

Ergonomic Assessment

Operating Landing gear

Concern Details

Task Description:

When connecting the 5th wheel to the trailer, workers have to raise or lower the landing gear so the trailer can connect to the tractor. Without the tractor attached to the trailer, the force to be applied to the landing gear crank to raise a loaded trailer ranges from 40-65 kg and 10-26 kg to lower the trailer in this low gear. Raising the landing gear requires an average of 30 revolutions. The height the trailer must be raised depends on the 5th wheel height, slope of the ground, and initial trailer height.



Evaluation:

The forces to perform this task exceed published maximum strength values for most of the population as well as push / pull design guidelines [1]. When forces exceed strength capabilities, it hinders an individual's ability to perform the task, and the higher the portion of the population not capable of performing a task, the greater the risk of overexertion injury. Similarly, biomechanical human modeling of this task also shows that both men and women have strength limitations at the shoulder and elbow hinder the ability to perform the task [2]. The high forces and awkward postures results in unacceptable shear and compression values [1]. The high forces and repetitive awkward postures to crank the landing gear results in high risk of injury to the workforce.

Countermeasures

To lower risk of injury to the worker, the maximum push / pull force to crank the landing gear should be set to 12 kg so that the majority of the population can safely do the job [1].

The following countermeasures are recommended for drivers, company, manufacturers, and customers in order to reduce the risk of injury when coupling and decoupling trailers:

Drivers:

- When parking the trailer, be sure to park it on level ground and preferably on a trailer pad.
- Connect and disconnect the trailer in an area of yard that has good grading.
- When operating the landing gear, use two hands and square feet up to handle.
- When lowering and raising the landing gear, ensure it is in the proper gear. When the trailer is loaded, the landing gear should be in low gear.
- If the trailer is not too low, instead of using landing gear, use the fifth wheel to raise the trailer by backing the tractor under the trailer and using the fifth wheel or frame rail ramps (if equipped) as lift points.



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Companies:

- Ensure adequate preventative maintenance for tractors and trailers, including lubrication of the landing gear
- Ensure that both landing gear plates are of the same size and type.
- Ensure that there is good grading in the yard.
- Investigate pneumatic or hydraulic landing gear systems.
 - Example of powered landing gear is by Gear Up
http://www.gearuplosethecrank.com/gear_up_power_landing_gear.html
- Investigate motorized device for operating landing gear
<http://www.cbs.state.or.us/external/osha/grants/hamannar/haroverview.html>
- Purchase trucks and shunt trucks with the same 5th wheel height.
- Train driver and shunt drivers how to set trailer to facilitate trailer connection and disconnection.
- Purchase trucks with ramps on the rear frame of the tractor or add ramps on to the frames after purchase to allow drivers to use the fifth wheel to raise the trailers and would even out the height difference.
 - Tractors with ramps on the fifth wheel frame allow for the tractor to raise trailers that start at a much lower height. The ramps on the rails slide under the trailer at a much lower point and lift the trailer to the height for a tilted back fifth wheel to get under the trailer.
 - If tractors with the highest fifth wheel height have the ramps, they would be able to slide under trailers that tractors with lower fifth wheel heights have disconnected from.

Manufacturers:

- Provide pneumatic or hydraulic landing gear systems as options on trailers.
- Add ramps to the frame at the rear of the tractor to allow drivers to use the fifth wheel to raise the trailers.

Customers:

- Ensure there is good grading in the yard.
- Train shunt drivers how to set trailer to facilitate drivers. Shunt truck drivers should adjust the landing gear to the proper height for every trailer moved, by measuring the distance between ground and bottom of landing gear. If the shunt driver is consistent, the driver will be able to judge what they are hooking up to, which would eliminate the height variance, adjust landing gear to the lowest trailer setting possible.

Sector:

- Standardize height of 5th wheel

REFERENCES

1. Norman, Wells, R., Neumann, P., Frank, J., Shannon, H., Kerr, M. (1998). A comparison of peak vs cumulative physical work exposure risk factors for the reporting of low back pain in the automotive industry. *Clinical Biomechanics*, 13(8):561-573.
2. Eastman Kodak Company. (2004) Kodak's Ergonomic Design for People at Work (2nd Edition) (S. N. Chengalur, S. H. Rodgers, and T. E. Bernard, Eds.) John Wiley and Sons, Inc., New Jersey.

