Automating to cut
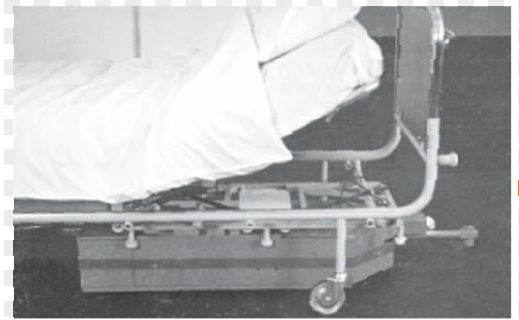# the cost of care.

Automated material transport systems
for hospitals and other care facilities

MLR System GmbH
Materialfluss + Logistiksysteme

A 1971 prototype

In operation in the Robert-Bosch Hospital, Stuttgart/Germany, since 1973 – one of the first automated guided vehicle systems in a European hospital.

Vehicle Number 1

A strong track record in hospital logistics.

MLR, headquartered in Germany, specialises in material flow management and automated guided vehicle systems. We began applying our expertise to hospital logistics in 1971. In 1973, the system we installed in the Robert-Bosch Hospital in Stuttgart was one of the first AMT systems in Europe to use floor-based transport systems. Since then, the company has engineered and installed systems in many major hospitals and clinics.

Intensive experience in delivering efficiency.
We deploy the specialised expertise, built up over many years, to develop optimal solutions to the complex challenges of hospital logistics. The automated material transport (AMT) systems we supply are highly customized systems, which make a powerful contribution to efficient hospital operation in today's demanding environment.

A strong commitment to innovation.
We are passionate about continuous development to our systems. We put intense effort into improving the control and navigation systems, for instance, and into developing the intelligent and versatile vehicles that can travel in lifts directly to the wards, communicate with the central control at any time and use sensors to identify loads. This results in increased availability, productivity and ease of use for the system. It also makes it possible to capture data on system performance and material flows around the hospital.

1. Optimal use of space and compre-
   hensive obstacle recognition
2. Waiting for work
3. Interfacing with a monorail system
4. Using the lift

The perfect system.

Logistical masterpieces.

Hospitals are places with an extraordinary number of things that need moving. Meals and medication, clean and dirty laundry, sterile items, refuse and used crockery, to list just a few. A state-of-the-art automated material transport system (AMT) links up the different areas of the hospital, guaranteeing that all the wards and treatment zones are kept supplied, and used materials removed, absolutely reliably, efficiently and hygienically.

Our AMT systems are engineered to deliver multiple benefits:

- Reduce logistics costs
- Integrate existing hospital processes in the best possible way
- Respond rapidly to changes in material flows
- Be easy to operate and extremely user friendly
- Guarantee correct and timely deliveries to wards and treatment zones
- Comply with rigorous hygiene standards

MLR – the perfect partner for new builds and retrofits.

Our automated guided vehicle systems are always the right solution – in new hospitals and when an existing hospital is being modernised or extended. With minimal downtime, we will link an AGV system with an existing monorail system, or exchange track-guided vehicles for freely navigating ones. The new AGVs can be adapted to transport existing containers, so that existing conveyor systems and lifts need not be replaced.

MLR – your partner from the start.

To achieve an optimal AMT solution for a specific hospital, MLR experts work with architects, planning specialists and hospital logistics experts from an early stage of the project. We have long experience and wide expertise in developing practical and sustainable concepts for new builds and conversions. We can supply information on specifications for buildings, floors, lifts, fire-safety doors, apertures, conveyor technology and containers. We define interfaces to existing equipment and use simulation technology to check the viability of the whole system in the planning stage.

MLR – tailor-made financing options.

We give our customers every support in finding the right financing solution – options include contracting models, hire purchase and leasing.

5. Platform vehicle: towing the load
6. Forklift: suspended load
7. Platform vehicle: carrying the load
8. Automatic battery charging
9. Container buffer and conveyor
10. Pneumatic tube conveyor system: transfer area
11. Container transmitting station

Vehicles and peripherals – all from a single vendor.

Modules for a perfect system.

The MLR range includes different types of AGV, from towing tractors, lifting or towing platform vehicles to various types of forklift. The vehicle navigation system – magnetic, laser-based or contour scanning – can be chosen to suit the project.

All MLR vehicles are fitted with human-detection systems that guarantee the highest safety levels. Heavily encapsulated motors make them exceptionally quiet. The stainless steel AGVs supplied for hospital applications are very easy to clean and disinfect. They meet the most rigorous hygiene standards.

