Luhr Jensen Presses Onward with Ergonomic Improvements

The folks at Luhr Jensen & Sons, Inc. in beautiful Hood River, Oregon know first hand how improving ergonomics in a manufacturing operation can enhance the working environment for their employees. Luhr Jensen, manufacturing quality world-renowned fishing tackle since 1932, was eager to follow on the heels of a successful project that had partnered them with Oregon OSHA and the Oregon Manufacturing Extension Partnership (OMEP). Funds from Oregon's Department of Consumer and Business Services, administered by Oregon OSHA, provided grant monies for equipment developed to address ergonomic, safety or health issues.

With their first "Worksite redesign" grant program already underway, a project to replace a manual soldering operation, Luhr Jensen set forth plans to tackle another problem area. After evaluating several operations, it was decided to improve a process used to form and weld a part known to those in the industry as weld rings or also as "jump rings". Weld rings are extremely high in volume and presented several difficult to resolve manual operations.

The existing process was split into two separate but sequential operations. Parts arrived into the work area from either subassembly, painting or plating in small carriers. At a work bench station, an operator first passed one or more parts (in most cases at least a "body" and possibly an additional hook or other hardware component) through the split opening of a weld ring. To accomplish this, the operator held the ring firm in one hand using a pair of slip joint pliers. Parts were hung onto the ring with the other hand and then opening was closed tight for the next process (welding) by picking up a slip joint pliers in the other hand and twisting the weld ring shut. The part was then hung on a rack with multiple racks placed inside a box type hanger. The rack hanger was sent to a manual plasma welding station where the racks were removed from the hanger and placed on a vertical rack conveyor. The welder processed parts one-by-one on a rack and then indexed the conveyor to the next rack until all of the parts that arrived on that rack hanger were complete. The racks were placed back into the rack hanger and, in most instances, traveled to further operations such as packaging and finally shipping.

The constant twisting of weld rings in the first operation presented major wrist strain from twisting the ring shut and fingers were constantly squeezing the pliers' handles. Also, the manual welding process produced fumes and subjected the operator to eyestrain from the constant focusing on such a small feature to weld. Eliminating these issues through the design and procurement of new equipment was the goal of the project.

There were two main challenges facing the team, the first of which was to define a basic operation sequence. Questions arose such as "Will the forming and welding be done in one operation?" and "Should the operator be able to load parts while the machine is performing a process?" Next was determining exactly which products would be targeted for processing on the new device. Although there were only 7 ring sizes (from .275" to .575" inside diameter), there were a myriad of parts joined to these rings that were generally manufactured from injection molded plastic (divers, planers) and stamped brass (flashers). Some parts were extremely heavy (over 1 lb.) and some presented unique handling challenges due to close interference. In the end, the four largest ring sizes were selected as they represented 90% of production requirements. All of the ideas and requirements were assembled into a specification by manufacturing consultant Mark Biederbeck from OMEP who also managed the machine's design and acquisition phase.

After receiving quotations from several sources, the team elected to hire Engineering and Prototype Services (EPS) in Portland, Oregon to design and manufacture the solution. Although many of the machine's features and functions were described in the specification, the team still had several issues to resolve during the design process. Issues such as proper ergonomic adjustments were carefully deliberated and decided upon. In the end, no concessions on the

specification were required and the machine, after extensive testing at EPS, was shipped to Luhr Jensen in January 2002.

While the machine itself could be described as complicated, from an operator's viewpoint the operation has been greatly simplified. A ring is loaded onto a gripper, which holds the part for the operator while the remaining parts are hung over the opening. Following a cycle start initiated by a foot switch, the part travels on a rotary indexer-driven table ("carousel") to an idle station. After indexing again, from the operator loading an additional part, the part stops at the form/weld station. Out of this station it stops at an optional unload station where the part could be automatically dropped into a box. If not unloaded here, it arrives at the original point of loading where an operator manually unloads the part. The carousel, which holds four sets of parts, continues around indefinitely with parts being processed until a particular batch (which could contain several hundred parts) is completed. Changing tooling from one ring size to another requires about 10 minutes of set-up time. No tooling changes are required for changing only the part type if the ring size stays the same.

A follow-up ergonomic evaluation revealed that the areas of concern with the original process had been properly addressed. Dave Lind, Luhr Jensen's engineering supervisor, stated that "While the entire process used to bring the machine into our facility was over one year long, the wait has been worth while". He noted that an added benefit was the combining of two separate processes into one has greatly reduced work-in-process around the area.

The overall machine cost was about $82,000 out of a $109,845 grant which also provided ergonomic surveys and project management. As required by the grant, Luhr Jensen provided an additional 10% in in-kind services to assist in developing and installing the solution. Although the grant program in not being funded for additional projects, Luhr Jensen is extremely grateful for the opportunity to have provided some of it's employees with technology that makes their jobs easier to perform. Design rights for this project are in the public domain and can be obtained from Oregon-OSHA.

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/worksiteredesign.htm

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