



Patient transfer technology assists nurses.

Facing a constant challenge of an increasingly overweight population can lead to debilitating injuries. DC motor driven, transfer device technology enables the movement of patients with a minimum of effort.

A major challenge in the nursing industry is diminishing staff levels. This can result with nurses having to cater for overweight patients with little or no assistance. This in the past, has been a major contributor toward musculoskeletal disorders (MSDs) including spine injuries. Almost 12% of nursing staff are unable to continue in their profession annually because of spine injuries, additionally 52% percent live with chronic back pain. Employment in an aged care facility carries even higher risk of injury.

Enabling nursing staff move a patient single handedly in a safe and comfortable fashion necessitates motor driven automation technology. Upcoming US company Astir Technologies mission is to utilise cutting edge technology to enable patient transfer so effectively that it both lowers hospital costs and decreases injuries while maximising patient comfort. This goal led to the development of the PowerNurse™ The motors and drive mechanisms are packaged within a 1879 x 711 x 58mm profile device that can travel across industry standard hospital beds. The device allows patients to be transferred between hospital beds, portable stretchers, medical imaging equipment, operating tables and examination tables. Chris McNulty, Astir Technologies president and designer of the PowerNurse device comments; "Other less expensive friction reducing devices decrease but do not eliminate the risk of nurse injury while performing a lateral transfer." The PowerNurse became a reality because of advancement in technology including the miniaturisation of motors and control electronics that has come about recently. A crucial area in the design is the DC motors and gearboxes. Rare earth magnets with high power density and advanced winding technologies have led to very high torque motors with very small dimensions. "maxon leads the industry with a wide selection of high end products that made it possible to lower the profile of the PowerNurse, leading to a more comfortable and effective product," McNulty said.

Author: Joe Martino, maxon precision motors

1/4

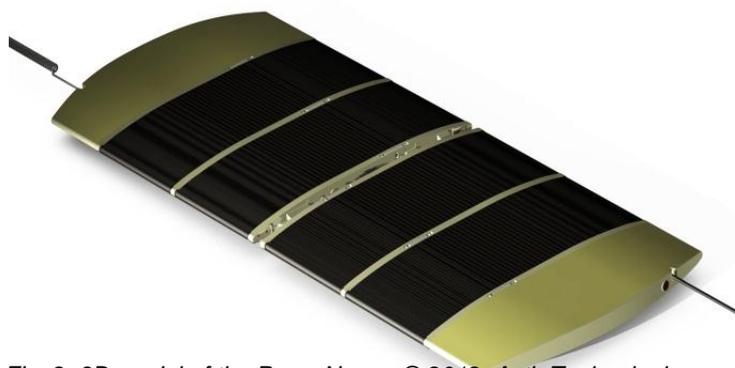


Fig. 2: 3D model of the PowerNurse. ©2012 Astir Technologies

The innovation contains a sequence of belts, DC motors fitted with gearboxes and controllers that have a low profile allowing very heavy weights to be transferred robotically. Whilst building the prototype, over 180 kilograms could be effortlessly transferred utilizing only 0.2 of a 250W maxon 45mm brushless motors capacity that was first tested in the prototype. This allowed a 120W ECmax 40mm brushless motor to be used. This left the larger 45mm motors to be used in the bariatric model.

Initially the transfer belting only traveled a single speed of 25mm/s. This speed was sufficient for patient pick-up and delivery but it was too slow for the lateral transfer process.

The new design incorporates two speeds where the device operated at 25 or 50 mm/s. “maxon’s wide selection of gearbox diameters, gear ratios, and number of gear stages allowed us to fine tune the products overall speed while maintaining the highest level of torque,” he said. Combining the maxon DEC 50/5 motor control unit with either the 45mm or 40mm motor streamlined the design and additionally smoothed the operation of the device. The complete design includes four 40mm brushless DC motors fitted with 42mm 43:1 ceramic planetary gearboxes and four maxon servo-amplifiers all powered by a single 400W, 48V DC power supply.

Unique amongst the hurdles in development was the design of the drive rollers, which need to withstand the torque of the maxon gearbox which is further geared with an additional 2:1 reduction. To find the optimum solution an extensive test and evaluation process of many different roller types was conducted. This resulted in the use of specially coated rollers as they were the only device that could deliver performance and handle the torque levels of the motors.

The PowerNurse is activated solely with push buttons and has three operation modes: Transfer, burrow and pad alignment. Whilst in burrow mode the belts are utilised to gently pull the patient onto the device, meanwhile the belts on the underside move the unit underneath the patient. The patient experiences a very smooth transfer compared with that of other devices. When pad align mode is used only the top belts are running. Transfer mode activates the bottom belts only transferring the device and patient. In each mode the unit can be rotated and translated giving skid steer like control. Upcoming additions could include yaw gyros for the system to augment the human machine interface and give motor control an increased level of performance.

