

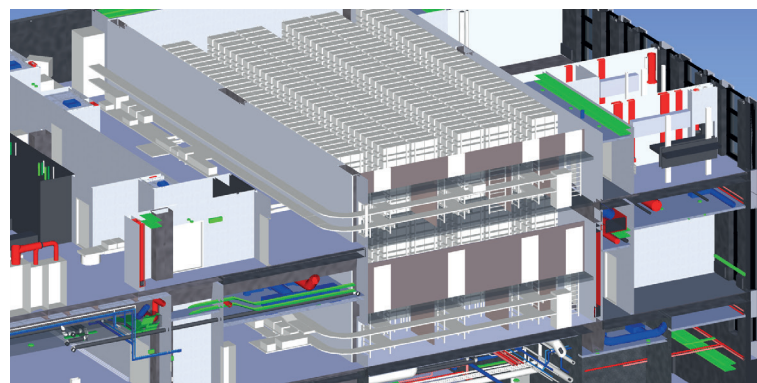
DESIGNING FOR EFFICIENCY – THE INCREASING ROLE OF AUTOMATION IN HEALTHCARE FACILITIES

Healthcare facilities around the world are increasingly looking to innovations in robots and robotic design to help them run more smoothly and efficiently, taking over the repetitive, labour intensive jobs that occupy so much time in hospitals, and in the process improving health and safety in the workplace and freeing up staff to deal with more complex tasks. In this article, we look at the role UK materials handling and management specialist Medstor is playing in facilitating the operation of the world's first fully automated CSSD, currently being built in Copenhagen.

Most people are familiar with the frustration of visiting a hospital, entering through the main door only to realise the ward or clinic you are looking for is right at the other end, or possibly even in another building. But it is not only people that have to move around the seemingly endless maze of corridors: drugs, specimens, medical instruments, linens, food... everything has to travel from one place to another, taking up staff time and being exposed to hundreds of possible sources of infection along the way. Hospitals are complex structures, offering a myriad of services, and moving a wide variety of materials many miles around the buildings every day. The construction of efficient facilities that incorporate modern technology to improve patient care is essential, and the most progressive hospitals are designing for efficiency before they build.

A CSSD Staffed by Robots

In what is a world first, Medstor is working in Copenhagen with Danish consulting company ALECTIA, equipping two automated warehouses, built to deliver sterile goods and services. Medstor's Danish distributor, Botved A/S, who first introduced Medstor to the project, has continued to provide support and liaison throughout. The Central Sterile Services Department (CSSD) is an important part of any hospital, vital for efficient treatment and optimum patient safety. The Danish Capital Region is streamlining and upgrading these services by constructing two new CSSDs that will provide sterile instruments for the entire Capital Region. The new buildings, based at Rigshospitalet and Herlev-Gentofte Hospital, will set a new standard in the provision of CSSD services as almost all the heavy and repetitive work previously undertaken by staff will now be carried out by robots, mini Automated Guided Vehicles (AGVs) and conveyor systems, making the process safer and more efficient than ever before. In addition to optimizing patient safety and the efficiency of the working environment, the new sterile services departments will create the conditions needed for the highest possible uniformity and product quality, as well as increasing productivity through economies of scale and ensuring fast adjustments to new genetic treatments.



Where employees today must carry the instruments themselves, from 2018 the robot workforce in the new CSSDs will take over. They will transport the instruments to a high-bay storage for sterile goods, with room for approximately 11,000 units. The instruments will remain here until ordered up by one of the hospitals in the cluster, when more robots will pick them up and place them into boxes on the long conveyor belt system that will run around the CSSD, moving the instruments through the selection, disinfection, packing and distribution process as it travels round. This is where Medstor's expertise in designing healthcare materials management systems will come into play. The conveyor belt on which the "transport boxes" travel will carry "transport boards", which will in turn move the boxes and containers carrying the medical devices around the system. Medstor has been awarded the European Contract to supply both the boards and the lidded boxes, and to carry out all design development and function testing of these completely new products, to be employed in a situation that is also new territory for all involved. Precise and exact manufacturing in the company's UK factory will be essential to ensure compatibility with the conveyor belt and the entire system, and will necessitate the development of new tooling specifically designed for the project.

