

## Electronics Assemblers Provides an Ergonomic Boost for Tired Hands

At Electronics Assemblers Inc. (EAI), a cable and harness manufacturer in Oregon's Columbia gorge town of Hood River, the emphasis is always on finding and developing better methods of producing goods for their customers. This includes an emphasis on safety and ergonomics as well. A successful ergonomics project recently partnered them with Oregon OSHA and the Oregon Manufacturing Extension Partnership (OMEP). With funds from Oregon's Department of Consumer and Business Services, administered by Oregon OSHA, grant monies were provided for equipment developed to address ergonomic, safety or health issues. Their mission: develop a powered, hand-held or bench mounted wire stripper to remove the outer insulation from electrical cables.

Nearly every product provided by EAI to its customers incorporates wire that is processed by cutting, stripping and either soldering or crimping of electrical terminals. Although individual wires (that are not enclosed in a sheath with other wires) can be cut and stripped on automated machinery, the individual wires in multi-conductor cable must be hand stripped. This is a tedious and strenuous job worsened by high production requirements. Using manual tools commonly available in the industry, an operator endures continuous squeezing of the tool's handles and pulling of the wire to remove insulation. A solution was needed that would replace this process with a powered mechanism.

As part of the grant application process, a search was conducted to ensure that a suitable tool was not already in existence. Having found none, the grant was awarded and work proceeded on a design. In an attempt to use standard (replaceable) wire stripping blades from an existing manual tool, a design was developed to incorporate these blades. Two attempts resulted in linkages that were not efficient or too complicated for proper functionality. During conversations with the manufacturer of the stripping blades, Ideal Industries from Sycamore, Illinois, it was discovered that this company did indeed produce a hand-held pneumatically powered wire stripping device that incorporated the current blade design. An Ideal model 45-850 was immediately sent for the team to evaluate. While the tool performed wire stripping well, it was decided that additional features would be required to make the tool perform in EAI's production environment. A decision was made to change course from designing an all-new tool to modifying and enhancing the existing tool.

After trying the powered tool in production, a team represented by EAI's personnel, OMEP and the engineering firm developed a list of desired modifications. After carefully reviewing the available budget and the most important goals, the following features were incorporated into a modified tool:

- The ability to partially strip wire so that the insulation slug could be left on to protect the wire and be removed in subsequent operations. The existing tool could only completely remove the slug but most operations at EAI required it to be removed later.
- Provide interchangeable wire-guide bushings of various sizes that could be positioned at the wire insertion point. As the tool had up to four wire-size positions, it was easy to misplace the wire within the strip blades and required constant fine-focusing to the point of creating eye strain. The bushing would allow easy and direct insertion of wire into the proper position of the strip blades.
- Provide an insulated and cushioned handle covering. Compressed air is often colder and, especially on an aluminum-bodied tool as this unit, can make the tool feel "cold" to the touch.
- Compact the stripping mechanism so that shorter wire leads could be processed.
- Provide a bench-mount adapter so that both hands can be free for handling the wire only. Activation would be via a foot switch.

After the design and modifications were completed by Engineering and Prototype Services in Portland, Oregon, the tool was sent back out to EAI for evaluation. Several items required further modifications and the tool was again sent to EAI. Following an endurance trial period, an ergonomic evaluation was completed that compared the new tool to the methods and conditions originally documented on a pre-solution assessment. The final report indicated that awkward postures, forces and loads, repetition and pressure points had been eliminated or greatly reduced.

Since engineering has been completed, the overall cost for a single modified tool would be about \$3,000 which includes the base tool and the cost of parts. This could be significantly reduced if produced in greater quantities. Further documentation has been provided to Ideal Industries to incorporate these and other changes into future products. As required by the grant, EAI provided an additional 10% in in-kind services to assist in developing and testing the solution. Although the grant program is not currently being funded for additional projects, the design rights for this project are in the public domain and can be obtained from Oregon-OSHA. The Oregon Manufacturing Extension Partnership wrote the application on EAI's behalf and managed the project completion. Additionally, while completing this project, another project for a bench-top heatshrink application device at EAI was completed as well by OMEP.

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

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