



MOTIUS

WE R&D.

Low Cost AGV

Motius GmbH

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Low Cost AGV

 Manufacturing

 Automation

We developed a revolutionary low-cost AGV platform for spinning mills, achieving:

- ✓ **Under \$80,000 total budget** for complete AGV system
- ✓ **80kg payload capacity** for transporting textile manufacturing products (yarns, bobbins, and sliver cans) up to 1200mm height
- ✓ **Modular design** supporting interchangeable platforms and future enhancements
- ✓ **Dust-resistant construction** optimized for fiber-dense textile environments



Project Vision

The vision was to revolutionize material handling within spinning mills through development of a cost-effective, modular, and scalable under-carriage Automated Guided Vehicle (AGV). This AGV serves as a modular robot platform with potential for future enhancements, including robotic arms and specialized tools.

The AGV streamlines transport of materials such as yarn, bobbins, and sliver cans between processing stations, improving operational efficiency and reducing manual labor in textile manufacturing environments.

Technical Approach

System Architecture

Component	Specification	Details
Base Dimensions	600mm × 800mm	Accommodates 600mm diameter sliver cans
Drive System	Differential drive + caster wheels	2x stepper motors for precise control

Navigation	Line following / magnetic tape	IR/camera-based sensors with $\pm 5\text{mm}$ accuracy
Power System	24V/48V LiFePO4 battery	2-6 hours runtime per charge
Control Platform	ARM-based IPC with Linux/ROS	Modular software architecture

Modular Platform Design

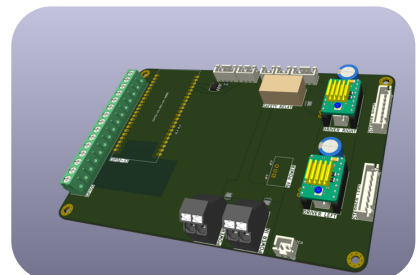
Despite the cost, the AGV features a sophisticated modular system designed for rare but necessary component swaps:

Mechanical Interface

- **Docking plate with quick-lock bolts** for rigid, vibration-resistant connections
- **Guide pins** for precise alignment during module changes
- **Tool-assisted swap** process (10-15 minutes per module)

Electrical Integration

- **Anderson Powerpole 45A connectors** for industrial-grade power connections
- **M12 Industrial CAN Bus connectors** for real-time control communication
- **EEPROM-based automatic module detection** for plug-and-play functionality



Navigation & Safety

- **Line following capabilities** using IR or camera-based sensors
- **Basic obstacle detection** with ultrasonic/infrared sensors
- **Dust-resistant mechanisms** preventing fiber accumulation
- **Low-speed operation** optimized for safety in industrial environments

Implementation Strategy

We applied a hybrid Agile-Systems Engineering approach combining iterative development with structured validation:

Development Phases

Phase	Deliverable	Timeline
Phase 1	Business needs & system requirements	Weeks 1-2
Phase 2	Detailed design completion	Weeks 2-3
Phase 3	Sub-system manufacturing	Weeks 2-6
Phase 4	System integration & testing	Weeks 5-7
Phase 5	Fleet management integration	Weeks 7-9

Key Working Packages

- **Drive System Development:** Motors, gearboxes, wheels with dust protection
- **Lifting System:** Servo-driven mechanism with 80kg capacity
- **Navigation System:** CPU/microcontroller with line-following sensors
- **Power Management:** Battery system with wire harness and indicators
- **Modular Platform:** Standardized interfaces for future expansions



Cost Analysis

Our preliminary Bill of Materials achieved the target budget of ~2000€ of hardware costs per AGV, assuming a fleet of 50 units:

System Category	Components	Cost (€)
Drive System	Motors, drivers, wheels	375
Lifting System	Servo, spindle, mechanism	100
Navigation	CPU, sensors, line module	480
Power & Signals	Battery, BMS, harness	240
Structure	Chassis, body, assembly	780
Modular Platform	Connectors, interfaces	60
Total Hardware		2,185 €

Application at Keller & Kalmbach

Our modular AGV platform demonstrates how cost-effective automation can transform traditional manufacturing processes. Keller & Kalmbach can now automate material handling in areas that are not covered by AGV suppliers, or would have been too costly to automate with existing solutions.



Keller & Kalmbach Logo

The scalable design approach enables rapid deployment across various industrial environments while maintaining flexibility for future technological enhancements and specialized sensor integration requirements.

Compared to AGVs from Asia, our solution is comparable in cost, but can be supported locally, and is designed for European standards.