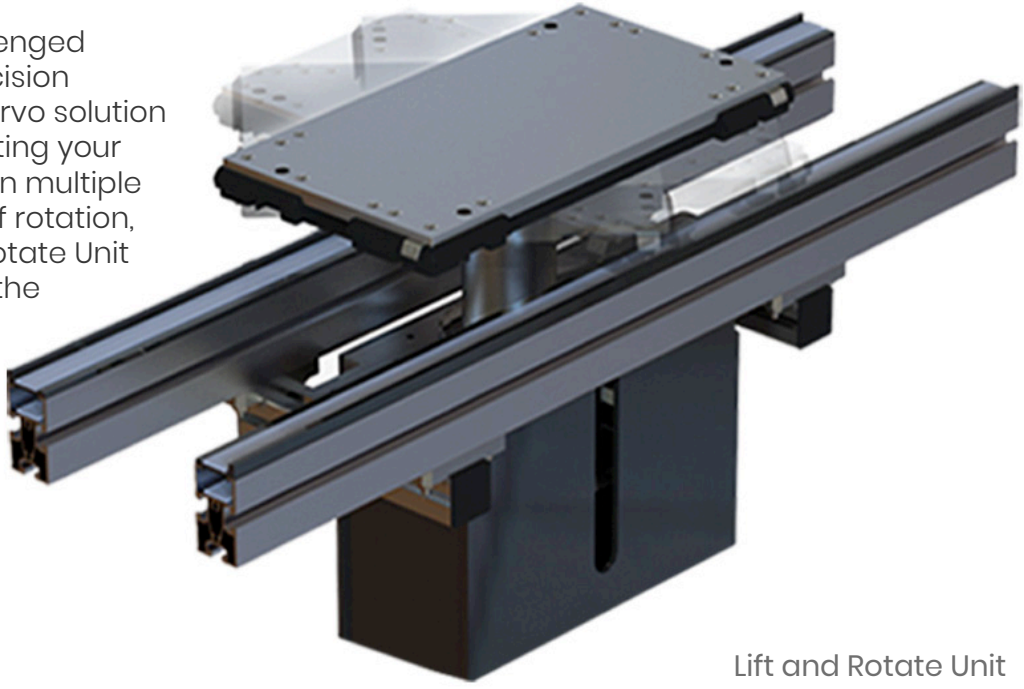
LRU: Furniture Visual Inspection Case Study

Visual presentation isn't just for cameras. Manual visual inspection of large products is also aided by the floor-mounted LRU and its ability to rotate products to multiple pallet stops within a process. For example, a furniture manufacturer's process may require visual inspection of all sides of a small chair before it's packed and shipped. Despite its large size, the floor-mounted LRU turns the entire pallet so one person can inspect the entire product, instead of requiring the operator to walk around the conveyor to inspect all sides, or requiring multiple operators on multiple sides. Using the LRU this way makes for a far more efficient process. This would likely be a Drop and Rotate version of the LRU.

4 Multi-angle Programmable Rotation Stops

No matter the number of stops needed within a rotation, a servo-powered rotating conveyor pallet from Glide-Line can make them, in unlimited increments. The pallet can be programmed to stop in one degree (or less!) increments for 360 degrees if that's what's needed. Its acceleration and deceleration are also smooth at each of those rotation stops.

When you're challenged with finding a precision programmable servo solution for lifting and rotating your clients' products on multiple varying degrees of rotation, the flexible Lift & Rotate Unit form Glide-Line is the solution you want.



Lift and Rotate Unit

5 Bypass Creation

Another creative use for the lift and rotate mechanism is to create a simple and effective bypass using this application. This works by lifting pallets and placing them on a shelf or ledge so other pallets can pass under the lifted pallet. This can be a cost-effective bypass solution in specific product instances.

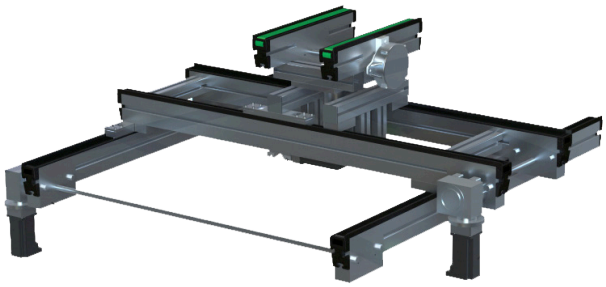
Lift & Rotate Unit: Bypass Creation Example

Picture a square pallet. When it comes to an inspection station on the conveyor line, a Lift & Rotate Unit can elevate the pallet and rotate it 45° so the corners catch on a square-shaped ledge above the main line. Additional pallets can continue moving under the elevated pallet. Once the pallet is ready to be re-engaged, the Lift & Rotate re-connects with the pallet, rotates it back 45°, and the pallet can continue down the line.

6 Product Waste Reduction

A Lift & Rotate Unit can help reduce product waste. Servo-driven conveyors are less likely to cause damage to delicate or high-risk products during transport. Thus, using the servo-driven LRU to perform turning or rotating actions in a process should help reduce product waste.

Using the LRU also limits the amount of contact needed for assembly, inspection, and transfer through an automation process. Because the product is lifted on the conveyor, rather than physically handled, damage and product waste are minimized.



CONCLUSION

If you're avoiding product rotation at all costs – sacrificing dollars along with loss of efficiency and low throughput – there is a better way to rotate products in your automation systems. Modular conveyors able to rotate products in-line are a simple, efficient, and creative way to overcome automation process challenges for manufacturers. Just about any product category can benefit from the ability to rotate products directly in an automated conveyor line. Product orientation, visual inspection, or programmable rotation stops can be accomplished easily, smoothly, and precisely using a Lift & Rotate Unit or a Drop & Locate Unit.

ABOUT GLIDE-LINE

Glide-Line solves problems other conveyor systems manufacturers won't. We developed Glide-Line from the ground up with a few key, driving factors in mind. First, our conveyors had to be robust and reliable. Second, they would be simple – easy to maintain and service. Finally, we insisted on flexible configurability, creating an efficient, hassle-free customer experience. We've built the most versatile multi-strand panel and pallet-handling solutions available for the assembly automation industry.

Glide-Line aims to be dependable from all directions. We want our customers back. We'd like them to call us whenever they get in a pinch because they know they'll be getting a comprehensive solution resulting from a collaborative, thought-provoking conversation with industry experts who think outside the box. If you have a challenge, throw it our way and we'll do whatever we can to make it happen.

ABOUT THE AUTHOR

Ron Schwar is the Godfather of Glide-Line. A machine designer by trade, he has experience designing everything from bottle cappers to fiber optic embroidered apparel and even unmanned helicopters. He's seen it all. His passion is to develop innovative products for engineers that are easy to design with, easy to design around, and set the bar for industrial automation. He loves a challenge and does everything he can do to make Glide-Line the best it can be.