

Heavy-duty Automatic Guided Vehicles Primary Metal Material Handling



DAIFUKU

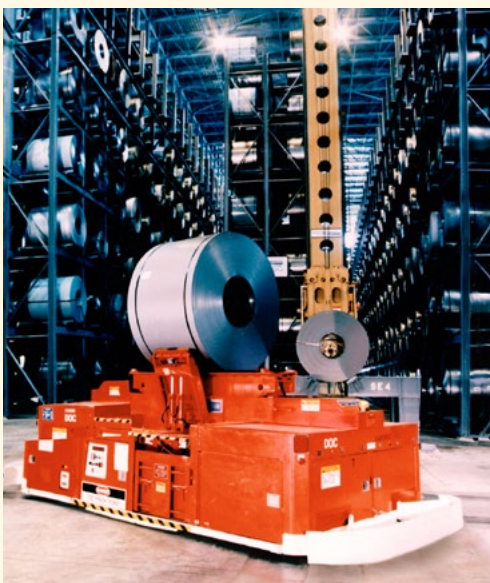
...producing the best heavy load handling AGV systems available today



Aluminum ingots are delivered to a storage area and automatically unloaded by a vehicle mounted lift/lower deck.



These AGVs interface with cantilevered pick/drop stations that can be supplied as part of the AGV system. A 100,000 pound load capacity AGV is shown transporting a steel coil.



Coils are taken from various processing centers to the fully automated overhead fixed mast automatic storage and retrieval system.

For over a decade, Daifuku's Jervis B. Webb Company has developed and installed AGV systems to transport loads weighing up to 130,000 pounds. Vehicles are available in various load capacities and load configurations. Custom design capabilities provide vehicles that meet your special requirements. Advances in control and vehicle design have made our latest automatic guided vehicle systems more reliable, affordable, and flexible than ever before.

Rugged, heavy load capabilities

With heavy load distributing suspension, all-wheel steering, and mill duty steel construction, heavy load handling with AGV technology has come of age. Standard vehicles are available for handling up to 130,000 pound loads.

On-board microcomputer

Each vehicle is equipped with an on-board vehicle control computer (VCC) and a 32-character display with keyboard, which enables the user easy access to extensive English language diagnostics of vehicle condition and status.

Vehicle design

A wide variety of standard vehicle designs are available for coil, ingot, and work roll handling, in unit load, fork, pole truck and towing configurations. Or let us design a custom vehicle for your unique automatic guided vehicle application.

Object detection

Vehicles are available with either sonic or optic object detection. These sensors are designed to bring the vehicle to a stop if an obstacle is detected in the vehicle's path.

Fail-safe bumper design

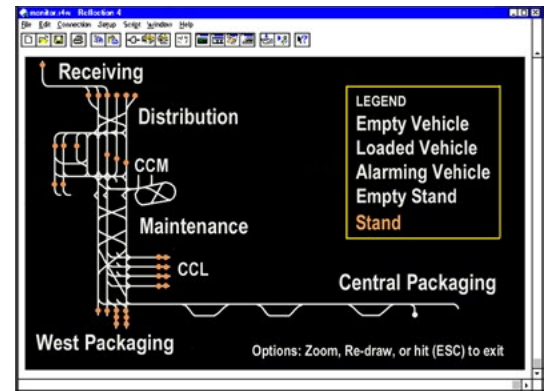
Emergency bumpers are provided on all vehicles. The bumpers cover the entire width of the vehicle and utilize a fail-safe optic design to stop the vehicle within the collapsed distance of the bumper. A laser bumper is also available on all models.

Proven Control Technology

The AGV system is controlled by the Vehicle System Manager (VSM), which controls, coordinates, and provides reports on the activities of the AGVs.

The standard VSM operates on a personal computer with a Windows NT® operating system. It provides real-time system monitoring and status reporting. Multiple VSM “SmartView” workstations can be located throughout your facility.

Communication is provided by two-way radio transmissions between the vehicles and the VSM computer. Both FM and spread spectrum radio systems are available. Communications include destination assignments, routing, traffic control, station releases, and vehicle status. For fault-tolerant operation and maximum system uptime, a hotbackup computer and redundant radio base station can be provided.



Typical “SmartView” user screen used in coil transportation system. Detailed vehicle status can be displayed by clicking on any vehicle.

