
SCHNITZER STEEL'S SUCCESS WITH ERGONOMIC IMPROVEMENTS

Schnitzer Steel Industries, Inc. (SSI), an Oregon company since 1908, is one of the oldest and largest scrap metal recyclers in the U.S. and serves the continental U.S. and Pacific Rim markets. With a network of facilities and joint ventures across the country, SSI collects, processes and recycles auto bodies, rail cars and track, machinery, demolition scrap from bridges, buildings and other obsolete structures. Raw scrap is processed by cleaning, sorting, bailing, shearing and shredding metal pieces into specific size, density and purity required for use in the remanufacture of new steel products.

With environmental awareness and protection a top priority, SSI has often served to help set industry standards. Recipient of EPA National Excellence Awards, SSI continually searches for ways to recycle more material and reduce landfill materials. Recognizing the reward potential for refining their separation of raw scrap, they changed their sorting procedures. Until recently, this was a simple process with magnets retrieving ferrous material, and the remainder, commonly called 'fluff', being discarded. Now, this is a two-step process, with extraction of non-ferrous metals such as stainless steel from the 'fluff'. Current technology is unable to identify this material, so the new separation process is primarily manual. Within the first 30 days of operating the newly installed conveyors and walkway workstations, employees reported great discomfort, particularly lower back pain problems. These were the result of a traditionally required bent over static posture, while leaning over the conveyor sorting line. Recognizing the risk of musculo-skeletal injuries from static positions and extended reach requirements, a work-team sprang into action. The product they developed is of interest to any organization with reach, static posture, and load concerns, primarily on conveyor type work assembly lines.

Employees stand on an elevated platform structure next to a moving conveyor belt that contains small ground-up auto parts. Their task is to pull out the small pieces of non-ferrous metals and toss them into bins or chutes. Key physical demands contribute to the risk of injury. Prolonged, static positioning was an issue with forward flexion of the lumbar spine estimated from 10 to 40 degrees with moderate flexion of the shoulders. Repetitive motion risks were a concern with forward flexion of the trunk and both shoulders while reaching for metal pieces. Poor posture and body mechanics and inadequate muscle recovery time were also issues. While the metal pieces being retrieved are small the forces and loads were a concern for injuries in the extensors of the back and flexors of the shoulders. Most of these risk factors are a result of excessive reaching distances with the risk dependent on the body shape and height of the employee.

Immediate actions were taken to alleviate the situation. Metal leaning supports were added where the workers lean and bend their bodies to reach out over the picking belt. Back belts were provided to each employee. Rubber mats were installed for them to stand on. The toe boards were redesigned so employees could move closer to the belt, and moveable wood platforms were provided for the shorter employees. Padded sit/stand stools with adjustable height gave employees the option of leaning back in a semi-seated position. While providing relief of some discomfort, these actions were temporary.

Continuing their process of joint venturing and partnering, SSI staff applied for and received a grant from the Oregon Department of Consumer and Business Services. The Oregon OSHA (OR-OSHA) Worksite Redesign program provided the funding, for which SSI had to provide a minimum 10% match. They contracted with a strategic partner, the Oregon Manufacturing Extension Partnership (OMEP) to manage the project. OMEP's project managers have a mission to increase Oregon manufacturers' productivity and profitability and have been very successful in managing OR-OSHA development projects. They are also experienced in developing the grant applications and completing the necessary evaluations and reports to measure and document success of the end result.

With a team of employees, company management, and outside consultants, several meetings were held to determine requirements, evaluate alternatives and implement desired changes. Understanding the individual ergonomic needs of employees was key in determining an effective solution. They had to consider employee heights ranging from 5 feet, to 6 foot, 7 inches. Two key requirements were identified. The first was the ability for an employee to adjust their height relative to the conveyor. This suggested individual work platforms with adjustable height controls. An ideal range from floor to top of the leaning support was defined as 38 to 45 inches. The second requirement was to reduce the reach to the materials being sorted. It was determined that an optimal conveyor belt effective reach distance should accommodate 95 percent of men, based on height tables. This was determined to be 22", measured from the front edge of a leaning support to the furthest point of material on the conveyor.

Research turned up no readily available solutions. The original equipment manufacturer did not have any alternatives, nor did any of the other conveyor and catwalk manufacturers. A search in the "Thomas Register" also came up empty-handed. Sorting conveyor manufacturers have traditionally focused their design priority on the conveyor and not the employee workstation. Conveyor technology required to handle this type of material is incapable of addressing individual ergonomic needs.

