Decubitous ulcers (“pressure sores”) are a significant concern for people using wheelchairs. In fact, results published by the University of Kansas [1] indicate that over half of those using wheelchairs will develop a pressure sore at some point. This susceptibility is due to the conditions under which these ulcers develop: shear stress and pressure work together to cut off the blood supply to the surface tissue, which subsequently dies. Heat and moisture can increase the likelihood of this necrosis and the rate at which it occurs. Although sores can develop quickly (onset can occur in as few as fifteen minutes), they may take months to heal.

Appropriate seat cushion selection helps to mitigate the causative factors [2]. In particular, custom-contoured cushions (CCC) can offer dramatic improvements. Research has shown that CCC’s offer the best distribution of pressure and reduction of shear stress, reducing these factors by as much as 80% [3]. CCC’s are not commonly used, however, because the cost and time involved in design, manufacture, and delivery are prohibitive.

The obstacles of cost, time, and inconvenience, can be overcome by applying mass-customization and rapid-prototyping principles to the process used to create CCC’s. This involves automating the basic steps of the process: creating an electronic representation of the seating surface and machining that surface using a computer-controlled (CNC) mill. Similar systems have been put in place to automate a variety of processes, from the creation of custom orthotics for footwear to the design and creation of impeller wheels [4]. Such a system would be capable of producing a suitable custom-contoured cushion in minutes or hours rather than weeks or months.