The Ergonomics of Automation

By ESS Technologies, Inc. Blacksburg, VA

Introduction

As an integrator for FANUC Robotics, North America, ESS has given a good deal of discussion to the advantages of increased productivity achievable when manufacturers automate their manual processes. A number of factors contribute to the increased production, including faster speeds, improved material handling, and reduced downtime associated with changeover. The ergonomics of automation are less widely discussed, but reducing workplace injuries also increases productivity and can save manufacturers thousands of dollars in lost productivity and worker’s compensation.

Ergonomic Injuries by the Numbers

According to the Bureau of Labor Statistics (BLS), “Musculoskeletal disorders (MSDs), often referred to as ergonomic injuries, accounted for 28% of all workplace injuries and illnesses requiring time away from work in 2009.” MSDs include sprains, strains, inflammation, degeneration, tears, pinched nerves or blood vessels, bone splintering and stress fractures. Repetitive motion injuries, such as carpal tunnel syndrome also fall into this category.

A research paper published earlier this year, “An Ergonomic Investigation of the Case Packing Line at Company XYZ” provides a succinct analysis of the types of injuries and their impact on a manual case packing operation. The paper determines that the most common injuries were associated with the wrist and the back. Back injuries are commonly the result of improper lifting techniques; wrist injuries are caused by cumulative trauma disorders (CDTs), such as carpal tunnel syndrome and tendonitis. In this particular study, seven OSHA recordable injuries totaled more than $59,000 in workers compensation claims over a four year period. While the paper did not include data for manual palletizing processes, it is not hard to imagine a similar injury rate for that physically demanding process. Data from the BLS further underscores the lost of productivity due to workplace injuries, for example:

- 3,277,700 total reportable injuries; 965,000 of those injuries resulted in time missed from work
- 379,340 injury reports involved sprains, strains, and tears; 11% of those injuries (43,100) occurred to workers in the manufacturing industry
- 195,150 back injuries were reported; 10% (20,540) occurred to workers in the manufacturing industry

The case packing line study concluded that, “The case-packing process should be further investigated in order to implement changes that will reduce the ergonomic risk factors currently present.”

Strains, Sprains and Tears by Event or Exposure, 2009

Strains, Sprains, and Tears by Affected Body Part, 2009
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Automation Solutions

Robotics automation offers a quick and relatively uncomplicated solution to reducing the ergonomic risks of both manual case packing and palletizing processes. Robotic case packers can quickly collate and load cases of product, and often these systems require less floor space than manual case packing stations. While the case packer still requires human intervention to run the machine and re-load the case magazine, the repetitive motions are handled by the robot, which cannot be injured.

Robotic pallet cells also require a human operator, mainly to operate the pallet jack to move pallets into and out of the pallet cell, but the robot handles the case lifting and stacking motions, again reducing the risk of injury to personnel. Even assembly and material handling processes can present an injury risk to employees. Assembly processes very often include repetitive processes that can lead to carpal tunnel syndrome or tendonitis, as can some material handling processes. For example, hand feeding a high speed blister packaging machine can require anywhere from one to six people to repetitively load blisters with product. Robots today have the dexterity needed for many assembly and material handling processes, allowing human personnel to be reassigned to duties that are less likely to cause injury.

Conclusion

Looking at the bottom line only, by reducing the risk of injury to their personnel, manufacturers can realize decreased downtime due to employee absence as well as decreased worker’s compensation costs. This may lead to increased profitability, which may, among other things, allow manufacturers to avoid relocating their factories to countries with lower wages in order to reduce overhead costs. Factor in the human equation and calculate the number of injuries not suffered by employees, and manufacturers can clearly see the ergonomic advantages of automating manual processes.

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2 Ibid.

3 Ibid.


5 Ibid, p. 34.

6 Ibid, p. 49.


8 Schmidt, p. 38.