National Safety Council

Case Study

MSD Solutions Lab
an nsc program

Effective Use of Powered Cart Movers

What's the Risk?

John Deere factories engage in many different types of work tasks, including the transporting of heavy materials for assembly. When workers are transporting heavy materials, John Deere has engineering controls in place such as the necessity to utilize a cart or dolly tugger to push or pull a load when the load exceeds the safe manual material handling (MMH) limit. Carts and dollies are often used in John Deere factories to manually transport large assemblies of materials between workstations. However, some of these carts and dollies require up to 120 pounds (55 kilograms) of force to manually push or pull, as they hold very heavy assemblies (~2000 pounds or ~900 kilograms). Containers of parts are typically moved 5 to 10 meters from the drop point to the point of use. Dollies with subassemblies or primary assemblies may be moved up to 15 meters. Pushing or pulling such heavy loads poses an MSD risk and as a result, recurring back and shoulder injuries have been reported in conjunction with moving these heavy carts and dollies. In addition, the changing of workforce demographics, like an increase in older workers within factories, has also led to increased risks for more employees.

Explanation of Powered Cart Movers

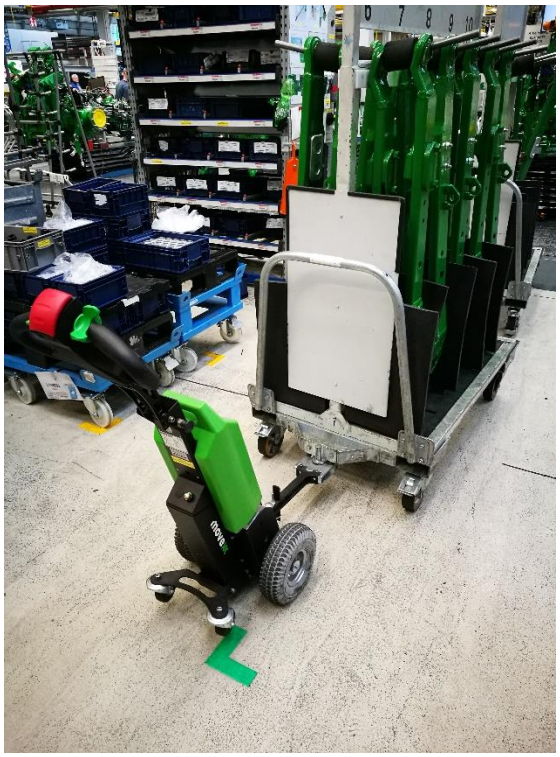
Powered cart movers, also sometimes called manually guided vehicles or tuggers, are intended for use with carts and dollies transporting heavy loads. These cart movers are specifically used for moving loads that exceed safe MMH guidelines and standards for pushing and pulling carts. For powered cart movers, the worker “drives” or walks behind the mover to guide it in the correct direction. They may not be necessary for all workstations, only as the load on the cart or dolly causes the manual forces to exceed prescribed limits. John Deere uses the lesser of 23 kilograms (50 pounds) or the recommendations found in the Liberty Mutual Material Handling Tables as the limits for pushing and pulling carts. Powered cart movers can attach to current carts or dollies to automate the movement of these loads, thereby alleviating the worker from pushing and pulling and mitigating the risk of MSDs.

Goals of Powered Cart Movers

To mitigate the MSD risks involved with moving heavy assemblies, early corrective measures involved having two or three employees move the assembly, but this administrative control was not always effective. At times, the second or third operator was not available at the specific time the move was made. As such, operators would try to move the assembly cart on their own, without the additional second or third operator, increasing their risk of shoulder and back injury. The goal of implementing the powered cart movers, or tuggers, was to allow for the timely ease of movement of heavy assemblies between workstations in factories and to keep workers safe from MSD risks and injuries.

Implementation of Powered Cart Movers

Tuggers have been used in manufacturing for many years. However, some tuggers are large, cumbersome and do not work well for an assembly line. Smaller tuggers or cart movers are better suited for this application. John Deere faced several logistical challenges when searching for suitable cart movers. They not only needed to find a cart mover that was available through preferred vendors but also needed to ensure that the cart mover would positively engage or fit with current carts or dollies, and could move the intended loads. Workers also needed to be trained on the importance and utility of using the cart movers and the carts' functions. Finally, engineers and supervisors needed to find a location to store and charge the devices when not in use.



Impacts

The cart mover was an effective engineering control. The device removed the need for manually moving the heavy loads. Also, since applying heavy forces was no longer needed to move heavy assemblies, this allowed more employees of more varying physical capabilities to perform the pushing and pulling tasks. In addition to reducing ergonomic risk, the device also eliminated the need for having multiple operators coordinating timing to move the load. Now, a single person can move the load rather than needing two or three people to perform the task. This makes for an overall more efficient process.

Regarding the return on investment (ROI), there was difficulty in justifying the initial cost of the device as injury costs and process inefficiency costs were somewhat difficult to determine. Engineers and managers were reluctant to purchase the devices without known benefits. Yet, after a few pilot tests, the benefits of the cart movers were seen. The initial cost for each device was $12,000 to $15,000. The average compensable shoulder injury cost in the U.S. is reported as $49,838 and compensable back injuries are $39,328, per the National Safety Council. This information was helpful in the purchase of the first few devices. The labor savings of needing fewer operators to manually push and pull assemblies also add to the ROI. Subsequent devices have been much easier to justify based on risk reduction, safety improvements and knowledge of device functionality.

Lessons Learned

John Deere mentioned the following are vital prior to the implementation of cart movers:

- The forces required to move carts and dollies need to be understood across various load and floor conditions
- Cart movers need to have a specific location for being stored and a power source for charging the devices
- Cart movers need to properly fit and attach to the carts that need to be moved
- Operators need to be properly trained on the use of the equipment, with the expectation that the cart mover is used for its designed purpose
- Regular inspection of wheels and ensuring proper floor maintenance to prevent debris accumulation is necessary to ensure smooth movement of cart movers and promotion of a safe working environment

Initial justification and acceptance of powered cart movers was slow. The costs were considered high and the movers were initially an unproven technology. Pilot evaluations of the devices at many factories demonstrated the capabilities and the ROI. Employees initially thought these devices took more time than doing the job manually. Now, cart movers are seen much like other tools with specific purposes and benefits. Most important is the recognition that employees experience a reduced physical workload when using the powered cart mover. John Deere now has several dozen cart movers in use throughout the company for moving heavy loads.

Founded in 1837, John Deere is a world leader in providing advanced products, technology, and services for customers whose work is revolutionizing agriculture and construction. We help our customers push the boundaries of what's possible in ways that are more productive and sustainable to help life leap forward. Our technology-enabled products including John Deere Autonomous 8R Tractor, See & Spray™, and E-Power Backhoe are just some of the ways we help meet the world's increasing need for food, shelter, and infrastructure. We don't just run for some. We Run for All.