We act as general contractors, supplying peripheral equipment including:

- Washer-safe containers for food, laundry, sterile items, medication or refuse
- Container washing systems
- Pneumatic tube conveyor systems
- Conveyor systems for container transport and storage
- Control desks
- Pick-up and drop-off stations fitted with centring and 'occupied' detection systems
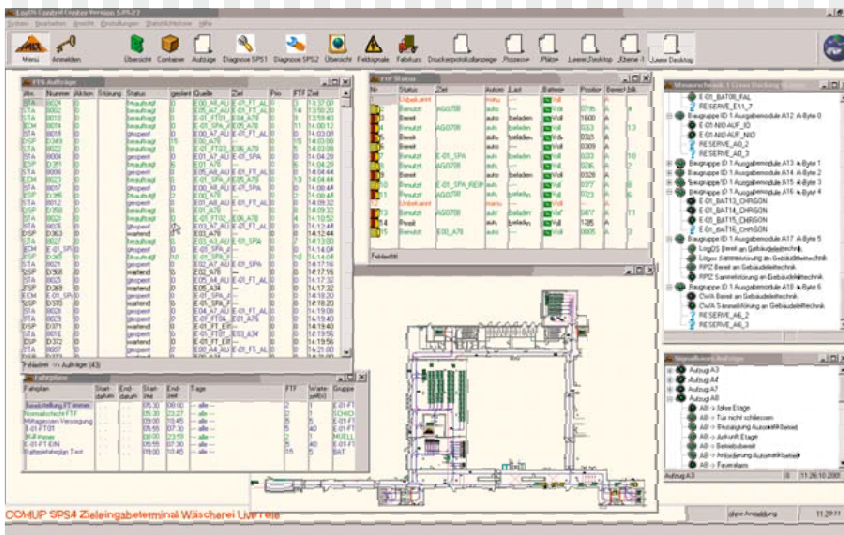- Load identification using barcodes or RFID

Network-based communication.

As standard, all communication between vehicles and other system components and with input/output terminals is handled by the control system via network-based interfaces. No special hardware is required. Hospital staff on the wards and in other operational areas find it easy to work with the system using specially configured terminals, PDAs or mobile phones.

Power supplies – versatile and application-specific.

A carefully planned power supply is a decisive factor in maximising system availability. This is why we deploy the whole bandwidth of ultra-modern power supplies and battery chargers, such as Li-ion technology. Batteries can be charged and changed manually or automatically. The use of emission-free, no-maintenance batteries sharply reduces maintenance costs. Moreover, a battery concept tailored to the requirements of the AMT system, together with the right recharging strategy, ensures that batteries last for as long as possible. In an MLR system, a software module is tasked with continuously monitoring battery capacities on each vehicle and sending vehicles not in service for a battery top-up. This ensures that the battery charge on all AGVs is maintained at a good level, so that all vehicles are ready to be deployed in response to demand peaks.
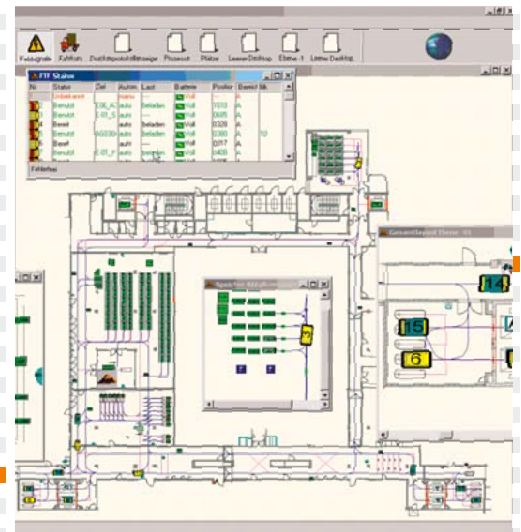
The control system.

The brain behind the system.

MLR offers a control system specifically targeted to managing hospital logistics systems – LogOS-Hospital. The LogOS software handles functions such as tasking, traffic regulation and data capture from the pick-up and drop-off stations, and also manages peripheral equipment such as lifts, washing machines and pneumatic tube systems. It also provides comprehensive and reliable system data capture and management. Other important features include integrated control for optimal resource utilisation and continuous monitoring and predictive optimisation of lifts, AGVs, etc. to achieve maximum throughput.

Control system details:

Simulation – we use the actual, project-specific control software to generate a realistic simulation of the target system during the planning process. Based on performance data from the simulation, the planned system can be optimised, weak points identified and eliminated and the effects of possible future changes tested.

Resource planning – timetables define the number of AGVs required at specified pick-up points for planned transport tasks and specify – to the minute – when the containers and empty AGVs must be ready. Timetables can be instantly adapted to cope with emergency situations or other changes.

Vehicle management – all task requests are dynamically monitored and managed by the control system. Linked with intelligent optimisation strategies, this makes predictive vehicle assignment possible. The benefits are optimal resource utilisation and a minimal number of empty journeys.

