

## Improving operator comfort and productivity



Operator comfort and productivity

### Operator comfort

Steering isn't only about the wheel any more. At Danfoss, we're partnering with our OEM customers and distributors to reinvent how operators interact with machines — increasing productivity and comfort. With more commercially available steering input options, including mini-wheels and joysticks, it was trendy to switch to a new method. We had multiple discussions with our customers about steering solutions that were very much driven by the current trend. Ergonomic benefits of joystick steering, for example, were implied, but we couldn't prove anything.

"The eSteering team sought to bring conclusive, hard data to the table. This to measure the exact impact of different steering inputs, which helped us be a better partner for our customers. Therefore, we can prove what exactly impacts operator productivity," said Tom Rudolph, Director BU eSteering Sales at Danfoss Power Solutions.

### Aalborg University steering study

To gain these insights, we reached out to the sports technology department at Aalborg University in Denmark. This was to conduct a study measuring the effectiveness and potential muscle strain of various steering solutions.

Our method included monitoring fifteen healthy, right-handed male students as they operated a wheel loader simulator completing a specific task. Different steering input devices were used. Including a standard steering wheel, a steering wheel enabled with our Quick Steering feature, a mini-wheel and joysticks. We measured completion time, task deviation and muscle activity of the hand, arm and shoulder.

We decided to use subjects who hadn't operated this type of vehicle before. Testing with inexperienced operators best represents the future workforce, as more and more of our customers struggle to find skilled labor. Plus, if we would have used operators with experience, they would have come into the study with established preferences. This could have potentially altered our results.

### Superior steering

After analyzing our results, we found that new steering methods live up to their reputation. They offer ergonomic benefits and increased operator productivity.

Out of all the input options, the traditional steering wheel performed the worst regarding productivity and muscle strain. In fact, using any of the alternative steering inputs resulted in a six percent decrease in task completion time. While six percent may seem like a small change at first. Consider how many hours an operator spends on a machine over the lifetime of a project. Using an alternative steering method could allow the operator to complete a given task six percent faster. This allows more work to get done in a day and timelines to stay on track.

The most significant results occurred when participants used a joystick steering method. When compared to conventional steering, using a Danfoss JS-1 joystick reduced the user's average workload by 65 percent. This is the lowest muscle activity for any steering input.

Considering the shoulder — this kind of difference in muscle activity is like raising your arm and trying to keep it parallel to the ground for a whole day versus utilizing an arm rest instead. A 65 percent difference means there's potential for a significant reduction of muscle fatigue.

### Making decisions with data

With these findings, OEMs can integrate new steering solutions into their machines. At the same time, knowing that they won't have to sacrifice operator comfort for productivity, or vice versa.

Findings like this give our OEM partners tangible value props to pass along to their customers. These steering solutions can give a competitive edge, providing one more way to further increase productivity and improve user experience.

This data we gathered will promote understanding for everyone involved on what benefits are available. This is from the solutions provider (Danfoss) and the OEMs to the distributors and eventual end-users.

Joystick steering solutions, in particular, reduce the overall operator workload and ensure a safer and more ergonomic work environment. In the long run, this will have positive effects on a user's health, reducing muscle fatigue and mobility issues.