INDUSTRY REPORT: INTELLIGENT LIFTING DEVICES

In Summary: The Ergonomic Advantages of Intelligent Lifting Devices

Manual Lifting vs. Intelligent Lifting: An Ergonomic Comparison

As technology continues to transform the world of manual materials handling, more and more businesses are exploring the benefits of Intelligent Lifting Devices (ILDs) over manual lifting and traditional lifting devices. With promises of enhanced productivity, reduced product damage and fewer jobsite injuries, the arguments in favor of switching over are compelling. But the real question remains: do ILDs live up to these promises?

An offshoot of the robotics field that focuses on human-machine systems, ILDs leverage the strength and power of a machine with the control and cognitive thinking of a human, essentially filling the void between manual and automated robotic solutions. First deployed in material-handling facilities in the late 1990s, ILDs have proven quite valuable.

For example, repetitive-motion tasks such as picking and placing have become exponentially safer and more cost-effective, as worker fatigue and ergonomic-related injuries are virtually eliminated. Precision placements have also been greatly enhanced with products such as Gorbel's G-Force® Intelligent Lifting Devices, which give workers exceptional product control, reducing the likelihood of damage to both the products being moved and the fixtures and machines they're being placed into.

In order to quantify the actual ergonomic benefits of its G-Force ILD technology, Gorbel commissioned a third-party study. This report will summarize and highlight the study's findings.

The Study

The following summary is based on a study performed by the Rochester Institute of Technology. The study compared the performance of Gorbel's G-Force® Intelligent Lifting Device to traditional manual lifting, an air balancer with pendant control, a variable-frequency-drive chain hoist, an electric balancer and an air balancer with electric controls. It focused on the performance of these six lifting options in the following applications:

HIGH-CYCLE APPLICATIONS

- Productivity
- Energy expenditure

PRECISION PLACEMENTS

- Productivity
- Energy expenditure
- Potential for product damage

QUICK CHANGE IN DIRECTION (INERTIA MANAGEMENT)

- Handling force required to reverse direction
- Handling force required to raise and lower the load

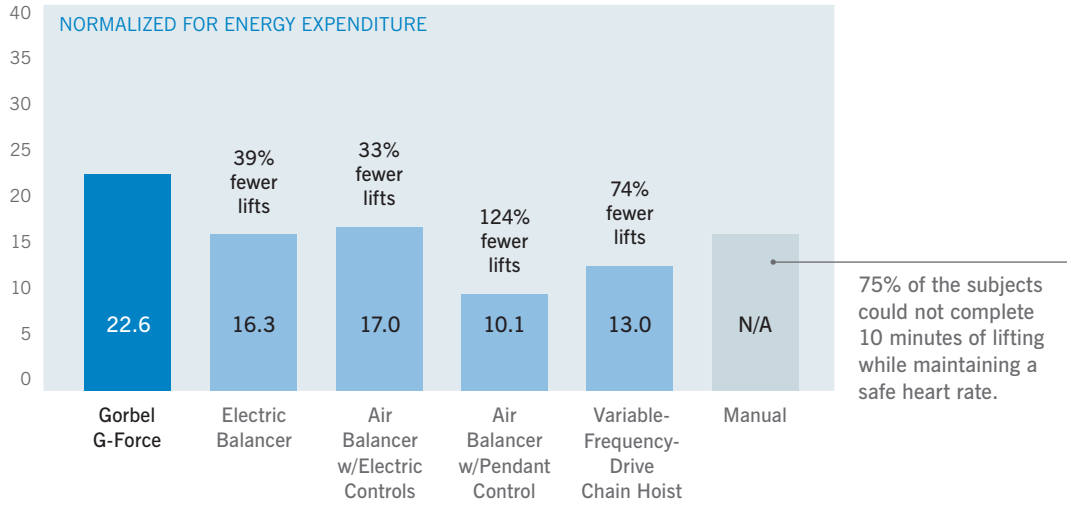
The subjects simulated high-cycle and precision-placement tasks typically performed with lifting devices. Subjects were instructed to work as fast as reasonably possible while keeping their heart rate in a target region of 45%–55% of their maximum heart rate, which is considered to be a safe working pace.

High-Cycle Test: Productivity & Performance

To test each lifting device in a high-cycle scenario, a **typical palletizing application** that one might find in a warehouse or factory was simulated. Each subject lifted a 45-lb. weight from one position to a position three feet away as many times as they could in a 10-minute period. This palletizing application was studied to show the workload associated with repeated manual lifting and to illustrate the extent to which different lifting devices could increase the number of lifts possible while keeping the worker's energy expenditure within safe ergonomic lifting parameters.