Major changes were planned and implemented to address these problems. Instrumental in these changes was the design and installation of a new section of the elevated conveyor and work platform itself. Advantages in the design change include the ability to work from either side of the conveyor, the incorporation of adjustable height work platform flooring at each worker location, and a reduction in the reach requirement from the old conveyor section.

The ability to rotate employees to different sides of the conveyor allows for a change in the repetitive motions associated with the material moving sideways to the worker. Material passing right to left on one side of the conveyor passes left to right on the other. This change in body motion helps to reduce repetitive body motion ergonomic problems. The adjustable height work platforms at 4 workstations on the conveyor landing measure 42" x 30" and adjust from 2.5" below the surrounding landing grade, to 6" above. The platforms are covered with a rubber anti-fatigue matting material. A simple push button electric control operates the floor to adjust the height of each individually. These floors allow for compensation for different height employees to optimize the working height of

the surface they stand on, to the conveyer height, thereby reducing back fatigue. A series of holes in the platform decks allow for the insertion and use of adjustable height, sit/stand stools on suspension columns, further reducing lower back strain. The original reach distance range on the old conveyer was 12" to 40". As a result of the design change, the new conveyer reach distance range is now 5" to 29". An added feature that has improved the 'friendliness' of the process is the proximity of the workers to each other. In a brightly lit workspace, 2 employees work side by side across the conveyer belt from 2 others. They are a more cohesive work unit, able to see, talk, and otherwise interact with each other, rather than strung along one side of a conveyer.

An ergonomics evaluation process created a baseline assessment at the start of the project. This was compared to a final assessment with a detailed report documenting the change in risk of worker injury. The post-project evaluation determines if injury risk factors are reduced, lessening the risk of employee injury.

Prior to the new process, up to 89% of the employee group reported lower back discomfort with an average discomfort rating of up to 7 on a scale of 0 to 10. In post-project discomfort surveys, SSI employees report high satisfaction with the results. It is expected that usage of the stools, not assessed in the pre and post assessment, will further improve the environment, providing reductions in weight bearing stress to the feet and legs.

The post-project evaluation determined all injury risk factors are reduced, significantly lessening the risk of employee injury, and supporting employee comments. Giving the worker an 8.5-inch standing platform height adjustment range and the option to sit or lean on stools has reduced the static body postures. Awkward postures of the trunk and shoulders have been significantly reduced. The frequency of movements of the trunk and shoulders have decreased because more of the metal materials are accessible while standing in a nearly up-right position, allowing more of the actual sorting to be done closer to the body, near the optimal range of 14 inches. Similarly, the extensors of the back and flexors of the shoulders are exposed to significantly reduced load due to improved posture. Muscle recovery time is much improved as workers can attain more neutral postures of the trunk and shoulders for a majority of the time.

Linda Barno, Workers Compensation Manager for SSI, is pleased with the results. She believes the employee team was particularly effective in determining requirements and evaluating the results of the new product. And she is very enthusiastic about the Oregon OSHA Worksite Redesign program, finding it invaluable in both mission and the results produced.

Pat Kraft, OMEP's Operations Manager, feels a personal satisfaction in helping companies address ergonomic issues such as these. "Employers want to address these problems for their employees but are often unable to, due to the lack of readily available solutions. No one, including myself, enjoys working at a job where your body is in pain at the end of the day. Helping prevent this is fulfilling for me. It is also not uncommon to achieve productivity improvements as a byproduct of these solutions."

Oregon OSHA's (OR-OSHA) Worksite Redesign Grant program provided \$60,000 in grant monies. This covered the costs of design, prototyping, and installation of 4 workstations of the final configuration. It also included the pre and post evaluation reports and documentation of the workstation so that others could benefit from the research. SSI contributed well in excess of the required 10% match, in the reconfiguration and construction of the conveyor section to house the workstations. While the workstation was designed for their special needs, SSI employees believe it may be of interest to many companies with similar applications. Specifically, it would be of value on any process where manual human sorting tasks on a conveyer line are required. A good example of these would be on fruit and vegetable sorting and packing lines.

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 adjustable lift work platform. 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. 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 as design and vendor information so that anyone may research the results and adopt the technologies.

Information about developments and the status of this program can be obtained from Oregon OSHA (www.orosha.org).

Phone: 509/453-7690.

Phone: 503/947-7448.

<http://www.cbs.state.or.us/osha/grants/worksitere design.htm>

For information from Schnitzer Steel Inc contact Linda Barno, Workers Compensation Manager

Phone: 1-800-922-2689

Information about OMEP can be obtained from their website or from Patrick Kraft, Operations Manager

Phone: 503-977-8145, pkraft@pcc.edu or <http://www.omep.org>