Container management – pick-up and drop-off stations and AGVs identify all containers via labels, RFID, tags, etc. The system keeps track of all container movements and positions by managing all container buffer bays and container types. Containers are assigned to and tracked through transport, storage, disinfection and maintenance individually or grouped according to type. The data can also be used in internal and external accounting.

Visualisation – the graphical display gives an overview of the whole system including all routes, AGVs, pick-up and drop-off points, conveyors, lifts, doors and barriers. It shows the current position of all vehicles, their current loads and task state, any problems and even individual I/Os.

Communication Manager – a software module makes it possible to designate specific transport system data – eg, alarms or task states – as triggers for specific messages to the system operators. Messages can be sent via SMS, email or voicemail to previously specified recipients.

12. Remote diagnosis
13. Setting vehicle parameters
14. Our service team

Other control system functions:

Service management – the control system can check the relevant functional and wear parts in the AGVs and generate appropriate service recommendations. This type of preventive maintenance ensures vehicles are operational at all times and increases system availability.

Statistics – the system provides statistical data, eg, for cost controls and internal accounting, in a format that can be analysed and processed using standard software.

Summing up:
Customers can rely on comprehensive, expert support from MLR.

All control system modules are designed to ensure transparent and ultra-efficient operation of the whole system. LogOS-Hospital makes life easier for hospital staff. At the same time, the whole system is engineered for easy, efficient service and maintenance, saving time, effort and money.

Service.

All-round excellence and customised options.
MLR provides after-sales service and support tailored to our customers' specific needs – from regular inspections to operating the whole AMT system on their behalf.

Service agreements – we provide remote maintenance, hotline support and on-site service and repairs, 24/7!

Service and maintenance – at defined intervals our technicians inspect functional and wear parts, make any necessary adjustments and, as independent experts, carry out the statutorily prescribed annual technical inspection.

All-inclusive maintenance – we undertake all the maintenance and repairs required to keep the system in full operating order and we maintain a stock of key spare parts.

System operation – we operate your AMT system, provide all-inclusive maintenance, and take over responsibility for all material transport tasks including planning and implementing strategies to respond to emergency stoppages.

Spare parts and repairs – we supply ready-to-assemble, original spare parts, we plan and maintain a system-specific stock of spare parts and carry out fast, cost-effective repairs.

CASERO can transport laundry, meals, drinks, medication, post and luggage.

CASERO moves around the wards bringing meals, medication and other small loads to the patient's bedside. Even older people understand intuitively how to interact with it. By taking on these typical service tasks, CASERO can be a logical extension of an existing AMT system.

Research and development. Shaping the future.

In the future, we'll see service robots helping staff in hospitals, and even in old age homes and care homes, for example, by delivering meals and medication directly to the patient, or by collecting dirty laundry or refuse. These are potential developments where MLR is playing an active role by working to improve interaction between people and automated machines. We are, for example, participating in WiMi-Care, a project supported by the German Federal Ministry for Education and Research which promotes knowledge transfer aimed at actively shaping the future of the care sector.

Our know-how helps to shift the focus of care effort.

In cooperation with the Fraunhofer Institute for Production Engineering and Automation (IPA), MLR developed and built the new CASERO AGV, which incorporates advanced components and technologies from the field of mobile service robots. CASERO uses an innovative navigation system to orient itself in its everyday surroundings, recognizing walls, pillars and apertures. It is even capable of avoiding dynamic obstacles, like people. CASERO can navigate along hospital corridors and enter hospital rooms through normal doors in order to perform daily service tasks. Other conceivable uses for this high-tech vehicle include guiding patients, care-home residents or visitors. It will also be capable of recognizing emergency situations and summoning help. When CASERO takes over some routine tasks, care staff have more time for actual nursing and interaction with patients.

Reference projects.

1: Klinikum am Bruderwald, Sozialstiftung Bamberg/Germany

2: Tan Tock Seng Hospital, Singapore

3: University Clinic, Friedrich-Schiller University, Jena/Germany

4: Rheinische Kliniken, Bonn/Germany

5: University Clinic Gießen and Marburg, Philipps University, Marburg/Germany

6: Akershus University Hospital, University of Oslo, Nordbyhagen/Norway

7: Leopoldina Hospital, Schweinfurt/Germany

More reference projects (without photos):

– Robert-Bosch Hospital, Stuttgart/Germany

– Hospital Universitario de Gran Canaria Dr. Negrín, Las Palmas

– University Clinic, Otto-von-Guericke University, Magdeburg/Germany

– University Clinic, Heinrich Heine University, Düsseldorf/Germany

– Offenbach Clinic, Offenbach/Germany

– Khoo Teck Puat Hospital, Singapore

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