

Maintaining Good Health through Improved Working Conditions

Repetitive motions. They bring to mind a vision of high energy, a perfect way to get a lot done. We are all learning that this is not always the case. Certain kinds of repetitive motion on the human body can cause life long damage to our muscles and skeleton.

Oregon OSHA and the medical community have been actively working to educate employers in Oregon about the effects of these, and other ergonomic issues within the workplace. One of these companies is Cherry City Wood Shop (CCWS). CCWS is a subsidiary of Shangri-La Corporation and is located in Salem. They are also a sheltered woodshop, employing physically and mentally challenged workers. They manufacture secondary wood products for a variety of companies within the state.

One of the primary products they manufacture is a load separator. Load separators are used under large loads of material like wood bundles, to elevate the bundle so a forklift can slide their forks under the load for lifting and placing. They are typically manufactured by laminating strips of particleboard wood sheet together with a nailing process. Traditionally, the process followed has been to saw the full size sheets to specific width strips and depending on the length required, to that final dimension. There are more than 10 stock lengths that CCWS manufactures. These finished products also are required to finish at or near a standard 2-1/2" thickness dimension. Depending on the raw materials supplied, this can require from 2 to 4 sheets of material being stacked up and nailed together, to achieve this. This process of sawing, stacking, fixturing, nailing, unstacking, and bundling was a day in, day out ergonomic concern that everyone wanted to improve on.

Two primary area's that needed to be improved, were the nailing process and the stacking/bundling process. These were unique processes, which required solutions that could not be purchased from a catalogue. About 4 years ago, Shangri-La contacted Oregon OSHA for advice on how to solve the problem. After some research, it was quickly realized that no off the shelf machines or solutions would solve the nailing problem. They were encouraged to apply for an Oregon OSHA Worksite Redesign Grant, funded through the Oregon Department of Consumer and Business Services. This unique program allowed companies to develop solutions to implement into their shops, to address health, safety, and ergonomic problems, for which their was no off the shelf solution. The grant application was written and eventually approved for funding. The Oregon Manufacturing Extension Partnership (OMEP) was contracted to act as Project Managers in completion of the project and development of the solution. A series of steps were followed, including ergonomic assessments, concept design reviews with the employees at the shop, complete engineering design, and eventual fabrication and assembly of the solution. It was a rather long process in developing this machine, taking almost 2 years, but the efforts have paid large dividends. The solution is a semi automated machine, that guides a grouped set of boards by conveyer, into a section of the machine that automatically nails them together with pneumatic nail guns. Up to 6 nail guns may be used in this process at one time. The machine can nail spacer assemblies from 2 to 6 feet in length or any increment in between. It then powers the finished product out by conveyer, to be stacked for eventual shipping. The post ergonomic assessment confirmed a substantial reduction in the ergonomic issues associated with the nailing process. Production capacity was tripled as a byproduct of the project. Life got much better at the shop.

But this only solved half the problem. The other area identified, that needed improvement, was the bundling/stacking process as the finished product came off the machine. They had still not identified a machine or series of machines that could accept a variety of material length products, and could stack these to a finished bundle weighing up to 3000 lbs. There were literally thousands of stickers a day that came off the machine, each being manually lifted, carried, placed, and aligned onto the pile, one by one. The new piles began at floor level and finished at almost 4 feet in height. The ergonomics of the job were painful. After such great success on the first project, and no solution in sight, they again contacted Oregon OSHA for advice. It was agreed that another grant application should be submitted. This one was to address the stacking/bundling process.

A multi page application was completed which included a detailed plan of action, a responsibility matrix of who would complete each action step, and a budget for these steps. An initial list of goals to be addresses by the solution was created. Included in these were:

- The ability to manipulate a 3000 lb. load of product.
- A roller system in the base of the unit, to roll finished bundles onto a conveyer if required.
- A locking system to prevent movement of the bundle on the rollers.
- A lifting and back tilting function to adjust the growing loads height and to allow gravity to assist in the stacking process.
- An adjustable top fixture for adjusting to the different bundles of products being stacked and bundled.

Again, the grant was approved. Dana VanHaverbeke from Shangri-La contacted Patrick Kraft, a Manufacturing Consultant with OMEP, to again project manage the project. He worked closely with Jimmy Shrull, General Manager of CCWS.