As the chart clearly demonstrates, study participants were nearly **70% MORE PRODUCTIVE** using Gorbel G-Force® Intelligent Lifting Devices over other lifting methods.

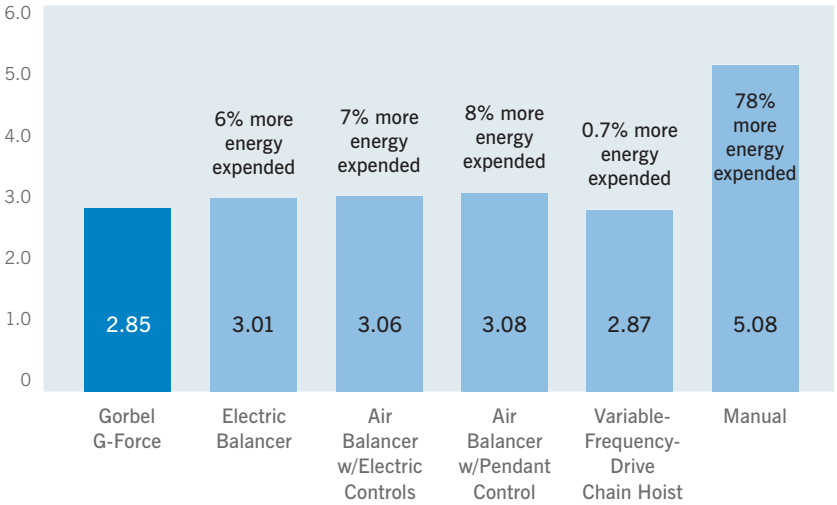
NUMBER OF PALLETIZING LIFTS



For the next portion of the High-Cycle Test, **operator energy expenditure** was measured through use of a Sensor Medics system that measured, breath-by-breath, energy expenditure for each study participant during lifting. Energy was measured in metabolic equivalents (METs), which are a measure of how much (as a multiple) the energy expenditure for a certain activity exceeds the resting metabolic rate. In addition to using the five lifting devices, subjects also performed manual lifting.

As you can see, on average, manual lifting required **78% MORE ENERGY** than the alternative lifting devices. Among those, Gorbel G-Force Intelligent Lifting Devices required the least amount of energy.

AVERAGE ENERGY EXPENDED, HIGH-CYCLE APPLICATIONS

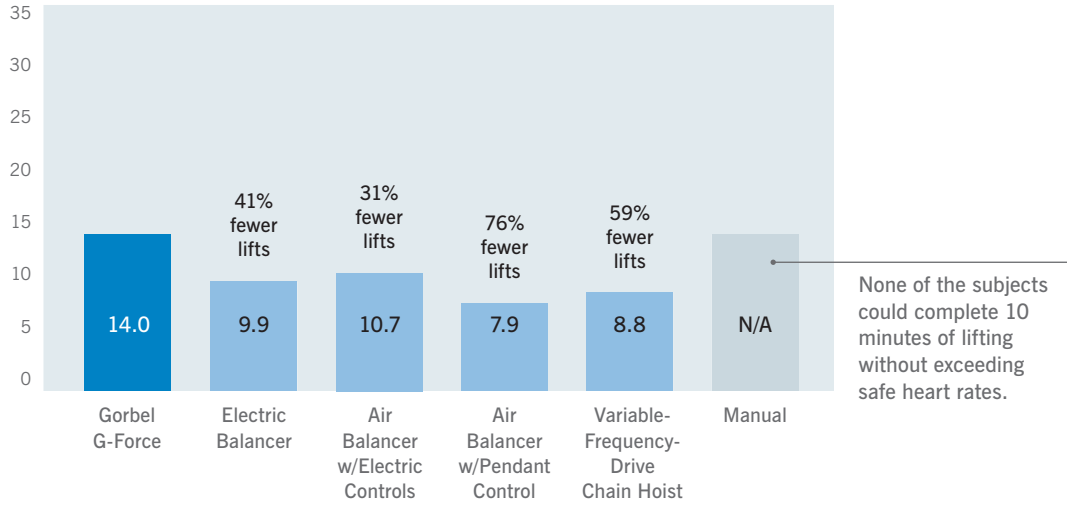


Precision-Placement Test: Productivity & Performance

Many **precision-placement applications** require placing a load as gently as possible to prevent damage to the load. To simulate this, subjects picked up a 45-lb. weight and placed it on a tabletop target three feet away. Underneath the target was a force plate that measured the force at impact.

As the chart shows, study participants were **51% MORE PRODUCTIVE** using Gorbel G-Force® Intelligent Lifting Devices than they were using other lifting methods.

