

A Case For:

AN EDUCATIONAL SERIES DEVELOPED BY HK SYSTEMS

# Designing Material Flow For Maximum Agility

## APPROPRIATE APPLICATION OF AUTOMATED GUIDED VEHICLES

Several proven technologies exist to transport pallets or large containers horizontally through a facility. Each alternative brings specific advantages and constraints, so selecting the best fit for your application should be done with care. Let's assume for the moment that manual transportation (fork trucks, etc.) has been disregarded in your operation and that automated alternatives will render a positive return on investment.

### THE ALTERNATIVES



*The most popular methods for automated pallet and container movement are:*

**Pallet Conveyor** – This includes for example, driven live roller, platten or slat conveyor and chain conveyor. This is a highly reliable and typically inexpensive solution with very repeatable throughput. Except when transfer cars are incorporated, pallet conveyor provides fairly inflexible point-to-point movement. It is most appropriate when floor space is plentiful and the throughput and material flow is fixed.

**Automated Monorail** – Usually suspended from the building ceiling or overhead structures, this technology employs a fixed-mounted track and independent powered “smart” carriers. Though more a costly alternative, monorail requires little or no floor space and can interface with a variety of equipment. This system is best suited when floor space is very limited and there is a need to accumulate or route material to several stationary points.

**Automated Guided Vehicles (AGV)** – AGVs are autonomous roving machines directed by a computer system to optimize movement in simple or complex applications. This is a highly flexible technology that operates safely in populated environments and where the sources and destinations of movement are dynamic. This battery-based equipment has the maintenance cost typical of fork trucks.

### BUSINESS DRIVERS

*Here are some trends in contemporary logistics environments that are driving the desire for increased agility:*

- In many markets, qualified, dependable labor is in short supply and the cost of product damage, turnover and inventory inaccuracies can quickly erode shareholder value.

- Today's business and logistics environments are rarely stagnant or predictable. The flow of material within a facility often changes based on market and production demands.
- Economic recovery has driven production growth, however, often without the luxury of new construction. Thus, space within current facilities is at an all time premium.
- New generation material handling is non-linear (point-to-point), and uses realtime intelligence to migrate material and assets where they are needed in random flow.
- Elevated demand for a solid ROI within companies has dictated that investments need to be multi-purpose and serve larger segments of the enterprise.

*The following list is how Automated Guided Vehicle technology responds well to the above business drivers . . . it is also the starting point to develop a practical business case:*

**Labor Free** – AGVs are in fact, fully automated and require no labor other than periodic and remedial maintenance. They can operate 24x7 without supervision, injuries, pensions, vacations or sick days.

**Adaptable** – Today's navigation systems direct the vehicles along a virtual path comprised of points or lines in 2-D space and use sophisticated teaching software to define that path. Thus, when your facility layout changes, moving or expanding the material flow is largely a matter of “teaching” the AGV the new configuration.

**Space Efficient** – AGV systems require little more space than the material they are carrying and since they are mobile and equipped with on-board safety equipment, they can co-exist with people, manual material handling and processes such as assembly.

**Logical** – The configuration of an AGV system can provide simple A-to-B transportation, but in many cases, the system is designed to provide a web of movement services to and from many points. This intelligent asset allocation is particularly valuable when servicing a production environment or in dynamic distribution scenarios.

**Multi-Tasking** – The flexible nature of autonomous vehicles allows the owner to utilize the asset simultaneously in a variety of applications under one roof. For example, the same system can migrate to service a receiving dock, replenish pick faces in a rack system and deliver empty pallets to a palletizer as the current demand dictates.



## THE KEYS TO SUCCESSFUL AGV TECHNOLOGY ADOPTION

*Harvesting the benefits of advanced technology requires a methodical process, supported by experience. Following are the 5 key elements of a successful AGV project implementation.*

**Geometry** – AGVs require a predictable amount of path, turning area and mixed-traffic space to function correctly in a populated environment. Be sure to perform a thorough 3-D survey during the design phase.

**Simulation** – There is no tabular rule-of-thumb to calculate how large an AGV fleet needs to be. Only through simulation modeling of actual operating data over a number of probable scenarios can the system size and throughput be correctly determined.

**Logic** – The way an AGV system responds to available work, sets and adjusts priorities and reacts to operator input is driven more by the owner's business rules than the supplier's product. Be sure to carefully convey your objectives and operating expectations.

**Culture** – AGVs are smart, complex machines, but unlike a press or filling machine, they roam around your facility. Thus, it pays to acclimate your employees with the concept and teach them the secrets of harmonious co-existence.

**Service** – Like any technological asset, AGVs will only serve and reward their owner as long as they are maintained. A simple and regular preventative maintenance program will greatly extend their lifecycle and ensure years of positive return on investment.

When used in appropriate applications, Automated Guided Vehicles can offer benefits far beyond other alternatives and provide modern companies the flexibility they demand in a dynamic and competitive market.

*The following matrix may assist you with choosing the appropriate horizontal transportation solution for your environment.*

### AUTOMATED HORIZONTAL TRANSPORTATION TECHNOLOGY COMPARISON

	CONVEYOR	MONORAIL	AGV
<b>Accumulation</b>	Zoned Models Only	Yes	Yes
<b>Relative Cost</b>	\$\$	\$\$\$-\$\$\$\$	\$\$\$
<b>Material Flow Flexibility</b>	None- Fixed Structure	Some- With Track Switches	Yes- Path Is Virtual
<b>Throughput Flexibility</b>	None	Somewhat- Add Carriers	Yes- Add Vehicles
<b>Material Flow</b>	Sequential	Mostly Sequential	Random- Multipoint Flow
<b>Cost of Ownership</b>	\$\$	\$\$\$	\$\$\$
<b>Maintenance Access</b>	Good	Challenging	Very Good
<b>Redundancy</b>	Single Point Of Failure	Carriers- Interchangeable Track- Single Point Of Failure	Vehicles- Interchangeable
<b>Throughput</b>	Medium For Straight Runs Low For Direction Changes	High For Long Straight Runs Low For Complex Navigation	Medium
<b>Interfaces</b>	Usually One Level Of Transfer	Lifts, Inclines, Declines	Lift-Lower Deck, Rollers, Telescoping Platten, Forks

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Our flexible solutions improve operational performance with superior integration services, quality material handling equipment, software applications and premier support services.

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## ACHIEVING MAXIMUM AGILITY WITH AGV'S



HK Systems manufactures and delivers a complete line of Automated Guided Vehicles, including standard unit load vehicles, specialty fork style vehicles and counterbalanced vehicles.

To date, HK has delivered more than 2,000 vehicles within Manufacturing, Distribution and Warehousing environments including food and beverage, pharmaceutical, automotive, consumer products, health, paper, grocery and pet supply to name a few.

AGV Systems from HK provide reliable horizontal transportation when space is at a premium and flexibility is critical. Delivering a valuable return on investment, these robotic transporters work under the direction of a Windows based control system and will automatically move material throughout your facility in a timely, safe and highly flexible manner.

All vehicles are manufactured in accordance with ISO standards, are available in a variety of configurations and capacities and incorporate the latest compliant safety devices.

HK vehicles are available with our patented Eagle III™ inertial technology or with laser guidance. These wireless guidance systems provide more options and greater flexibility for our customer's ever changing business needs.

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