

White Paper

State-of-the-Art Moving of Heavy Objects



January 2018



Innovative Load Moving Solutions

Executive Summary

Moving 50 to 200 tons on a repetitive basis is a common challenge in industries such as aerospace, stamping, power generation, rail and marine. It is critical to implement safe, yet relatively inexpensive, processes to transport these heavy, awkward and often delicate goods. Cranes and conveyors have long been used to transport parts, large sections, and finished goods along fixed paths. Today manufacturers face increased competition, reduced margins, and considerations of personnel safety. As they seek to improve quality and time-to-market in order to gain and retain customers, they seek more modern manufacturing methods. Savvy COOs recognize the structures that support overhead cranes and huge conveyors as unproductive, wasted space. Is it worth changing to newer technology?



Trends

The common technologies of cranes and conveyors have met their limits in modern day manufacturing. Both require the construction of monuments, meaning time-to-market and time-to-revenue suffer. As flexible production practices grow in popularity, fixed-path moves are less valued. Quality suffers along with productivity when entire production lines are slowed or halted during a transfer, a repair, or a redesign.

In 1993, the definition of material handling flexibility as stated in The International Journal of Flexible Manufacturing System (IJFMS) is: “Flexibility of a material handling system is its ability to move different part types significantly for proper positioning and processing through the manufacturing facility it serves.” By this definition loading, unloading of parts, transportation from machine to machine and storage under various condition is covered.¹

The more flexibility a product handling solution provides, the faster a manufacturer will realize a return on their investment. For companies facing worldwide competition, cost savings of any kind are appealing. Better use of space and resources are two ways of achieving a competitive advantage—increasing quality and reducing time to market—on the international stage.

¹ Barzani, Berhouz. Design and Development of Flexible Manufacturing Cells - A Case Study. May 1993. New Jersey. USA

History of Heavy Moves

In the past, 50 to 200-ton products and equipment have been moved on a variety of overhead cranes and conveyors. Forklifts are not an optimal way to move loads in the >50-ton category. The advantage to cranes is that by lifting heavy items up and away, cranes avoid the 'fight with friction' at the surface level. Another benefit is that a single individual using any of the following can operate very large cranes: remote systems, wireless remotes, pendant stations, etc. Cranes have been used successfully for a long time. Conveyor systems offer multiple configurations and predictability. Conveyors have proven themselves over the years. At the same time, both cranes and conveyors have disadvantages as well, in terms of safety, efficiency, plant and opportunity costs, portability, and installation expenses.

Cranes

Overhead cranes can be dangerous:

Historical U.S. Department of Labor, Bureau of Labor Statistics show a general reduction in fatalities, but the problem still exists: As recently as November 9, 2017, the U.S. Occupation and Safety Administration (OSHA) issued a

final rule setting the compliance date for Crane Operation Certification Requirements to go into effect on November 10, 2018.



Inefficiency: Overhead cranes are limited to straight-line movements. When production quality is high, and the production cycle is well honed, cranes are useful. However, a slow-down of the assembly line can occur when a work in progress or a finished piece needs to be removed from the production line for repairs or refinement. Downtime is increased, flow is reduced, and scheduling is disrupted.

Physical plant and opportunity costs: As part of the analysis for an overhead crane, companies must consider whether the building's construction can handle the size of the crane's dimensions necessary to transport production throughput. Is the ceiling high enough? Is the warehouse area large enough? Does the company have to relinquish manufacturing area to make space for the crane footings and supports? Could the company use this space more efficiently? A building retrofit to accommodate a crane 1) is expensive, 2) delays the start of production, and 3) may be denied by the building owner if the space is leased.

² www.bls.gov/iif/oshwc/osh/os/osh_crane_2006.pdf

³ <https://www.osha.gov/news/newsreleases/trade/11092017>

Low portability, one-use location: The crane and its footings and supports cannot be re-deployed to another building on the production facility's campus without great expense.

Cranes are expensive: Cranes, while useful in many environments, are costly. A 200-ton capacity span crane may cost around \$1 million. Beyond the larger general categories of rigging and span cranes, other variations—single or double girder, bridge, gantry, monorail, jib, or workstation, etc.—must be researched and planned, and then the correct frames and frame materials, supports, rails, etc., purchased and assembled. In addition to materials and construction costs, the planning, customization, maintenance, repairs, and finally personnel training (certification will be required in November 2018) all take time and cost money. Drops from cranes are costly. Overhead cranes not only threaten the safety of plant workers, but dropping an expensive and valuable 'fill-in-the-blank' load from high overhead can be both a scheduling and financial disaster. The plant's floors and facility can be damaged, and the delayed delivery may cause a breach of contract or worse.

