Industrial Lift Tables: Choosing Between Hydraulic, Pneumatic, and Electro-Mechanical Designs

Lift Tables provide ergonomic and productivity benefits across a wide range of industries, and the market has responded with multiple designs operated by varying technologies. Every type of Lift Table can help workers position materials, reducing incidents of musculoskeletal disorders and improving overall efficiency, but the technologies that produce the “lift” that defines the tool provide different sets of strengths and weaknesses.

Scissor Lift Tables rely on linear actuators to generate the force that moves them up and down. Three main technologies produce this motion: hydraulic, pneumatic, and ball screw, or electro-mechanical, actuators. For all but a few niche applications, hydraulic cylinders provide the greatest combination of lifting power, affordability, and — with the right protections in place — reliability.

In this paper, we’ll discuss the advantages of hydraulic power for positioning equipment, as compared to pneumatic and electro-mechanical lifts. First, though, we’ll provide a little insight into the general design of the positioning machine known as a Lift Table.

The Anatomy of a Scissor Lift Table

No matter which type of actuator they use, scissor Lift Tables work on essentially the same principle. They’re designed to elevate loads and to position work. To do this, they use a simple, rugged, and dependable design. There are essentially only five core elements of a quality Lift Table:

Figure 1. BHS Lift Tables position materials at comfortable heights for improved ergonomics and productivity.

1. The **base** comprises the unit’s footprint, and supports the device as well as the loads that rest upon it. In BHS Scissor Lift Tables, the base is made of formed steel with a protective powder coating, and includes pre-drilled floor-mounting tabs. In Mobile Lift Tables, the base includes corrosion-resistant urethane casters for complete mobility.

2. The **track** sits within the base of the unit. It supports the load placed upon the table surface itself, and houses the wheeled base of the traveling scissor leg.

3. The **scissor legs**, which are attached by a rolling fulcrum. As the traveling leg moves forward along the track, and the fixed leg tilts forward; think of a pair of scissors opened all the way. This lowers the surface load of the table. When the traveling leg moves backward, closing the legs, the load travels upwards vertically.

4. The **table surface** supports the load itself. These tables are available in a wide variety of sizes, materials, and configurations, including turntables, ball transfer, and roller conveyer surface that integrate into existing workflow infrastructure.

5. The **linear actuators** provide the force that pushes the scissor legs closed to raise the table. These can be pneumatic, electro-mechanical, or hydraulic. Depending on the technology, they may include auxiliary systems, such as an electric motor and/or a hydraulic pump.

While all of these elements are necessary for a functioning Lift Table, the power source may be the most important difference — assuming high-quality materials and skilled manufacturing for all components. Here are the advantages and disadvantages of each type of actuator. These attributes clearly point toward hydraulic power as the most beneficial for heavy-duty industrial applications:

Ball Screw Lift Tables

Electro-mechanical positioning systems typically use an electric motor which turns a ball nut along a ball screw, converting rotational force into linear motion. This design has found favor in certain manufacturing applications, thanks to high level of precision in positioning that the ball screw allows.

At the same time, though, electro-mechanical systems cost more than their pneumatic or hydraulic equivalents. Not only is the purchase price usually higher, but the electricity costs over time continue to compound the expense.

But ball screw Lift Tables pose a more serious problem: In high-throughput applications, electro-mechanical actuators heat up, causing components to expand. In order to prevent the mechanism from seizing, these devices may require frequent cool-down periods.

In fact, a 2015 article in the industrial journal Hydraulics & Pneumatics points out that electro-mechanical systems with lower price tags must spend half of their working time waiting to cool. Both pneumatic and hydraulic systems operate without need of cool-down intervals, leading to more efficient duty cycles.

In short, ball screw Lift Tables are ideal for highly specialized automated systems. For most work-positioning and industrial lifting tasks, however, they fall short.

Pneumatic Lift Tables

Pneumatic linear actuators have one key advantage over other lift tables designs: They don't require on-site electricity.

That doesn't mean they don't require any power at all, of course. Pneumatic actuators consist of a cylinder, a piston, and air pressure. In order to generate the air pressure required to generate thousands of pounds of force, they require compressed air. That means a shop air compressor — which typically do require electricity.

And while pneumatic power is clean and versatile — leading to the adoption of pneumatic Lift Tables in many food processing and electronics manufacturing applications — the simple fact is that these designs can't match the load capacity of a hydraulic or an electro-mechanical device. For material handling applications that deal in heavy loads, pneumatic power is not the best choice.

Hydraulic Lift Tables

Hydraulic systems remain the most enduring design for Lift Tables, and for good reasons. First, hydraulic power can handle even the heaviest loads safely. With velocity fuses installed on cylinders, even the rare event of a ruptured hose will result only in the scissor legs locking, preventing potentially serious injuries.

Electro-hydraulic power also provides the following advantages compared to pneumatic and ball-screw systems:

1. **They are much more energy efficient than electro-mechanical systems.** In a comparative analysis between hydraulic cylinders and electro-mechanical actuators in a motion platform loaded with 20,000 pounds, the electrical system required more than four times the electrical output than its hydraulic counterpart — all while the system remained elevated, but at rest.

2. **Hydraulic Lift Tables are more versatile than other designs.** While electro-mechanical systems offer more precision than an unassisted hydraulic model, the ball screw devices are also highly specialized. If the load size goes up, most operations will have to purchase an entirely new ball screw Lift Table. Given their generally greater capacity overall, users are more likely to be able to hold on to their old hydraulic Lift Tables unless the load increases beyond the maximum recommended capacity.

3. **Actuators powered by hydraulics are more powerful and efficient than comparable pneumatic cylinders.** According to the industry publication Machine Design, hydraulic cylinders exert 25 times as much force than a pneumatic actuator of the same size. The motors that drive hydraulic pumps also provider a greater horsepower-to-weight ratio — between 1 and 2 horsepower/pound greater — compared to the motor that powers a pneumatic system.

Designing The Best Hydraulic Systems for Lift Tables

Despite their clear advantages, hydraulic systems sometimes get a bad reputation. They're dirty, some claim, and prone to leaking. And what about coasting, drifting, and leak down?

First off, if hydraulic lines are leaking, that's usually because they weren't quality lines in the first place. All hydraulic systems in BHS Lift Tables use heavy-duty braided lines, which are designed with maximum burst strength and durability.

BHS hydraulic systems retain cylinder integrity with hardened chrome piston rods and custom engineered cylinders themselves. This combination creates a seal that is both rugged and reliable. By constructing closed hydraulic systems that are designed for longevity, BHS prevents the annoyances caused by lower-quality components.

When hydraulic systems don't leak, they don't fall victim to drifting or leak down—both of which describe the loss of elevation that occurs in a positioning device when fluid escapes the cylinder seals or valves.

As for coasting — or unintentional upward movement caused by momentum — a no-coast manifold in BHS hydraulics systems will prevent the issue. This optional upgrade includes a series of check valves that ensure motion ceases the instant the operator removes pressure from the up or down pedal.

To be clear, no one linear actuator is inherently “superior” to the next. There are excellent uses for pneumatic, electro-mechanical, and hydraulic positioning machines. They each have their advantages and their disadvantages, and it’s possible to find high- and low-quality examples of each. But for industrial Lift Tables in high-capacity applications, hydraulic power provides the most benefits with the fewest drawbacks, making hydraulic positioning the preferred option for heavy-duty uses.

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