Oxygen Monitoring in Welding Applications

By Zachary Carr

Achieving the perfect weld is the sought after prize for welders worldwide and is earned through the culmination of several properly executed steps. One such step is known as "pipe purging." Pipe purging occurs before any actual welding takes place and is the process by which inert gases (e.g., argon) are introduced into the welding zone to displace the oxygen and create a pure welding environment. Oxygen monitors are used to monitor the level of oxygen present in a welding environment, allowing the welder to know precisely when the target oxygen level has been reached. In this article we look at the quality, capabilities, and features of an oxygen monitor that are most beneficial to the welder.

The Pipe Purging Process

Before welding can begin it is customary to purge the weld zone of all oxygen to protect the root gap from oxidation and ensure a high-quality weld. Purging is accomplished by introducing inert gases, such as argon, into the weld zone. The argon gas displaces the existing atmosphere, including the oxygen, thereby evacuating it from the weld zone. This process is continued until the required level of oxygen is reached and a pure welding environment is secured. If the root gap is not adequately protected, problems may arise that can threaten the integrity of the weld. For example, oxidation can cause discoloration and can lead to metallurgical imbalances, especially in some stainless steels. Gross oxidation can degrade the mechanical properties of a pipe and significantly reduce its resistance to corrosion. To ensure an adequate purge, precise monitoring of oxygen levels is required.

The Oxygen Monitor

In order successfully monitor the oxygen levels in a welding environment, today's welders use sophisticated technology to perform complex welds. Oxygen monitors, like the Aquasol Corporation's PRO OX®–100 Programmable Digital Oxygen Monitor, are used as a critical tool in the quality control process in a myriad of industries.

The overall quality of an oxygen weld monitor is largely dependent on the quality of the oxygen sensor it contains. A superior oxygen sensor leads to more precise readings, which lead to a higher quality weld. Precise readings are crucial to a proper purge being achievable leading, ultimately, to a higher quality weld that is free of threats from oxidation. For these reasons, manufacturers rigorously test the accuracy of sensors.

Aquasol provides each customer with a calibration certificate acknowledging that their product has been thoroughly tested and inspected by an Aquasol engineer to meet claimed accuracy capabilities of 99.995 percent, Ar +/- 0.01 percent, the requirements specified by the National Institute of Standards and Technology, and those of Aquasol's own quality assurance regulations.

The PRO OX–100 features an internal pump that allows for hands-free maneuvering when monitoring oxygen levels. The pump draws an oxygen sample from the environment and the monitor has an easy-to-read, digital LCD display of 0.00-21.00 percent oxygen with 0.01 percent (100 ppm) resolution.

Aquasol Corporation Electrical Engineer Dipayan Majumder explains: "Other oxygen monitors use a hand aspirator to sample gas from the root gap. This creates variable pressure pulses on the sensor. All oxygen sensors are affected by such pressure pulses and read incorrectly. Hand aspiration also brings fatigue to the operators during long purge operations. The PRO OX–100 uses a constant-flow pump to sample gas uniformly and provide the most accurate result."

Features and Function

The features and functions of an oxygen monitor are important to know when deciding which monitoring device will provide the most precise results for the most affordable price.

Data reporting is extremely important. The PRO OX–100, with software reporting technology, has unique data logging capability. Welders can create permanent records of real time data (at 15 second intervals) of oxygen levels for critical welding operations. The user can capture up to 50 data points and offload information to a PC via an USB interface. This helps to ensure data integrity at all times.

Oxygen contamination is one of most common causes of substandard welds, so having absolute confidence in oxygen level readings is critical. The PRO OX–100 is equipped with an audiovisual alarm, which the user can program to a specific oxygen ppm value. Once the target value is reached, the alarm reaches both the eyes and ears as it alerts the user by emitting an intermittent beep simultaneously as a green light flashes. This allows users to perform other weld preparations while the weld zone is being purified, thus making the overall welding operation more efficient.

Conclusion

When evaluating an oxygen weld monitor remember to consider how features can maximize efficiency, reduce costs, and enable the perfect weld. Mike Hacikyan, CEO of the Aquasol Corporation, summarizes: "The design and features of the PRO OX–100 are the result of listening to distributors and clients, worldwide, who expressed the shortcomings in the market today. Our aim was to substantially raise the bar by incorporating the best technology into our product while still offering the fairest pricing. This resulted in the creation of the PRO OX–100, which we consider the most comprehensive and affordable solution for welders in the 21st century." ■

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