Conveyors

Conveyors are especially helpful when workstations are sequenced to meet production deadlines. They have proven to be accepted methods of achieving reduced cycle times. Yet there are drawbacks to conveyors, which include some inefficiencies, physical plant and opportunity costs, installation expenses, and low portability.

Inefficiency: When a product needs repair or adjustment, the conveyor must be stopped to remove the item. Assembly flow is disrupted. Work interruptions negatively affect Cost of Goods Sold (COGS), and scheduling and time-to-market are adversely impacted.

Physical plant, opportunity and installation costs: Conveyor belts, rollers, etc. and their carriers are disruptive to install. Existing production is stopped, slowed or delayed to install or re-install a system, which can include cutting the floor and pouring new concrete. A leased building might preclude this solution altogether.

Low portability, one-use location: Once in place, the conveyor's structure cannot easily be changed nor the assembly-flow redirected or reconfigured. Moving the system in its entirety to a different building incurs almost the same costs as installing a whole new system.

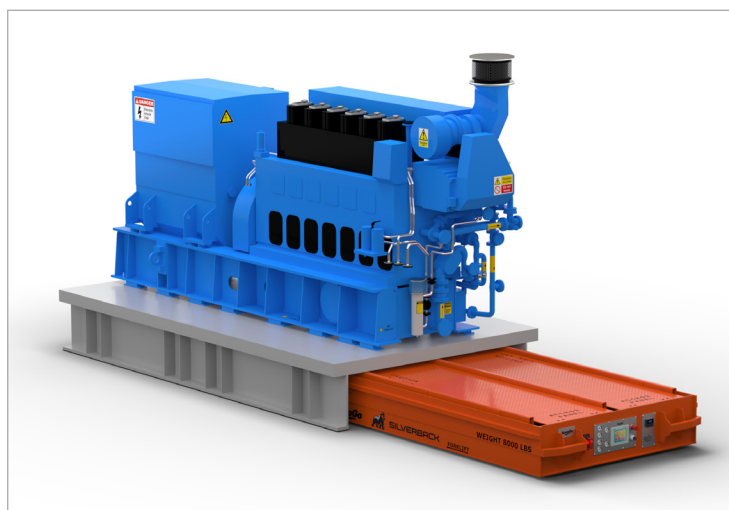


Transfer Carts Modernize Heavy Load Movement

Manufacturers in the world marketplace increasingly seek lower cost solutions for production-related challenges. Massive, weighty, expensive, and valuable items are particularly problematic. While cranes and conveyors work well for many applications, AeroGo Inc. offers a newer, state-of-the-art solution. Although over 20 years old, the recently reengineered SILVERBACK Wheeled Transfer Cart (WTC) meets the pressing demands of industries such as vehicle manufacturing, automotive, heavy equipment, aerospace, marine engine, paper and textile manufacturers. Some of the advantages include safety, efficiency and flexibility, maneuverability, portability, easy implementation, and cost effectiveness with a measurable ROI.

Safety: With the SILVERBACK WTC, transported loads are only inches off the floor. The personnel hazards associated with cranes or rigging processes are removed, and the SILVERBACK radio remote control device provides 100% walk-around operator visibility. Overhead impact load accidents are eliminated. The cart's audible and visual alarms are operational while transporting important payloads.

Efficiency and Flexibility: The AeroGo WTC eliminates first-in-first-out requirements, and needs a minimal operational footprint to enable maximized utilization of floor space. No rails, footings, or supports are needed for the vehicle to function. The cart's integrated lift system provides self-loading capability, which in turn makes it so the cart can be shared across multiple production stations. This cart can be quickly deployed to lift, move, and deliver its load to an entirely different location.



The AeroGo SILVERBACK Wheel Transfer Cart is engineered with precise movement proficiency through multiple steering modes. It can rotate within its own footprint, unlike forklifts or other conventional ride-on vehicles. The brake and acceleration function is designed to create the soft start/stop that prevents a multi-million-dollar product from “momentum-sliding” off its perch on the cart. Upon delivery, a single operator easily maneuvers the transfer cart using a remote control.

Portability: Unlike cranes and conveyors, the AeroGo carts do not require permanent installation in the facility. The largest of the three sizes is 20 feet long and can be easily relocated and used in multiple buildings on site or in other cities and states. Once delivered, it is easy to implement and ready to run with minimal training. The product’s heavy-duty wheels work on typical factory floors. Unlike with the use of cranes and conveyors, no facility modifications are required. There is no need for a compressed air system as required by air cushion vehicles, and there are no hoses to tether or restrict the movement of the WTC as it traverses from one end of the plant to the other.

