July 2009

Pregis Corporation
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Case Study

Pregis Corporation is a leading global provider of innovative protective, flexible, and foodservice packaging and hospital supply products. The specialty-packaging leader currently operates 47 facilities in 18 countries around the world. Pregis Corporation is a wholly owned subsidiary of Pregis Holding II Corporation.

Problem Statement

The project addresses the high musculoskeletal risk of grasping the core (internal) material used to make hexacomb and lifting it onto an expansion table.

Expected outcomes

This modification will significantly reduce the risk of musculoskeletal (specifically low back and shoulder) injury by reducing a task from a lifting task to a sliding task which will eliminate the lifting, grasping, and twisting forces incurred by the operator in the process of feeding the expansion table.

Process

The existing process for the feeding of the core involved delivery by fork lift of a rack with removable corner posts which enclose the flakes of core material. The rack is placed on a set of rails and rolled into place for the core to be fed into the machine. Full racks were easier to load because the top layer of core was closer to the roller and the lifting distance was not as far. Unfortunately partial racks are often used and the vertical lift distance of core material could exceed 30". Compounding the issue is that the operator has to lift. With 4 inch and type 1 core, the pinch and lifting forces could be extreme.*.

Controlling the Risk

The primary goal in controlling the MSD risk was to find a way to present the core to the roller at approximately the height of the roller, which was impossible with partial racks. The solution was to install a scissors lift with a new more sensitive and reliable scale under it. The scissors lift would raise to present the core material to the roller at or just below shoulder height which would virtually eliminate the back forces and significantly reduce the shoulder forces. The design seemed straight forward and the new scale and scissors lift were installed. In early tests of the new product it became apparent that one consideration that had not been addressed was the fact that the two leading posts needed to be removed in order for the scissors lift to present the core to the roller. If they remained in place, the core would not be able to be presented to the roller at the appropriate height.

*Attempts to determine pull and grip forces using gauges failed due to the nature of the material, and the coupling necessary to attach the gauges. Instead, the Borg Scale was used as a psychophysical assessment

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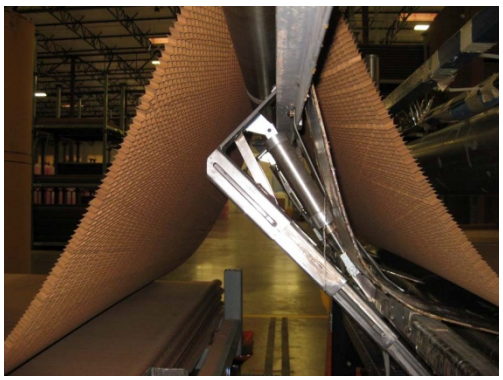
A device needed to be manufactured which would constrain the core flakes with the corner posts removed and would accommodate the rise of the rack when the scissors lift was actuated, and would be retractable to allow the rack to be moved into place in line with the core feeder table. An in house machinist, Martin Forler, developed two telescoping posts which would constrain the core flakes. The posts were retractable and actuated by a mechanical switch for the placement of the rack and then would drop into place to restrain the core flakes and allow the corners to be removed. The original design for the telescoping posts was of aluminum. They proved to be too light, and due to dust and other particulate tended to stick. The machinist replaced them with steel tubes and the additional weight of the steel solved the problem.



A Borg Scale, a subjective assessment of perceived exertion, was used to access the discomfort associated with worst case (4 inch, type 1 core) on a partial rack, as opposed to the optimum configuration where the core flake is at the same level as the roll which virtually eliminates any lifting and significantly reduces the grip force to transfer the flake across the roll. Results are below.

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Borg Scale Assessment

Before control	Borg Rating
Partial rack 3” Type 2 	10 The lift is heavy, asymmetrical, the vertical excursion is up to 36 inches, and requires a 1” to 4” wide pinch grip.
After control 	3 The lift is eliminated when the leading edge of the core is level with the roller to the expansion table.

Modified Borg Scale* of Perceived Exertion

SCALE	SEVERITY
0	No Effort
0.5	Very Very Slight Effort
1-2	Slight Effort
3	Moderate Effort
4	Some What Difficult
5-6	Difficult
7-8	Very Difficult
9	Very Very Difficult (Almost Maximum)
10	Maximum Effort

*Borg, G, "Perceived Exertion as an indicator of somatic stress", Scandinavian journal of Rehabilitation Medicine 1970, 2(2), 92-98

Potential Transfer of Control Method to Other Industry
Pregis Auburn has shared this innovation with the five other sites who manufacture hexacomb and who have similar machinery.

The device manufactured could be used in:
“industry which stores products in racks with removable corner posts which contain the product. The product stored is a raw material in the manufacture of a larger product and needs to be drawn from the rack in the process”.

Attempt to measure pinch and lifting forces

There was an attempt to compare the pinch and lifting forces of the core of various thicknesses. This was a request by the General Manager of the plant in order to determine criteria for determining a threshold at

which the scissors lift must be used by the operator of the Core Feeder. The results are detailed in the Appendix at the end of this case study.