VEHICLE GUIDANCE

Inertial Guidance

Industry leading, non-wire inertial guidance utilizes an on-board solid state gyroscope, which continuously monitors the vehicle’s heading of travel. Our patented SmartMark™ passive transponder codes are placed in the floor up to 150 feet apart and serve as reference points to maintain accurate vehicle navigation and positioning.

Laser Guidance

Laser-guided vehicles navigate by using a laser scanner that measures angle and distance to reflectors that are mounted to columns and machines. Laser provides maximum flexibility for easy guidepath changes with no system shutdown necessary. Laser guidance provides continuous calculation of vehicle position, high immunity to false reflections, and high position accuracy.

Wire Guidance

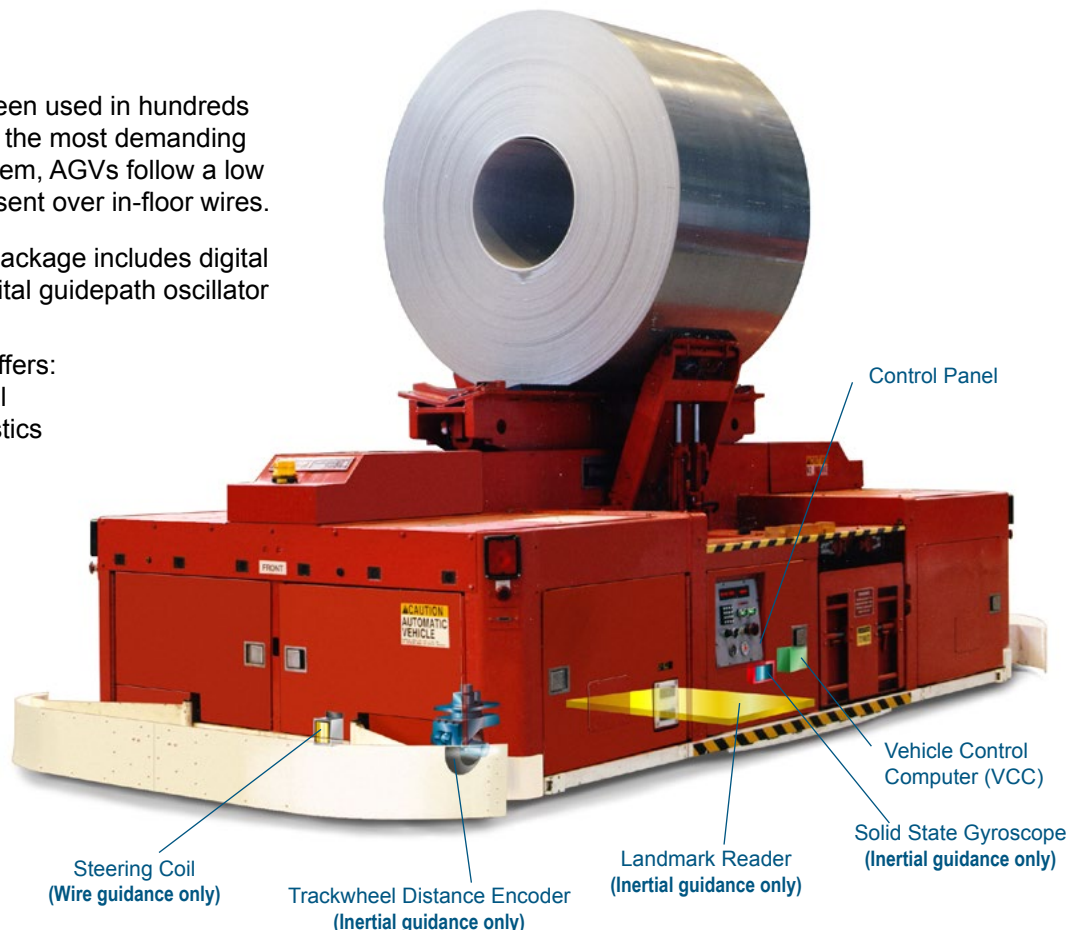
This proven technology has been used in hundreds of applications and in some of the most demanding environments. Using this system, AGVs follow a low voltage, low frequency signal sent over in-floor wires.

Our improved wire guidance package includes digital vehicle motion control and digital guidepath oscillator (signal generator) control.