Cost effectiveness: No time is wasted waiting for engineers and builders to finish so the production can begin. Assembly slow-downs are greatly reduced if not eliminated. Productive floor space is maximized. Maintenance is handled through a system of easy-to-read maintenance diagnostics and scheduling reminders built into the product’s software. Two or more WTCs can be linked together and controlled by a single operator to accommodate heavier loads.



A representative ROI calculator is below:

Sample Value Analysis Calculator for Product/Service

			Q1	Q2	Q3	Q4
BENEFITS						
Increased revenue	\$K		\$0	\$293	\$587	\$880
Reduced or avoided costs	\$K		\$13	\$59	\$106	\$152
Quarterly total	\$K		\$13	\$353	\$692	\$1,032
Cumulative value	\$K		\$13	\$366	\$1,058	\$2,090
INVESTMENTS						
One Time investment	\$K		(\$641)	(\$271)	\$0	\$0
Ongoing investment	\$K		(\$97)	(\$30)	(\$30)	(\$30)
Quarterly total	\$K		(\$738)	(\$301)	(\$30)	(\$30)
Cumulative investments	\$K		(\$738)	(\$1,039)	(\$1,069)	(\$1,099)
NET VALUE						
Quarterly total	\$K		(\$725)	\$52	\$663	\$1,002
Cumulative total	\$K		(\$725)	(\$674)	(\$11)	\$991
Net return	\$K		1-year	\$991,000		
ROI	%		1-year	90%		
Breakeven point						4th Quarter

Tips for Calculating Benefits and Investments:

- Increased revenue generally comes from improved productivity. Use of space or the ability to manufacture new or more product.
- Reduced or avoided costs generally include reduced time/labor, avoided site modifications, improved safety or reduced outsourcing.
- One-time investment generally includes the cost of the equipment plus any site modifications
- Ongoing investment generally includes costs for maintenance and running the equipment.

How AeroGo Products Can Increase Revenue

- Allow new product to be produced
- Increased production rate due to:
 - Faster cycle time
 - Elimination of downtime due to waiting on crane or forklift
- Expand effective production area by enabling cross-bay transfers

How AeroGo Products Can Reduce or Avoid Costs



- Increased efficiency due to:
 - Faster moves – more work done
 - Idle workers waiting on the crane
 - Rigging time for crane move
 - Flexible product flow (LIFO/FIFO)
- Reduced need for site modifications
- Saves expense of outsourced moves
- Reduced workplace injuries and costs
- Satisfies personal + product safety requirements related to:
 - No forklifts or regular forklift training
 - No overhead lift or restricted overhead lifts

Conclusion

Transferring parts and finished goods, whether for aerospace, automotive, marine, vehicle manufacturing, or other industries, presents challenges of safety, efficiency, and expense. Maximizing production facility floor space while addressing product quality and time-to-market issues demands attention, vigilance, and creativity in manufacturing endeavors worldwide. AeroGo's SILVERBACK Wheeled Transfer Carts deliver modern, state-of-the-art transfer solutions that are safe, efficient, flexible, portable, and durable.

The company's SILVERBACK brand WTCs can be easily integrated into many manufacturing environments alongside existing cranes and conveyors.

AeroGo's Wheeled Transfer Carts are backed with 20 years of engineering enhancements and come in three sizes to provide modern and enduring results. The Silverback product line is as follows:

WHEELED VEHICLE SPECIFICATIONS					  SILVERBACK			
Standard Specifications					Metric Specifications			
Model Number	Maximum Capacity	Standard Width (ft)	Standard Length (ft)	Standard Height (ft)	Maximum Capacity (mt)	Standard Width (m)	Standard Length (m)	Standard Height (mm)
WV-E40T	80,000	5.9	14.1	17	36	1.8	4.3	432
WV-H65T	130,000	4.9	20	18	59	1.5	6.1	458
WV-H100T	200,000	7.5	20	20	91	2.3	6.1	458

About the company:

Since 1967, AeroGo, Inc. has been manufacturing innovative load-moving equipment, using wheels and hovercraft technology to move heavy, awkward, or delicate loads.

Companies large and small benefit from AeroGo's worldwide dealer network, experienced product specialists, and skilled engineers. From Standard Product offerings to highly customized Engineered Systems, AeroGo has an innovative solution for every load moving need.

"AeroGo maintains a dynamic and interactive management style to allow greater flexibility in meeting the requirements for our customers. Managers become active participants in every program, from the program's inception through installation, training, and operation in our customers' facilities. We optimize communication between departments and our customers by creating teams for each project and by reducing the management levels between upper management and first list supervision." John Massenburg, CEO, AeroGo, Inc.

AeroGo, Inc., was awarded the 2017 Washington Manufacturing Awards: Manufacturer of the Year – Small Firms in the *Seattle Business Magazine's* Washington Manufacturing Awards contest, on April 26, 2017.



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