

SERVODRIVES PROVIDE ACCURACY REQUIRED FOR TOTAL BODY IRRADIATION TREATMENT TABLE

A servo drive from Control Techniques has given a total body irradiation (TBI) table a new lease of life at the Institute of Oncology Ljubljana in Slovenia, bringing both the required precision and reliability to an advanced life-saving radiotherapy procedure.



The original system was designed and built in 1989 by the maintenance department of the Institute of Oncology Ljubljana, and featured a DC servo drive for the control of the table movements. However, advances in radiation treatment led to the need for an upgrade to achieve better accuracy and improved reliability.

The Institute chose Control Techniques' local representatives PS Logatec as their partner in this project and a system was designed around Control Techniques' new Digitax ST Plus servo drive, providing both the accuracy of control needed

and the reliability without the need for an additional PLC.

Total body radiation (TBI) is a special radio therapeutic technique for the treatment of predominantly hematological diseases such as leukemia's and lymphomas. The technique is mainly used for conditioning prior to bone marrow transplantation in combination with intensive chemotherapy. The main objective of TBI is to deliver a uniform dose 12 Gy within $\pm 10\%$ of the prescribed dose to a patient's whole body and for the reference point the accuracy of the delivered dose must be within $\pm 3\%$, whilst optimally sparing vital organs such as the lungs. This is difficult to achieve because of the variations in the thickness of the patient's body and the density of the tissue.

There are several methods of TBI, the system at the Institute of Oncology Ljubljana, uses a table that moves along rails, known as the 'translation' method. Good clinical results encouraged them to invest in an upgrade to give them greater

KEY BENEFITS

- INCREASED PRECISION
- IMPROVED RELIABILITY
- PRECISE CONTINUATION FOLLOWING INTERRUPTION
- SIMPLE & QUIET OPERATION
- ELIMINATE PLC REQUIREMENT

control and reliability – the latter being most critical since the table must not stop or deviate from the set speed cycle whilst the radiation source is on.

PS Logatec were tasked with producing the complete system which is in three separate elements; the electrical cabinet with the servo control system, the rails with timing belt linear unit, table, servo-motor, gearbox and measuring system and finally the remote control panel with touch screen, control buttons and emergency stop button situated in the operator's room. It was designed and built in these three sections because of limited available space. The final assembly is 504 cm long and can be accommodated even in a small radiotherapy room.

The key requirements were for very accurate speed control, so that the dose of radiation could be adjusted by the speed of the table and ultra-reliability – the table must never stop whilst the radiation source is on. The latter was achieved by using a magnetic measuring system that measures the actual speed of the table, rather than just measuring motor speed. The signals are evaluated within the processor in the Digitax ST servo drive, with actual speed being constantly compared with the speed of the servo-motor. In addition, as a further safety back-up, an IFM counter also monitors the table speed and disconnects the radiation source if the speed drops below a selected minimum.

In addition, the client specified very quiet operation and a simple operator interface.

The powerful Digitax ST Plus features a full functionality motion controller that is configured using Control Techniques' programming tool, CTSOft, with the drive's advanced motion features being configured in a flexible IEC6113-3 software development environment using PLC-open motion function blocks within Control Techniques' SyPT software. It was possible to provide all of the programming required within the drive itself, negating/eliminating the need (and cost) of an additional



PLC. The system incorporates three feedback loops; a closed position loop, a closed speed control loop and an actual speed control loop using the additional security counter.

The medical staff determine all of the required parameters, using the touch-screen control panel; the starting point, the length of movement and, most critically, the speed. In addition to automatic control, staff can override speed control using the remote screen – and, if treatment is interrupted at point, it can be resumed precisely from the point at which it was stopped.

Speed tolerance is better than the specified 0.2% at speeds from 30-mm per minute up to the treatment maximum speed of 500-mm per minute.

Digitax ST, from Control Techniques, is a new range of servo-drives with unprecedented connectivity, feedback options, intelligence and functionality.

The Digitax ST range has been designed to meet the requirements of machine designers and system integrators – a compact servo drive with an unmatched range of flexible integration features, optimised for servo applications requiring high peak torque, exceptional dynamic response, faster installation and start-up as well as ease of integration. Four product variants make up the range at launch – Base, Indexer, EZ Motion and Digitax ST Plus, the latter being chosen by the Institute of Oncology for its power and programmability.



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