

Weld Hawk: Leveraging Real-Time Welding Analytics for Quality and Training

The Challenge

Skilled welding requires both technical knowledge and hands-on experience, but traditional evaluation methods often provide feedback only after a weld is completed. This delayed feedback can slow skill development and make it more difficult for students to understand and correct errors.

In industrial settings, post-process inspection methods provide limited visibility into what occurred during the welding process itself. While these methods can determine whether a weld passes or fails, they often provide little insight into the factors that contributed to the result.

Organizations need a better way to provide immediate training feedback while also capturing objective process data that can support quality assurance initiatives.

The Solution

Transform welding from a reactive pass/fail process into a data-driven experience that delivers real-time operator feedback and comprehensive weld documentation.



Addressing the Welding Workforce Challenge

As experienced welders retire and demand for skilled trades continues to grow, organizations face increasing pressure to train new welders efficiently while maintaining high-quality standards. Traditional training methods often rely on post-process evaluation, limiting the ability to identify and correct issues while a weld is being made.

Weld Hawk introduces a more proactive approach by providing real-time visibility into the welding process. Students, instructors, operators, and quality personnel can view key process parameters as they occur, enabling immediate feedback and a deeper understanding of how welding techniques influence outcomes.

In training environments, this real-time insight helps reinforce best practices and accelerates skill development. In industrial applications, the same data can be captured and retained to support process verification, quality initiatives, and weld documentation requirements.

By combining training, weld characterization, and digital recordkeeping in a single platform, Weld Hawk helps organizations strengthen workforce development, improve confidence in weld quality, and promote greater process consistency.

Weld Hawk System Overview

ADVINT developed the data acquisition, analysis, and feedback technology that powers Weld Hawk, a next-generation welding characterization platform designed to improve welder training, enhance process visibility, and provide objective insight into weld quality.

Drawing on decades of experience in automated test systems, advanced measurement technologies, signal processing, and ruggedized electronics, ADVINT created a complete solution capable of capturing and analyzing multiple welding parameters simultaneously while delivering real-time feedback to operators.

Weld Hawk continuously monitors:

- Voltage
- Current
- Power
- Gas flow
- Wire feed speed

Using proprietary signal conditioning, filtering, and analysis algorithms, Weld Hawk evaluates welding performance as each weld is being made. When key process parameters begin to move outside acceptable ranges, operators receive immediate feedback, allowing corrective action before weld quality is affected.

Unlike traditional inspection methods that only determine whether a completed weld passes or fails, Weld Hawk provides continuous visibility into the welding process itself. This real-time insight enables instructors, operators, and quality personnel to identify trends, understand process variation, and make informed decisions that improve performance and consistency.

By combining real-time process monitoring, operator feedback, and objective weld characterization, Weld Hawk enables organizations to support more effective welder training, enhance quality outcomes, and document process performance with confidence.

Flexible Hardware Integration

Weld Hawk requires the simultaneous acquisition of multiple sensor inputs, including both analog and digital signals. National Instruments hardware simplified integration of the diverse sensing technologies used in the platform while providing the measurement performance necessary for accurate weld characterization.

National Instruments hardware and LabVIEW software provided a flexible development platform for data acquisition, signal processing, hardware integration, and user interface development. This allowed ADVINT to focus engineering resources on welding analytics, characterization algorithms, and operator feedback rather than developing foundational measurement infrastructure from the

ground up. NI's modular architecture also provides scalability for future enhancements and the integration of additional sensing technologies.



Real-time Analysis

Fast, accurate analysis of incoming data is paramount in this application. LabVIEW offers extensive mathematics, filtering, and analysis libraries, allowing ADVINT to rapidly develop adaptive front-end filtering that produces clean, high-resolution data for analysis. These tools support offset removal, level-shift correction, and noise reduction—enabling quick implementation without the time required to develop routines from scratch.

Intuitive Operator Experience

ADVINT developed a custom LabVIEW-based user interface that provides real-time visualization of welding parameters and system status. The interface was designed to closely reflect the physical welding environment, enabling operators and instructors to quickly interpret system feedback and make informed decisions during the welding process.

LabVIEW's integration capability of multiple device Application Programming Interfaces simplified communication with the various devices and sensors used throughout the system.

Conclusion

Weld Hawk demonstrates how advanced measurement technology and real-time analytics can transform welding from a reactive process into a data-driven discipline.

By combining National Instruments hardware, LabVIEW software, and ADVINT's expertise in automated test and measurement systems, Weld Hawk delivers real-time operator feedback, objective weld characterization, and comprehensive process documentation in a single platform.

The result is enhanced skill development, improved process consistency, and greater confidence in weld quality. Rather than relying solely on post-process pass/fail inspection, instructors, operators, and quality teams gain actionable insight throughout the welding process, enabling continuous improvement and more informed decision-making.

As training organizations and manufacturers seek new ways to improve workforce development and quality outcomes, technologies such as Weld Hawk provide a practical path toward more effective training, greater process visibility, and higher confidence in every weld produced.

About ADVINT

Located in Columbus, Ohio, ADVINT is a veteran-owned small business and a recognized leader in the design and build of automatic test systems for military and commercial applications. As a full-service system integrator, we provide end-to-end hardware and software development, custom fabrication, and turnkey solutions tailored to the most demanding environments without compromising precision or performance. Our multifaceted platforms integrate advanced data acquisition, control, and analysis capabilities, empowering clients to solve complex challenges in any industry (clean energy, aerospace, defense, life sciences, manufacturing, etc.). Whether you're seeking real-time field diagnostics, intuitive user interfaces, or scalable automation, ADVINT, known for unsurpassed customer responsiveness, supports everything from early-stage consultation to full deployment.

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