

The Clinical Center Ingolstadt has given its goods transport system a fitness cure of the special kind. Newly automated throughout with “clinically tested” automation technology, the punctual supply of meals, linen and other clinical items is possible with it at any time. This not only greatly contributes to the satisfaction of the patients, but also to that of the operator.

Total Quality Management – quality in all processes – is the top priority for all medical and patient care procedures, treatments or other services at the Clinical Center Ingolstadt. This primarily involves keeping appointments and performing all services on time. One of the bigger challenges presented the supply of on average over 1000 patients with meals following a precisely determined schedule – and that three times a day. Add to this the coordinated and as required supply with drugs, sterile utensils for care/treatment, fresh bed linen or cleaning agents. And the proper disposal of all used articles from the stations has to be ensured as well. In doing so, the supply and disposal are strictly separated to counteract any contamination. An integral aspect of any (automated) transport system is the smooth and trouble-free operation.



***Especially during meal times, there is a lot of traffic in front of the elevators in the ward that has to be managed quickly and safely by the control network without collisions. The kitchen interests always have priority.***

## Totally Integrated Automation for Hospital Logistics Well looked after – throughout

For these tasks, an automated goods transport system was installed in the early eighties by Schindler Fördersysteme (a feed systems company residing in Berlin) during the construction of the clinical center. From the so-called ready-stock room and the kitchen, it individually supplies the central ward, the slightly out of the way psychiatry and the emergency, examination/treatment as well as operating rooms with the necessary items.

Thirteen undercarriages attached to a ceiling-mounted rail system and elevators transport up to 1000 containers and wire cages per day on an approximately 500 m long driving route with a total of eleven stopping points and multiple rail switch groups. The horizontal stopping points are located facing the four elevators of the ward and the two elevators of the psychiatry. There, the containers are transferred to loading carts, transported into the elevators and distributed among the up to eight floors. The high hygienic standards are satisfied by three integrated container washers. All of these processes have always been automated. However, after being in operation for almost 25, the system has become outdated, which is why the operator decided to comprehensively modernize the entire automation technology. The Schindler Aufzüge und Fahr-treppen (elevators and escalators) GmbH of Munich was the general contractor for the modernization of the automated goods transport system.



***The Simatic Operator Panel OP3 at the undercarriages makes the control simple and visualizes current process data.***

Following specifications from Schindler, the company ATN, also residing in Munich, carried out the hardware and software implementation – with a preference for employing automation technology from Siemens. The brand loyalty of ATN has several reasons: Director Wolfgang Ziegler, for example, likes to have only a single contact for all or at least many products to minimize interfaces.

Electronic Innards completely refurbished

A criterion for the selection of the controller and the drive system was compact design: New core elements in the frame of the undercarriages and loading carts include one Simatic controller S7-300 CPU 313C of the compact CPU series and one compact frequency inverter of the Micromaster 440 series each as well as one induction motor per undercarriage and two additional motors per loading cart.



**After entering the destination number, the container is automatically transported to the designated floor from the ready-stock room on the supply floor.**



*Mandatory for some goods such as food carts with ready-made meals: Frequency inverters. They precisely position the loading carts and enable smooth movements without sudden jolts*

Each undercarriage also possesses a Simatic Operator Panel OP3 for simple control and monitoring tasks such as the selection of the operating mode (setup, manual, automatic) or the readout of current parameters. If required, an OP3 can be attached to a loading cart, thus providing quick access to its controller. In this application, the frequency inverter has two tasks: It positions the cart within and outside of the elevator precisely at the stop positions and regulates the motor of the integrated lift table, which transfers the containers – weighing up to 300 kg – from the undercarriages. To exactly determine the current position of each individual undercarriage/ container on the 500 m long rail line, the RF identification system Moby D from Siemens is employed. Each undercarriage possesses a sender/reader that contactlessly acquires the position from about 90 data storage units mounted along the driving route while passing by.

Via the undercarriage controller and an infrared system serially connected to it, the information at last arrives at the main controller, a CPU 416-2DP of the Simatic S7-400 series. “This has been our first exclusively on the Simatic level implemented Moby application,” explains Wolfgang Ziegler. Trials have shown that the contactless data transmission functions error-free even at twice the driving speed. Depending on the position, the RF identification system controls the braking of the undercarriages before curves, rail switches and the target positions at the elevator, while proximity switches ensure the precise positioning for the transfer. Once the transfer position is reached, the loading cart drives out of the elevator and under the container, while the lift table moves up. After the container interlock at the undercarriage is released, the loading cart including container returns to the elevator and automatically heads for the predetermined floor. There, the loading cart moves the container in front of the elevator and gently lowers it onto the target parking space. The station staff is informed optically and/or acoustically, depending on the urgency. Containers can be dispatched to more than 30 task points. For this, task magazines – holding either two or ten containers – have been set up in front of the elevators on the supply floor, which contains the kitchen and the ready-stock room. At each station in the ward and the psychiatry, two containers can be buffered for transfer to the automatic goods transport system. When transporting meals and other “clean” articles, only a two-digit number for the destination needs to be entered at the operator panel of the task magazine.

## Dirty Containers always go to the Cleaning System

Since the only destination of used “dirty” containers is the collection point at the cleaning system, this function requires no operator action at all. “The handling has become even easier – it is immediately understood by all staff members and has therefore been fully accepted,” explains Michael Meyer, the technical services manager of the Clinical Center Ingolstadt. The interface for the operator at each of the five 10-space magazines is a Simatic Operator Panel OP3. The HMI devices communicate via MPI (Multi-Point-Interface) with the floor controllers of the type Simatic S7-300 CPU 313C.

For the simpler 2-space magazines at the stations, rugged complete control systems have been installed in front of the elevators. They combine the controller and the operator panel in one compact unit and offer all functions required for smaller applications. They are also equipped with MPI for the connection to the precisely performance-matched floor controllers.

## During the “Hot Phase”, only Transports from the Kitchen are allowed

All floor controllers exchange information directly with the coordinating main controller through standardized communication processors of the type Simatic CP 343-5 and quick Profibus communication in the data blocks.

As a result, the main controller always knows the destination as well as the current position of each individual undercarriage/container, ensuring a smooth, error-free and collision-free automatic operation. Unlike in the past, the clinic staff no longer needs to worry about the blocking time during the meal distribution. The central control program only permits transports from the kitchen during these “hot phases” and automatically blocks the supply to other task points. This ensures that all patients receive their meals without delay. Possible malfunctions in the complex network are immediately conveyed to a visualization PC by means of a communication processor CP 443-1 IT in the central control rack and an Ethernet switch. This PC also acts as the OPC server and distributes the information to other client PCs in the kitchen, ready-stock room, central control system and workshop. In this way, errors can be quickly localized and suitable corrective measures be initiated. “This keeps the availability high. As a result, the on schedule supply of our patients with meals, drugs as well as other articles required for the recovery and well-being can be ensured and our Total Quality Management for this elementary area be implemented without limitations,” sum up Michael Meyer and Reinhard Stampfer (technical services, Clinical Center Ingolstadt) their positive result.

*The controller in the central switchgear cabinet coordinates the interaction of approximately 70 subordinated controllers via Profibus and/or matching communication processors.*



*Integrated controller and operator panel: The complete control system Simatic C7-621 accomplishes all tasks required by a 2-space magazine.*

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