The all digital control design offers:

- more stable guide wire signal
- advanced guidepath diagnostics
- greater reliability
- lower maintenance
- faster installation time

All navigation methods can be seamlessly combined in a concept called multi-navigation, which switches back and forth from laser to spot guidance without stopping the vehicle in applications requiring multiple modes of guidance.



Primary Metals

AK Steel



System Features

Installed	2000
Total AGVs	14 Bi-directional vehicles with 120,000 lb. capacity
Application	Just-In-Time Delivery
Industry	Primary Metal - Steel
Guidance	Inertial
Load Type	Steel coils
Path Size	6,000 feet, 35 coil stands

CB&I Constructors



System Features

Installed	1997
Total AGVs	1 2 x steer drive, 50,000 lb. capacity
Application	
Industry	Steel Manufacturing
Guidance	Laser
Load Type	Steel Plates
Path Size	

BHP Sheet and Coil - Springhill Works



System Features

Installed	1995
Total AGVs	16 Heavy Coil Handling vehicles, with 38 metric ton capacity
Application	Just-In-Time Delivery / Storage
Industry	Primary Metal - Steel
Guidance	Wire
Load Type	Steel coils
Path Size	7,000 feet, 40 pickup and drop-off spurs

Control System: Vehicle System Manager (VSM), DEC MicroVAX 3100 with hot backup, continuous FM radio communication between vehicles and VSM.
 Operation: The vehicles are designed to transport bore horizontal coils of steel and aluminum between process lines, a coil packing line, a paint line and several warehouse areas within the Springhill plant. The vehicles interface with multiple auto transfer devices including: Overhead Cranes, Rail Mounted Transfer Cars, Manual Cranes. Vehicles include automatic opportunity charging, automatic coil centering, and side guidance for traveling over pits.

Primary Metals

Hylsa



System Features

Installed	1994
Total AGVs	2 diesel powered AC drives & lift, 176,000 lb. capacity
Application	Outdoor Hot Mill Exit
Industry	Steel
Guidance	Rail
Load Type	Steel coils
Path Size	1,800 Feet

Kennecott Utah Copper



System Features

Installed	1994
Total AGVs	7 Unit load with steerable axle, 44,000 lb. capacity
Application	Cathode and Anodes to/from Electrolysis
Industry	Copper Production
Guidance	Wire
Load Type	Cathodes and Anodes
Path Size	2,500 Feet

Alcoa Brazil



System Features

Installed	1993
Total AGVs	1 Unit Load 35,000 lb. capacity, dual end steering
Application	Just-In-Time Manufacturing
Industry	Primary Metal
Guidance	Wire
Load Type	Aluminum Coil
Path Size	1,000 feet of guidepath, 3 pickup locations, 5 drop-off locations, and 2 charging stations

Control System: Allen Bradley PLC controller routes the vehicle between the charging station and pickup and drop-off locations. The vehicle communicates to the PLC via in-floor wiring. The vehicle is equipped with the latest generation VCC-2 and chopper steering controls..

Operation: The vehicle moves coils between processes at this sheet coil plant. The vehicle is all electric (no hydraulics) including steering and ball screw lift bed and feature bi-directional travel and automatic charging.

Primary Metals

Logan Aluminum 2



System Features

Installed	1993
Total AGVs	3 Model P15-250 with 250,000 lb. capacity, lift/lower load transfer, and opportunity charging
Application	Work-in-Process and Finished Coil Transportation
Industry	Primary Metal
Guidance	Wire
Load Type	3 Aluminum coils or work roll / back-up rolls
Path Size	4,300 feet, 4 opportunity charge stations, 15 pickup and drop-off locations, maintenance spur

Control system: Vehicle System Manager (VSM), DEC MicroVAX 3100, FM radio communication between vehicles and VSM, three VT340 color graphic terminals, host interface DECNET/TCPIP interface. Opto 22 I/O for crane interface and load station monitoring. Two crane mounted AGV service request radio terminals.

Operation: These ultra-heavy load capacity vehicles carry from one to three aluminum coils, each weighing up to 64,000 lbs. The vehicle also carries a single work roll set or a backup roll set with chocks. Coils and mill rolls are loaded onto P/D (pickup/drop-off) stands by overhead crane. Load pickup and drop-off is automatic by the AGVs. Remote crane mounted radio frequency terminals are used by operators to request AGV movement of coils. The vehicle's sealed lead acid batteries are automatically charged at selected P/D stations. Coils are transported between cold mill, coater, tension leveler, and storage areas. Work and backup rolls are transported between the mills and roll shop.

