

Green Welding...Utilizing the VRTEX 360 to Reduce Our Carbon Footprint

Introduction

"Thanks to a global boom in industrial manufacturing, skilled welders are in greater demand than ever" (Brat, 2006, p.1). Since the demand for skilled welders has increased the need for more advanced training facilities and equipment is a necessity. With the increased amount of welder training raises a problem. This problem is the amount of waste that is accrued throughout the training process. There are multiple forms of waste that include metal, electrodes, gases, and electricity as well as the release of toxins during the welding process. In an effort to keep our environment healthy we must find a way to combat this carbon based waste.

The solution to this problem of welder training is to initiate the use of a green welder, the VRTEX 360™. The VRTEX™ 360 is a Virtual Reality Arc Welder produced by Lincoln Electric. This machine puts the operator in a virtual reality welding simulation that can be used to train the welder for Gas Metal Arc Welding (GMAW), Shielded Metal Arc Welding (SMAW), and Flux Core Arc Welding (FCAW). With a virtual reality welding simulator the carbon footprint left by traditional welding processes will be drastically reduced.

How it works

The VRTEX 360™ welding simulator is a computer based training apparatus used to train beginning welders prior to operating an actual welder and throughout the training process. Placing the operator into a simulated environment to practice their welding technique before welding reduces the production of waste of traditional training techniques. One program utilized by the VRTEX 360™ called the weldometer, tracks the material usage and verifies the cost and savings of consumable materials that the student would have utilized while welding. The consumable materials that are associated with the welding process include metal used, gases consumed, and electrodes utilized.

This program uses five welding coupons in the shape of Flat, Tee, Groove, 2" pipe and 6" pipe. The use of these five welding coupons alone will cut down on the waste metal material that would have been utilized in the training of a skilled welder, thus reducing the carbon footprint left behind from the traditional welding training process. The coupons can be utilized in four different positions, which are flat, horizontal, vertical, and overhead. The program utilizes a traditional welding helmet that has been retrofitted with virtual reality goggles and ear buds. This allows the welder to see and hear everything that is happening just like if they were welding. The program also utilizes a realistic puddle simulation to help tie in the entire virtual reality simulation together.

The VRTEX 360™ utilizes a program called Weld Tracker. This program allows for instant feedback to the welder, which increases the learning curve of the welder. Within this program the welder can see their performance on specific indicators that affect their weld. Some of the indicators that can be analyzed are arc length, travel speed, and travel angle. With the instantaneous feedback from the program the welder can quickly utilize this information and

fix any problems they have, thus reducing the amount of wasted metal, gas, and electrodes being used by the welder. The other aspect of this program is the ability to track a welder performance from start to finish during the training program. The ability to track performance of the different welding indicators from one weld to the next will show areas that need improving.

The utilization of a virtual reality welding simulator also creates a safer environment for the welder to practice and hone their skills. Some safety concerns for welders include the exposure to welding fumes created by the welding process. There are different pollutants in welding fumes, but one that can cause death after prolonged exposure is carbon monoxide. The carbon monoxide pollutant can be “found in fumes of SMAW, GMAW, and FCAW” (Balchin, 1993, p. 160-161) welding processes. This is the reason welding facilities utilize ventilation systems, to reduce exposure of welding fumes to the welder. With the virtual reality welding simulator there is no risk of exposure to these harmful fumes that are created, and also reduces the amount of carbon released into the atmosphere from welding training.

Results to Date/Implications

Iowa State University offers one agricultural mechanics course that covers construction, electricity, small engines, and welding skills training; thus allotting roughly four weeks for each skill area. The students enrolled in the spring 2011 course utilized the VRTEX 360 prior to the welding section of the course. The students had positive feedback regarding several variables associated with the machine; however, they did indicate the need for access to the machine throughout the welding process. The feedback from the students led the department to recently purchase a VRTEX 360 to assist in the training of pre-service agricultural education teachers and reduce the department’s expenditures on welding consumables. The VRTEX 360 will also be used for in-service welding workshops and other training opportunities hosted by the department.

Future Plans

A research project has been designed to be implemented in the Fall 2011 course measuring the consumables utilized by a control group that does not use the VRTEX 360 for training purposes compared to a test group that will utilize the VRTEX 360 as a training aid. Data collected from the weldometer will also be reported to track “virtual” consumables used.

Costs/Resources Needed

The faculty in Agricultural Education department applied for and received funding from the University’s student technology fee grant. The university was able to purchase the unit for \$45,489.00. A one-year software upgrade for \$7,440 is optional. The researchers also recommend storing the VTREX 360 in a clean, and temperature controlled environment.

References

Balchin, N.C. and H.R. Castner. 1993. Health and safety in welding and allied processes. New York: McGraw-Hill.

Brat, I. 2006. Where have all the welders gone, as manufacturing and repair boom. The Wall Street Journal Online. <http://visiblewelding.com/SourcelItems/Wall.Street.Journal.Where%20Have%20All%20the%20Welders%20Gone.pdf>

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