

The lift truck operator's compartment – *ergonomically sound or an ergonomic disaster?*

By Jonathan Tyson, MASC, CPE, PPHSA Ergonomist

*They are everywhere in industry. No matter the size of your company, it is almost certain the you will have at least one lift truck on site -- with forks or clamps or a variety of other attachments on the mast. These vehicles are popular because they are well designed for moving materials of all shapes, sizes and weights. They can move materials quickly and efficiently and maneuver around tight corners and within small aisles. And, when used correctly, the basic lift truck infrastructure is safe and stable. Let's face it -- lift trucks are well constructed for their intended uses. The real problem in the workplace lies with **how** they are being used.*

The lift truck is designed to lift materials while stationary or move materials while driving forward. Nothing about the make-up of today's standard lift truck gives any indication that the lift truck is meant to be driven backward for any length of time, or repeatedly during a shift. In fact, everything about the lay-out of the operator's compartment on a lift truck suggests just the opposite -- that the vehicle is designed for forward operation. But we know, that for all kinds of different reasons, lift truck drivers spend a large portion of their driving time going backward.

Let's take a look at the ergonomics of the lift truck operator's compartment from two different points of view -- with the operator driving forward and with the operator driving backward.

driving a lift truck forward

For forward driving, the operator's compartment of the modern lift truck is reasonably well designed, ergonomically speaking. Many newer lift trucks have mast/fork controls that are better positioned for easy reach, high visibility masts, and tilt steering wheels. Most lift trucks also have seats that can be adjusted forward and backward to accommodate different sized operators, and some seats have built-in vibration clamping systems that can be adjusted to suit the weight of the operator. Some also have backrests with adjustable lumbar support and backrest angle, and many of the more advanced seats come with wide, padded and adjustable armrests. Some other design features worth mentioning include:

- operator cabs that are isolated from the main body of the truck to reduce the amount of vibration felt by the operator;
- good access/egress systems that include low, non-slip steps and handles to allow for three-point contact
- narrow ROPS columns (front and back) for improved visibility;
- power steering and easy to ready fuel, water, and temperature gauges.

Not all new lift trucks have all of these features, but generally speaking, a new lift truck will be reasonably well-designed for forward driving and it is possible to buy a truck that is *very well designed*.

But no matter how well designed, improvements could still be made -- especially to accommodate workers of different sizes. From a design point-of-view, lift trucks are not always well constructed for taller and shorter workers. Taller workers would be more comfortable if seats had a greater range of aft or rearward adjustment. Both taller and shorter workers would benefit if lift truck seats could be adjusted for height. Workers with short legs would find it more accommodating to reach the pedals if the seat could be lowered. Taller workers would be able to adopt more comfortable leg/knee postures if, along with pushing the seat back, they could raise the height of the seat. Of course the operator's compartment, including the ROPS, would need to be designed so that operators could take advantage of these adjustments.

driving a lift truck backward

Almost all of the design features that are considered to be ergonomic positives for driving forward become significant ergonomic negatives when the lift truck is driven backward. The seat restricts movement, creates pressure points, and doesn't provide support. The controls may restrict movement and the foot pedal location results in increased stress on the legs and knees. Added to this is the concern about the effect of whole body vibration on a twisted spine. At best, driving backward contributes to higher levels of neck, back and leg discomfort. At worst, the postures adopted while driving backward have been linked to serious, long-term low-back, shoulder and neck injuries.

Research suggests that lift truck drivers will adopt one of three postures when driving backward:

1) The Twist

Some drivers will rotate their neck as far as possible to one side, while keeping the rest of the body fixed in the seat. This results in the least amount of strain on the back and legs, but the greatest amount of strain on the neck vertebrae, spinal discs and muscles. Also, with this posture the operator has no direct view of the path



A -- this angle can lead to pain and discomfort due to back and neck rotation.



B -- a swivel seat, and dual pedals are a good start to designing a better lift truck.

of travel. Operators will state that they judge their path of travel by looking at the near side wall or rail cars. They 'expect' that nothing will be in their path of travel.

2) Twisting a little more...

In order to have some view of the path of travel, some operators will twist the upper trunk, shoulders and neck, leaving the lower body static in the seat. This posture provides some increased visibility in the direction of travel but it places high loads on the spine and neck. If turned to the right, an operator in this posture has a very large blind spot to the back, left-hand corner of the lift truck. (See picture A, above).

3) The Hip Shift

Finally, some operators will adopt a posture that allows them to have a full field of view in the direction of travel. With this posture, 'the hip shift', the operator shifts his/her hips to one side of the seat. They then spin about on one buttock until they are almost seated sideways in the seat. With a full, but not excessive neck rotation the worker has an excellent field of view. This posture seems to result in less neck and back discomfort but higher levels of knee discomfort.

It might be argued that if all operators used the hip shift posture while driving backward, that the problems associated with driving a lift truck backward would be significantly reduced. While the hip shift posture may help to reduce back and neck discomfort it would likely result in increased knee pain and it doesn't address the real issue -- that people are expected to use a tool in a way it was NOT designed to be used. Doesn't this go against everything we

teach workers about only using tools for the job they are intended? It is quite obvious that the operator's compartment of the standard lift truck is not designed for backward travel.

Meanwhile, there is another issue related to the hip shift posture. For safety reasons many companies and the Ontario Ministry of Labour, for that matter, require lift truck operators to wear seat belts. When properly worn this greatly limits the ability of the operator to shift his/her hips. It should be noted that most lap belts on lift trucks are the fixed, non-retractable type. Why they can't put in an inertial locking, retractable type, as used in automobiles, is unknown.

what can be done?

In an ideal world it would be possible to eliminate the need for driving backward, except for going very short distances infrequently during a shift. All loads would be small, so that operators could see when driving forward; and loads would be stable, so that product wouldn't topple forward if the truck should stop quickly.

However, in the real world, it seems that we should be encouraging workers to adopt a hip shift posture. We should also insist that seat belts on lift trucks be designed to allow this posture to be adopted.

What is needed is a concerted effort on the part of all lift truck manufacturers to redesign the operator's compartment for both forward and backward driving. This

will only happen if the manufacturers are forced to change by legislation (*don't hold your breath*) or when the purchasers and users of lift trucks begin to demand this change. If companies in the pulp and paper sector are concerned about the driver discomfort and injury associated with driving lift trucks, then they need to demand changes from lift truck manufacturers. There are signs that some manufacturers are willing to listen.

Recently a large international paper products company went looking for a lift truck with an improved design. Their long-term lift truck supplier was not willing to talk. They are now in negotiations with a different company that has recognized the need for a better operator's compartment (see picture B, above). The truck shown has a dual set of foot pedals, fork/clamp controls on a wide, padded and adjustable armrest, a seat that swivels 45 degrees, and a retractable seatbelt. It may not be a perfect design, but it is light years ahead of the current 'state of the art'.

As a final note, the PPHSA is hoping to put together a meeting of lift truck manufacturers and users later this year. It is hoped that through a series of presentations and discussions this session will be a catalyst for change. Stay tuned.

For expert ergonomics advice, call PPHSA Ergonomist Jonathan Tyson at (705) 474-7233 or e-mail jtyson@pphsa.on.ca.