The plan outlined in the application was followed. It began with a Baseline Ergonomic Assessment by Rob Strickland; an Ergonomic Consultant hired on the project. Rob completed an evaluation of the existing job of stacking materials, and documented the health and ergonomic issues that existed. He offered advice on optimum work elevations and reach distances for incorporation into our future solution. Steve Dishman, a Concept Designer with Design Acumen Inc, led a series of meetings with the employees at CCWS. At these meetings, the Baseline Ergonomic Report was used in conjunction with input from the employees, to come up with an outline of the kind of machine that would address most of the issues identified.

The solution would consist of the marriage of 2 devices. The first, being an altered lifting, tilting base, and a fabricated secondary fixture, which would be attached to the deck of the sub base. Wes Locke was contacted at the OATC training center in Wilsonville. The OATC is operated by Clackamas Community College and offers technical training, and completes short run prototypes and fixtures as training activities. Wes and his associates completed a CAD design of the secondary top fixture and fabricated it. While this was happening, the altered lifting, tilting base machine was specified, ordered and was being manufactured by an experienced lift manufacturer.

Upon delivery, the top fixture was attached to the base machine and delivered to the woodshop. 2 powered conveyers were ordered that would elevate the finished boards 2 feet as they left the nailing machine and progressed to the stacker. An elevated work platform was installed near the end of the second conveyer and adjacent to the stacker. When starting a new load of product, the base is elevated and the top fixture tilted back until the front edge of the stacker is level to the end of the conveyer. As a finished spacer comes up

the conveyers, it slides onto the stacker frame and gravity carries it to the back of the fixture. Slight guiding with one hand at the end of the board is all that is required in a majority of the stacking process. As layers are built up, the fixture is lowered to keep a correct height relationship to the conveyor. At the end of a standard height bundle, the fixture has been completely lowered and leveled. All of this happens with the employee remaining at an optimum average working height range in relation to the end of the conveyor. In essence, the load of finished product is manipulated, relative to the employee, not the other way around. A large majority of the twisting, bending, and reaching that previously happened on the job has been eliminated. Controlling the lift and tilt of the new device is accomplished with a push button electric controller box, which the operator controls at the work platform location.

Jim Shrull states "These two projects have made a tremendous difference in the woodshop, especially in our ergonomics and safety. These were both strong concerns and with the help of OrOSHA and many others, these issues have been resolved. The increase in productivity was certainly a bonus, as well as the decrease in repetitive motion incidents and accidents that have occurred in the past. The employees are happier, do not get fatigued as quickly and are more aware of what is going on around them. This makes everyone happy because we are all working safer."

Overall, this project has been a huge success. It truly compliments the original nailing machine that was first created. It is expected that the employees will have greatly reduced future ergonomic health issues with the creation and addition of these devices.

Oregon OSHA's Worksite Redesign Grant program provided up to \$41,000 in grant monies for this project. This covered the costs of design, development and evaluation of the prototype device, as well as the documentation of the results, so that others could benefit from the research. Shangri-La/CCWS contributed our required 10% match in the form of meeting involvement, installation, testing, and reporting on the project outcomes. This product was designed for the special needs of Cherry City Woodshop, but their employees believe it could be invaluable to any company with manual material stacking tasks.

All product designs developed through this program are public property. The design is complete, and will be freely available to anyone wishing to duplicate or further develop the mobile lift. A web based project archive is in the process of being constructed, that will provide details on this and many of the 35 to 40 grants being completed by other companies. It will be linked from the main Oregon OSHA website and will provide information such as project overviews, ergonomic reports on the projects, as well design and vendor information so that anyone may research the results and adopt the technologies.

*Information from Shangri-La / Cherry City Woodshop may be obtained from Jimmy Shrull, General Manager
Phone: 503/362-0761.*

Information about developments and the status of this program can be obtained from Oregon OSHA (www.orosha.org).
Phone: 1-800-922-2689.
<http://www.cbs.state.or.us/osha/grants/worksitere redesign.htm>

Information about OMEP can be obtained from their website or from Patrick Kraft, Manufacturing Consultant
Phone: 503-977-8145, pkraft@pcc.edu or <http://www.omep.org>