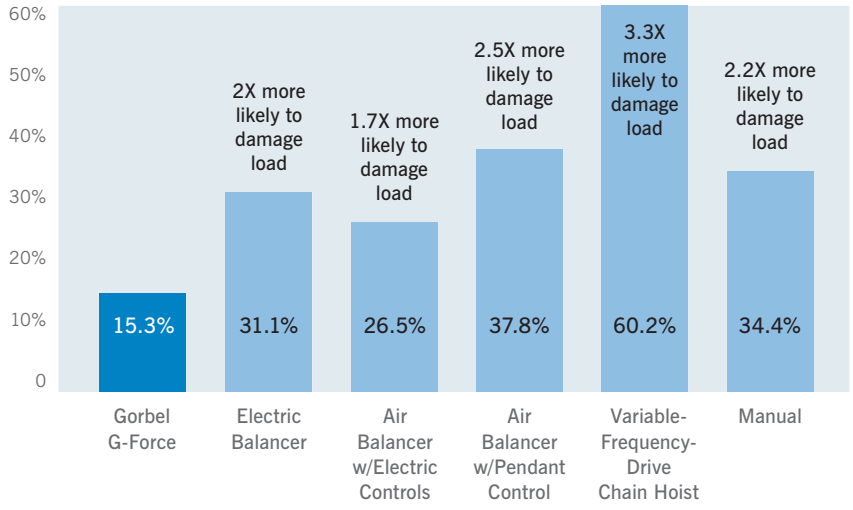
NUMBER OF PRECISION-PLACEMENT LIFTS



In order to determine the likelihood of **product damage during precision placement,** a force-measuring system was integrated into the target in order to monitor peak impact force. A damage impact threshold of 1.5 times the weight of the load was computed, and the number of times that threshold was exceeded was counted for each device. The damage impact threshold for the 45-lb. load used in the study is 67.5 lbs.

According to this test, the Gorbel G-Force Intelligent Lifting Device was **3.3X LESS LIKELY** to damage the load than the other lifting methods.

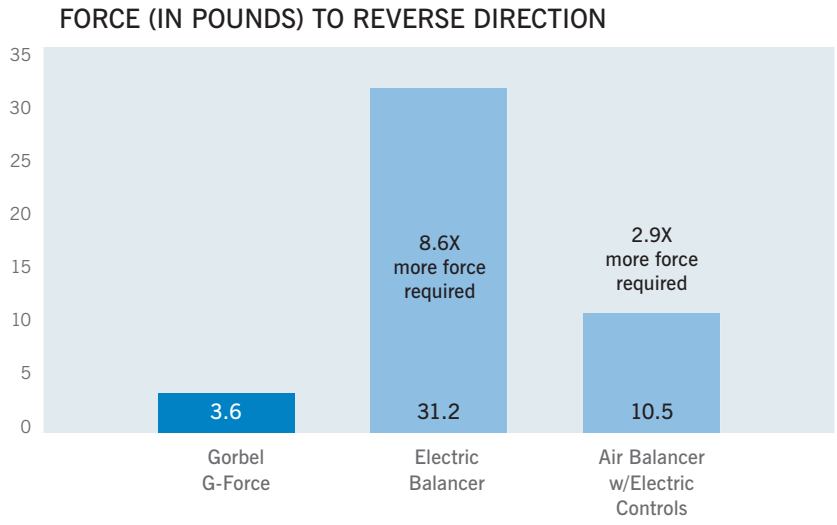
PERCENTAGE OF LIFTS EXCEEDING FORCE THRESHOLD



Inertia Management Test: Productivity & Performance

The final part of the study measured the **handling forces involved in overcoming the inertia** required to change the direction of a load being raised or lowered. The force required to change load direction from down to up and from up to down was measured for G-Force® ILDs, the electric balancer and the air balancer with electric controls. The average force required to change direction is shown in the figure below.

As the results show, G-Force Intelligent Lifting Devices required an average of **5.8X LESS HANDLING FORCE** to reverse load direction than all of the other devices tested. This can translate into fewer repetitive-motion injuries and their associated costs.



ILDs improve productivity, precision and profitability.

In summary, the study shows that ILDs, and more specifically, Gorbel's G-Force® Intelligent Lifting Devices, make operators dramatically more productive and precise, while reducing the likelihood of product damage, repetitive-motion injuries and their associated costs. Today, G-Force is widely used in applications such as automotive parts assembly, aerospace, heavy-equipment manufacturing, loading docks, palletizing, gas and oil industries, and other repetitive-lift environments. To arrange an onsite demonstration, or to find out if a Gorbel G-Force Intelligent Lifting Device is right for your application, **call (800) 821-0086.**