How VR Welding Simulators can Improve the Workforce & Position Welding Operations for Future Success

As a generation of welders prepares to retire, manufacturers that depend on high-quality welding professionals will need to find more creative ways to fill those vacated positions with new talent that understands the science of welding and possesses appropriate skills.

BY JASON SCALES PH.D.
It’s no secret that finding, recruiting and training highly skilled welders will continue to be one of the most challenging aspects facing the welding industry throughout the next decade. But the question remains – what tactics or technologies can be deployed to ensure a steady supply of highly trained welders will keep operations at or near peak production through this period?

With the shortage of skilled welders projected to reach 400,000 by 2024, competition for top talent can also be expected to increase and create further strain on labor quality within the manufacturing industry¹. To maintain or gain an advantage, employers will need to consider more intently the expenses and resources allocated to attract, identify and hire the best welders.

While there are a variety of methods and technologies available to assist in the hiring process, the application of Virtual Reality (VR) simulators is one area that is being evaluated by several industries for its potential to impact recruitment in a positive manner.

VR was introduced in the 1960s and throughout the decades has evolved from a mere novelty to a more practical hands-on training tool. In the last 10 years, technology breakthroughs have advanced the VR experience significantly. Today’s VR utilizes faster frame rates, more precise eye-, head- and hand-tracking technology, and integrates higher-quality visual and audio effects to create a more fully immersive three-dimensional world. With these advancements, users can experience different aspects of “reality” as the user moves within the simulated environment like never before. This has made VR considerably more realistic and representative of real environments, and is emerging as a more useful and cost-effective tool for validating job skills or providing professional training.

Applications include the ability to demonstrate practical on-the-job-skills in the interview stage, as Lloyds Banking Group recently administered to provide potential candidates the opportunity to show – instead of tell – how they can perform on the job.² VR has also gained value as a training and onboarding tool for new employees in several industries, especially for high-risk or high-stress jobs (such as firefighting) in preparation for the realities of the position³.

With virtual reality expected to continue to grow in popularity among general consumers – annual shipments of VR systems are expected to reach 13.5 million in 2018 and 55 million by 2022 – it behooves human resources managers to seriously consider the cost benefit of adopting and implementing the technology in some form.⁴

VR simulators designed specifically for welding training facilities, schools and the general welding industry, immerse users into a safe, “virtual” welding environment that can be used not only for training, but to test and evaluate all levels of welding skill and ability.
Challenges and Solutions

In this white paper, we address six common labor recruitment challenges experienced in the welding industry. We also explain how the addition of a VR trainer can help streamline recruitment and workforce development initiatives to identify and verify welding talent quickly and accurately, while simultaneously providing an affordable and effective continuing workforce development solution.

1. There is a shortage of younger, highly skilled welders in the workforce.

In order to increase the recruitment potential for new welders, the welding industry must continue to proactively attract would-be welders to the field and promote welding as a viable career option. One way to accomplish this is to develop more engaging partnerships between welding employers and welding educators. By offering more enriching opportunities, such as internships and job-shadowing experiences, or participating in events like career fairs, welding organizations can play a major role in encouraging the growth and development of new welders.

VR welding simulators can easily be used by those with little or no experience, and also without supervision. Because there is no need to wear proper Personal Protective Equipment to protect participants from sparks, slag, radiation or intense heat, VR trainers make the idea of welding more accessible, approachable and real to a larger, more diverse group of people.

When mindfully presented as part of an introduction to welding or a training program, VR trainers can provide that hook of excitement that can encourage further pursuit of an interest in welding or generate development of more advanced and job-applicable welding skills. It can also be applied to reinforce or supplement training to help new welders hone more specific welding skills in preparation for more advanced welding, or when welding on the shop floor or in the welding booth is simply not possible due to age, experience or legal restrictions.

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The hiring process for welding candidates can be time-consuming and result in misallocated resources.

Despite the threat of an impending welding skills gap, there are still many qualified welders searching for jobs. With multiple job recruitment products and technological tools available to advertise opportunities and collect applications, employers can cast a wider net than ever to attract new hires. Sorting and ranking applicants using keywords and other internal metrics also help automate the process.

One thing HR recruiting software programs can’t do, however, is offer a hands-on welding test – which is often the deciding factor and most crucial step in the interview process. These tests can take hours to complete, depending on the complexity and level of detail required.

Among the many advantages of a VR welding trainer in this capacity is the ease of set-up. Tests on a VR trainer can be conducted anywhere in proximity to an electrical outlet. This saves manufacturing operations from having to order materials, schedule or block off time on the shop floor in advance, and possibly close off space that could otherwise be used for more profitable welding production.

Tests can also be completed much faster on a VR trainer compared to the real welding environment. On some VR simulators, a weld on one coupon can be completed in 10-15 seconds, as opposed to 10-15 minutes in the welding booth. There’s no need to tack plate or toss scrap, which means you can simply turn on the machine and start welding within seconds.

In addition, VR screening provides a measure of safety and reduced liability associated with applicant or employee testing.

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HOW VR WELDING SIMULATORS CAN IMPROVE THE WORKFORCE AND POSITION WELDING OPERATIONS FOR FUTURE SUCCESS
Traditional welding tests may not catch all the signs of good or bad welding.

While traditional welding tests are an effective way to determine how well a candidate can complete a specific weld to specification, they may not show the full picture of the candidate’s skills.

Destructive and non-destructive tests can be deployed after the welding process to determine weld strength. However, these results only give hiring managers a pass-fail measure of performance, as some of the finer skills that actually occurred during the weld can only be interpreted. This is where a VR trainer can produce more pertinent information to assist in determining future welding potential.

Depending on the sophistication of a particular VR trainer, hiring managers can receive instantaneous feedback on welding speed, angle, arc length, contact-tip-to-work distance and positioning.