Author: Joe Martino, Sales Engineer maxon precision motor | Local language edits maxon motor Australia 2013.

Links: <http://www.astirtechnologies.com/>

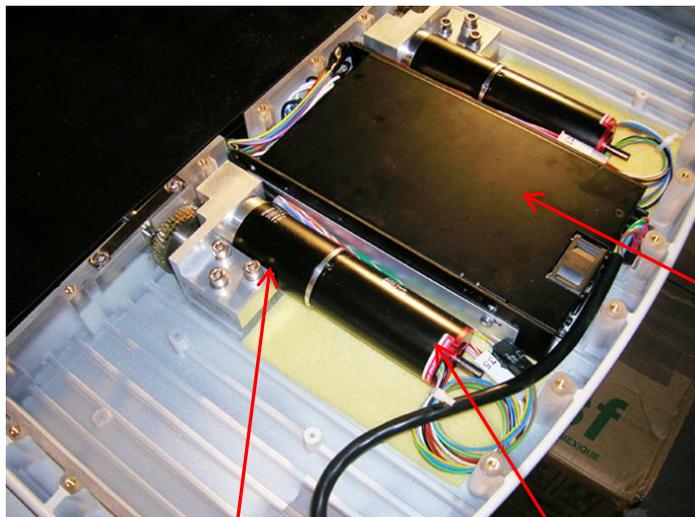


Fig. 3: maxon 40mm brushless DC motors and 42mm ceramic planetary gearboxes.

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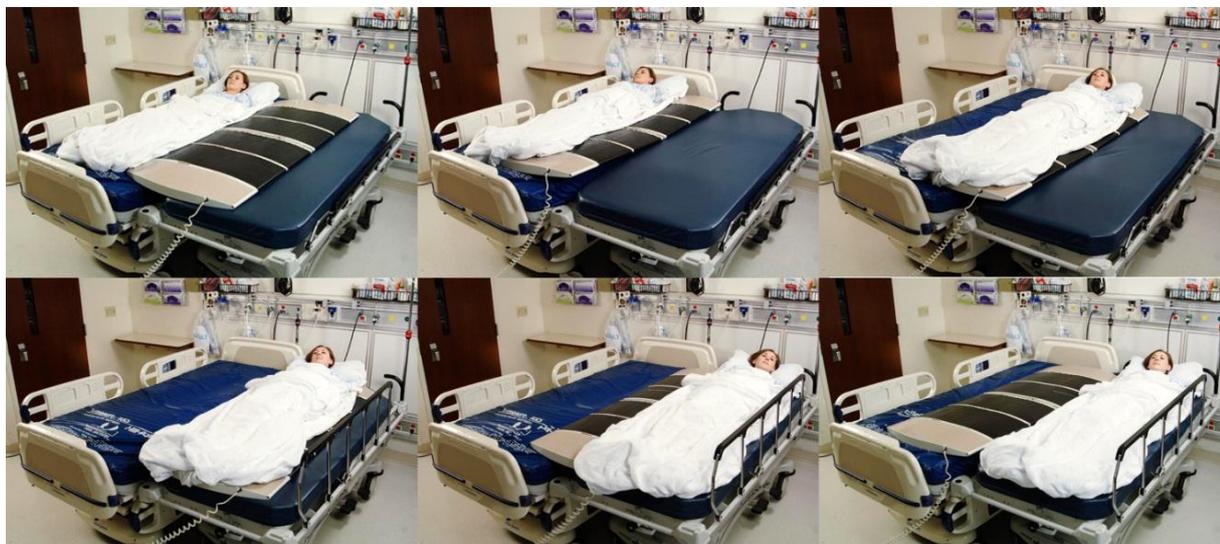
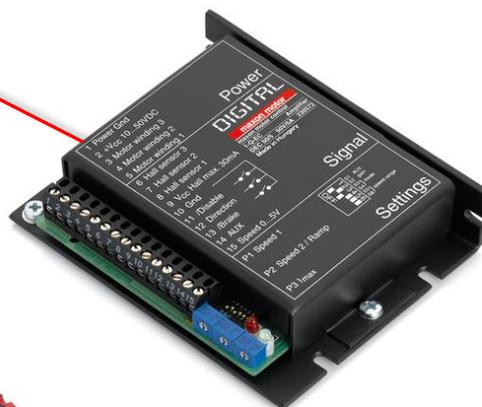


Fig. 4: transferring a patient © Astir Technologies

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