Master Brewers
Safety Toolbox Talk

Safety Considerations for Forklift Selection

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Introduction

Most discussion of forklift safety focuses on operator training and daily use. This is entirely appropriate, but the reality of industrial lift trucks is that they are tools, and like any tool, they need to be selected carefully. Even a used lift is a significant capital investment, so making sure that selection criteria take safety into account is essential.

Powerplants

Electric- and propane-driven (or liquid petroleum gas [LP]) forklifts are the most common types used in the brewing industry. There are also gasoline lifts, but these are generally only used in construction.

Electric lifts are ideally suited to indoor use, but they require the facility to have an adequate power supply and space for a charger. Charging stations present a chemical hazard from the acid portion of the battery. The batteries themselves need to periodically watered, so adequate PPE and spill kits need to be in place. Hydrogen gas can be emitted during this process, so chargers need to be located away from any sources of flame or sparks. Fire extinguishers and other controls need to be supplied.

Propane lifts have the advantage of having a portable fuel source and aren't dependent on having the space and capacity for a charger. They can readily be refueled with a fresh cylinder if they run low, returning to service immediately instead of having to wait through a charging cycle. The downside to propane is that incomplete combustion generates carbon monoxide, which presents a risk in an enclosed space. Carbon monoxide testing should be a part of annual service checks, although some states require this testing more frequently.

Propane lifts also present a fire hazard; a fire extinguisher should be present during operations, and the gas connection should be checked regularly to ensure that it is secure.

Ride/Drive Formats

There are four main ride/drive formats to choose from:

- Seated
- Stand-up
- Ride-along
- Walk-behind

Seated units are the most common form. They work very well in most environments, but there are visibility and maneuverability constraints. Stand-up lifts are designed to be driven in reverse, affording superior visibility, and are highly maneuverable. There is a learning curve when transitioning from one lift style to another, and operators should have individual certifications in each type they are expected to use.

Powered pallet jacks are also considered powered industrial lifts. They come in two forms: ride-along and walk-behind. Ride-alongs are designed to have the operator physically standing on the lift to drive it and generally don't have a lift mast. They are commonly used in distribution warehouses and frequently have forks long enough to pick up two pallets, making them efficient for loading and unloading trucks. Walk-behinds may be smaller versions of a ride-along, or they may have the capacity to lift and stack loads, with outriggers to provide stability.

Operating Environments

The general considerations concerning environment and forklifts involve freedom of movement, hazards/combustibles, differences between indoor and outdoor terrain, and temperature extremes. In daily brewery use, the most important factors to consider are:

- Narrow/constricted areas
- Presence of grain dust and other flammables
- Ambient temperature and room transitions

For compact spaces, breweries need to consider the turning radius available in aisles and select forklifts accordingly. Stand-up lifts have a superior turning radius versus sit-down lifts, as do walk-behind powered jacks. The one downside of powered walk-behinds is that the stability outriggers make it difficult, if not impossible, to load into storage racks.

Grain dust is considered a flammable substance by OSHA when present above a defined concentration. For forklifts that are intended to operate in spaces that may exceed this level (e.g., dedicated grain-handling and/or mill rooms), a hazard analysis needs to be conducted.

Depending on the situation, ventilation and regular cleaning may be adequate to control the hazard. In other cases, a specific propulsion system is required. Looking beyond the primary categories of electric and LP drives, there are additional ratings that are environment specific.

For cold room use and traveling between warmer and colder areas, condensation on the lift and the floor can impact tire traction and electrical components. Selecting a specific tire material or tread type may be needed in damp spaces. Condensation on wiring harnesses can affect connections and overall lift performance. Electric lifts are a common choice for cold rooms, but prolonged use in cold areas can reduce battery life significantly.

Load Ratings

Both electric and propane lifts are capable of having sufficient lifting capacity for typical brewery use. This does not mean that every forklift on the market (or even in the same brewery) is equally capable of moving loads, however. Every industrial lift truck is required to have a data plate that provides information on the allowable working capacity.

The lifting capacity is largely governed by the counterbalance mass, while the maximum lifting height is governed by the height of the mast and the allowable working capacity is a function of a center of mass calculation. Getting a load off the ground isn't the same as controlling that

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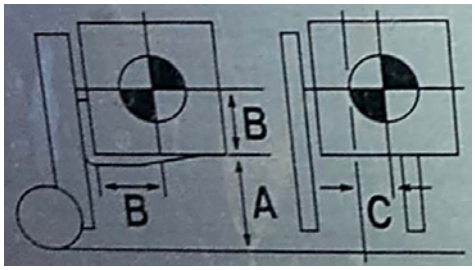
load and safely placing it onto a shelf that is 15 feet above the floor. (Note: The maximum working height of the mast doesn't take into account any portion of the load below the forks; leave space for the bottom of a pallet or other load component suspended below the forks when determining shelving heights.)



Where the center of mass of the load sits in relation to the center of mass of the forklift determines whether the lift will tip over. There are several key measurements, as highlighted in the image, that define a virtual 3-D box where the center of mass needs to be in order to be balanced with the lift's counterweight:

- Maximum stable height of the forks (Distance A)
- Distance from the center of mass to the mast (Distance B below forks)
- Distance from the center of mass to the forks (Distance B above forks)
- Distance from the center of mass to the centerline of the mast (Distance C)
- For this particular lift, if Distance A is 240 in., Distance B is 24 in. and C is 0, the maximum lifting capacity of this lift is 3,500 lb. If we extend B out to 30 in., meaning that the center of gravity of the load is higher above and further out on the forks, our maximum lift capacity drops to 3,100 lb.

This calculation assumes that the mast is vertical and stationary. Selecting a forklift also needs to take the stability triangle into consideration. Side-shift controls or specialty attachments can exacerbate the problem. The closer the center of mass of the load is to the outer boundary of the virtual box, the more prone the forklift will be to tipping. Tilt-dump spent grain bins are notorious for shaking an otherwise stable forklift. Inertial momentum from being tilted or turning (especially with an elevated load) will be amplified and can disrupt stability.

Any time a forklift tips over or loses control of a load, there is the potential for severe or fatal injuries, so selecting the appropriate forklift to lift a specific load is essential to maintaining safe operations.

Conclusions

While there are a number of decisions to be made concerning forklift specifications, safety should be paramount in dictating the features of the selected machine. Users should:

- Identify the primary environment in which the lift will be used and any associated safety concerns with that space.
- Choose the appropriate power source and tire for that environment.
- Identify the lifting capacity needed and the appropriate lift type for the required tasks.

Taking all these factors into consideration will ensure that operators are able to effectively perform their necessary job functions without compromising personal and coworker safety.