VR simulators with embedded video replay and other tracking functions provide another advantage for hiring managers. They can more easily see what the candidate sees and watch what is happening to the weld in real time. Using these features, hiring managers can pinpoint strengths and weaknesses faster and use VR to their advantage, engineering a more efficient and productive interview process.

By providing an additional source of welding skill and justification, VR simulators offer hiring managers the potential to achieve greater peace of mind over the interview process. This can come in handy when having to reach a decision on one strong welding candidate over another. And by tracking established benchmarks for welding performance, VR simulators can play a major role in developing individualized professional development programs for new hires who may show promise but require additional training in a specific area, such as position in the joint or contact-tip-to-work distance in Gas Metal Arc or Gas Tungsten Arc Welding.
Consumables and materials used during recruitment and the first few months of employment can be expensive.

Consider the cost of gas, electricity, welding wire and metal coupons that could be consumed during a single two-hour welding test. It’s easy to see how quickly expenses can add up during the interview process.

Factoring in just the coupon alone, which can range in price from $1.00 for 10 gauge mild steel tee joints to $240.00 for 12 inch Schedule 40 pipe coupons, the cost to test one welding candidate can easily exceed $25.00-$400.00. When there are multiple job openings with multiple candidates applying for the same positions, those costs can grow exponentially over time.

VR simulators can help welding operations significantly reduce or eliminate these types of expenses entirely because they don’t waste steel coupons or consumables. The components (including the welding gun) of real welding are replaced with replicas made from materials that provide the same look and feel as the real thing in the physical environment. In the virtual environment, they appear as three-dimensional computer-generated animations. By integrating a realistic welding gun and coupon with real welding sounds and advanced graphics, these VR trainers provide an authentic and comprehensive experience that transfers seamlessly to real welding applications.

Advanced motion-sensing technology provides another added benefit, allowing for accurate tracking and reporting of welding speed, work and travel angles, arc length/contact-tip-to-work distance and position. This data can be reviewed after making a weld or in real time to determine how an individual can perform in a wide range of welding scenarios.

An argument can also be made that VR simulators assist in future cost savings well beyond the hiring process. When used to their full potential to identify top welding talent, these machines can help to minimize production errors during onboarding and reduce material expenses earmarked for more long-term professional development training.

Some VR systems offer customized welding programs tailored to a company’s unique welding process or requirements. While these features do not guarantee welding production quality, they can provide hiring managers with a good indication of how successful new welders will be and what impact (if any) they may have on product quality. This can have a lasting positive or negative impact on production and a company’s bottom line.

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Not having the space or capacity to administer welding tests in the proper location.

Shutting down part of a welding production area to administer a test for a new hire is not an efficient use of space or company resources, especially during peak production times. Considering the average welding booth costs around $15,000, it can be expensive to create a dedicated space to administer a welding test for hiring or additional on-the-job training.

Additionally, there are other infrastructure costs and incidentals that may need to be taken into account in order to meet stringent Occupational Safety and Health Administration (OSHA) codes. Virtual welding simulators are compact and can be easily deployed almost anywhere that has a standard electrical outlet available. They also are less costly to operate than a typical transformer welder. Some VR systems, such as Lincoln Electric’s VRTEX® simulators, cost 33-43 cents less per hour than a real welding machine when turned on and not in use.

When there is no dedicated testing or training site available, VR simulators can serve as a valuable space-saving alternative, as well as cost- and time-effective solution.
Needing to pull welders with limited teaching experience off the line to conduct training.

During a shift, manufacturing organizations typically require experienced welders to serve as welding instructors with little warning when training is needed. While these employees are often uniquely qualified to provide invaluable, in-depth industry knowledge, they may lack sufficient skills to teach younger welders these processes in the most effective manner.

And in an era where younger welders have essentially had access to smart phones and other advanced technology for their entire lives, VR simulators can be a useful tool for integrating welding skills quickly and efficiently. When used in conjunction with hands-on-training, VR simulators can significantly enhance the muscle memory and fine motor skills that are required to successfully handle a wide range of real-world welding scenarios.

VR simulators don’t replace welding instructors. They help them more easily identify what other welders can do to improve their processes or make adjustments to suppress bad habits from developing. VR simulators that are designed to track and record the subtle movements of the welder can provide instant feedback and greater clarity on what mistakes may be taking place in the middle of the weld. This can help the welder make corrections and go back to the welding booth or welding line more quickly and inexpensively than traditional welding training.

Conclusion

VR welding simulators offer several distinct advantages that can help manufacturing organizations take a more proactive approach to addressing the welding skills gap.

When applied to the recruitment process, VR welding simulators can be more convenient and flexible than traditional interviewing practices. In some cases, they can provide more reliable and useful insights on a candidate’s anticipated performance.

This can be of great benefit to manufacturing organizations in need of new strategies for screening highly trained welders. Similarly, VR simulators can serve as a critical evaluation and professional development tool that can be used to pinpoint and address professional development needs and other problem areas as they arise.

In addition to providing helpful performance data and skills reinforcement, the positive impact VR simulators can have on a company’s bottom line should not be underestimated. At a time when more creative approaches are needed to address the welding labor shortage, VR simulators and their stated potential to enhance recruitment, training, product quality and costs should motivate any economically minded organization to further explore the benefits of VR integration in greater detail.

About the Author

Jason Scales, Ph.D., is the Business Manager for Lincoln Electric’s Education products and services. His background includes teaching as a former welding instructor, high school agriculture teacher and college professor. In his current role, Scales oversees Lincoln Electric’s Welding Technology & Training Center in Euclid, Ohio, and the development of advanced training products, curriculum books, technical documents and specialized training programs for customers and welding education groups.