From Concept to Reality

When Medstor was awarded the European Contract following a rigorous EU-supply tender procedure in May this year, it was for the design, development and manufacture of the transport boards and boxes, based on the system as a concept, rather than a physical reality. Medstor gave an evidence-based overview of its ability to complete the work by linking together the many disciplines within its organisation, from product design to prototyping, through to tooling design and manufacture, culminating in product manufacture and delivery. Allison Seabourne, Sales Director at Medstor, says, "Within our company, we have vast experience of "concept to reality" projects and this, when coupled with our experience in retail logistics as one of the UK's main manufacturers of food logistics containers for the supermarkets, meant I was confident that we could deliver the project in line with the many detailed requirements specified in the tender."

Medstor was able to show that it could produce products accurate enough to be picked up by robots but at the same time robust enough to withstand the repeated and thorough cleaning process the boxes and boards would have to undergo. The design had to accommodate robotic solutions, assist the cleaning regime, and be suitable for manual handling, a triumvirate of needs that would require experience, creativity, and an understanding of the bigger automated transport picture.



Boards and Boxes

With a complex set of design parameters, Medstor engineers have collaborated under ALECTIA's project management, with Danish robotic company Gibotech, washing plant provider Echberg and CSSD specialists from both the Rigshospitalet and Herlev-Gentofte Hospital and the Central Region to develop a truly multinational solution, and a world first.

These complex design parameters include requirements to satisfy all the stakeholders:

- The design of a board that will hold the two newly designed transport boxes, plus a series of three aluminium caskets (provided by surgical device specialist Aesculap) carrying medical devices to be autoclaved, and three more boxes from KLS Martin. In other words, 8 boxes of varying design and from different suppliers, that all need to be held firmly and safely while being transported over a route that includes inclines, declines and accelerated speeds.
- The boards need to be very strong, as they may have to hold products for as long as 12 months, with a weight of up to 12kg, whilst maintaining their critical form.
- The boards and the boxes need to be as smooth as possible and without design details that would hinder the regular and rigorous cleaning processes. They also need to be strong enough to withstand these processes without any loss of their critical form.
- And lastly, where manual handling is required at the point of use, the boards and boxes must deliver an ergonomic operating solution.

The design ensures each component integrates seamlessly with the other elements around it, and is perfectly suited to its role in the bigger picture

Ground-breaking 3D Simulation

ALECTIA's design for the new buildings allows several working processes to be centralised, and operation to be based on automated processes and robot technology. However, the space available is very limited. To overcome this ALECTIA has used a new simulation method based on Revit (a programme for 3D modelling) to test and detail the planned construction of the sterile services department. The building parts of the 3D model are linked to the implementation time schedule of the building project, which makes it possible to simulate the construction of the building in relation to the allocated space and time, and examine whether it was possible to construct the building within the restricting outer boundaries.

Beads on a String

Although this is still work in progress, the entire project is an incredible experience for all involved, bringing together exciting and innovative minds, all committed to developing a perfect solution. The robots bring the ability to carry out mundane and repetitive tasks ad infinitum, but we bring the inspiration, passion and dedication. It's a union of robotics and human skills, uniting to enhance patient care and advance the boundaries of what can be achieved in the healthcare environment, embedded into the build from the very beginning, and an integral part of the design process.



"Previously, we have seen sterile services departments where different automation solutions eliminated some of the manual working procedures. With the new sterile services department at Rigshospitalet, we have worked with an overall solution where the various automation solutions are linked like beads on a string. We believe that we are in the process of creating a unique design in cooperation with the Capital Region. The part elements are well-known but when they are combined by an experienced team, a new and ground-breaking solution is created."

Kevin Jungløv, ALECTIA Project Manager