I/N Kote



System Features

Installed	1991
Total AGVs	10 Heavy Coil Handling (7 with 65,000 lb capacity, with lift/lower coil transfer, and 3 with 100,000 lb. capacity)
Application	W-I-P and Finished Steel Coil Transport & Storage
Industry	Primary Metal - Steel
Guidance	Wire
Load Type	Steel coils
Path Size	System 1: 2,700 feet, 18 pickup and drop-off spurs, 14 on-line pickup and drop-off locations and a maintenance System 2: 800 feet, 7 pickup and dropoff locations and 1 maintenance spur

Control Systems: Two Vehicle System Manager's (VSM), DEC Mira MicroVAX II with CEC hot backup software, continuous in-floor modem communication between vehicles and VSM, Interface to plant Level 3 controller, OPTO 22 I/O network. Operation: A total of 10 vehicles will deliver steel coils to various galvanizing processing areas. Two independent systems handle the steel coils weighing 65,000 and 100,000 pounds. The systems utilize opportunity charging.

Primary Metals

Logan Aluminum 1



System Features

Installed	1991
Total AGVs	2 Model P-15-250, 250,000 pound capacity with lift/lower load transfer
Application	Ingot Transportation
Industry	Primary Metal - Aluminum
Guidance	Wire
Load Type	Aluminum Ingots
Path Size	2,200 feet, 3 opportunity charge stations, 15 P/D locations, and a maintenance spur

Control system: Vehicle System Manager (VSM), DEC MicroVAX 3100, FM radio communication between vehicles and VSM, three VT340 color graphic terminals, host interface DECNET/TCPIP interface. Opto 22 I/O for crane interface and load station monitoring. Two crane mounted AGV service request radio terminals, one floor mounted AGV service request terminal.

Operation: These ultra-heavy load capacity vehicles handle ingots of aluminum, each weighing up to 60,000 pounds. Up to 250,000 pounds of ingots can be stacked on the AGV. Ingots are picked up and delivered between P/D stations. Stacking and unstacking of the ingots is done manual and automatic overhead cranes. Remote crane mounted radio frequency terminals are used by operators to request AGV movement of ingot stacks. The vehicle's batteries are automatically charged at selected P/D stations. Ingots are moved between receiving, storage, melt and cast, scalpers and preheat furnaces.

Alcoa



System Features

Installed	1987
Total AGVs	13 Coil Handling 60,000 lb. capacity
Application	W-I-P and Finished Coil Transport & Storage
Industry	Primary Metal - Aluminum
Guidance	Wire
Load Type	Aluminum coils
Path Size	6,700 feet, with approximately 50 program stop locations and a test track

Control System: Webb PSC Central Control System, DEC MicroVAX II computer with Webb design hot backup, M.A.P. 3.0 interface to customer host controller for Job Commands.

Operation: This system moves aluminum coils between hot line, annealing, storage, and a state-of-the-art continuous cold mill. The system incorporates opportunity charging to maximize vehicle utilization.



Various size coils at the finishing end of a mill are handled with this versatile coil handling AGV. The same vehicle is capable of handling work rolls.



Work rolls are transported between Mill and Roll shop with less chance of damage. Backup rolls can be transported in the same manner.



This unit load coil handling vehicle has an electric lift table and features a load capacity of 30,000 lb. Its low profile allows it to access low work stations.



Steel coils weighing up to 120,000 pounds move between load stands serviced by automatic cranes and automated process equipment.



Utilizing an automated crane for direct loading of coils, this vehicle transports single coils between multiple processing centers. Load capacity of the vehicle shown is 60,000 pounds.



This ultra low profile vehicle moves 95,000 pound earth grader and dump truck chassis between various assembly operations.

Jervis B. Webb Company has over 35 years experience in the design and manufacture of AGV systems and system controls. We offer a complete line of medium capacity AGVs (1,000 to 10,000 pounds) as well as high tonnage AGVs up to 130,000 pounds.

We have installed over 3,000 vehicles in a variety of industries and applications.

Our standard vehicle and load configurations include: HV-3 pallet and paper roll handling vehicles, HV-S/R Narrow Aisle Storage and Retrieval vehicles, Prontow® automatic towing vehicles, and Autotrans® unit load handling vehicles. We will also custom design an AGV to suit your particular application.

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