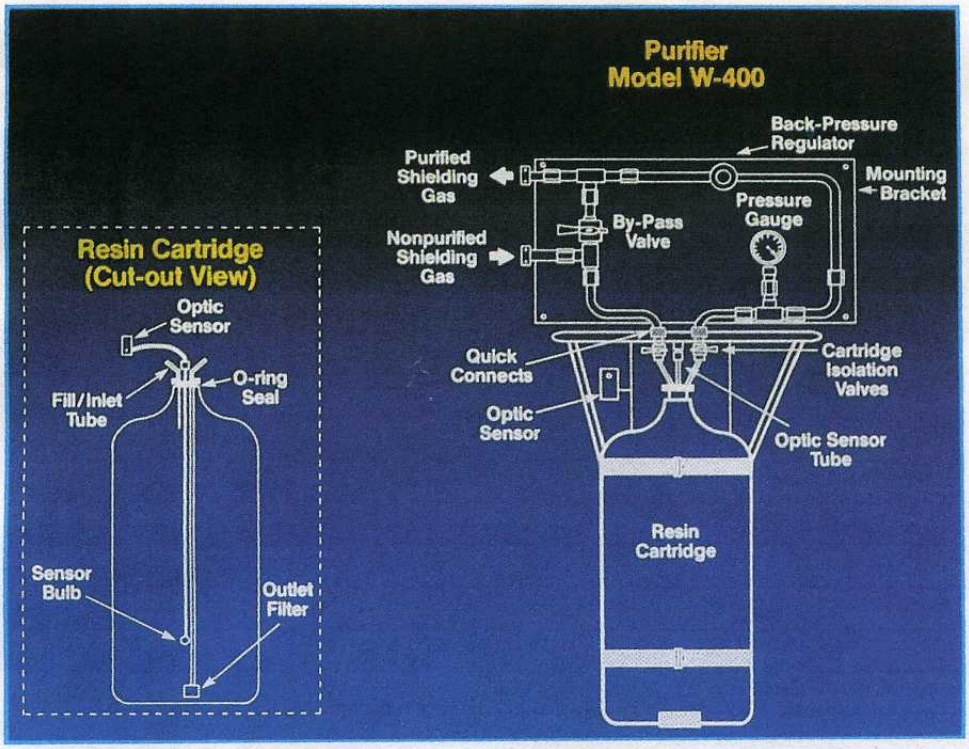

Fig. 5 — Nanochem gas purification system for welding.

and backing gases were not very great. In fact, the impurity level was only slightly higher than the normal specification of welding-grade argon, which is 50 ppm or 99.995% argon. If the level of oxygen and moisture in the cylinder had been higher, which is not uncommon, the impact toughness of those welds made without purification would have been even more inferior.

Purification

The new resin can provide effective removal of a variety of impurities to less than 10 ppb — the limit of sensitivity of our test equipment. The purifiers are simple to use, have low energy requirements and operate at room temperature.

The purifiers are most frequently used to remove moisture, oxygen, hydrocarbons (such as oils from compressors) and carbon dioxide from welding gases such as argon and helium. The efficiency of impurity removal with a purifier system is independent of the level of impurities in the gas stream. Impurity surges as high as 50,000 ppm are completely and irreversibly removed from the gas.

The gas purification system (Fig. 5) can be mounted on the wall or on the welding power supply unit. The system consists of two major components: a gas manifold and a refillable aluminum cartridge that holds 4 L of active resin.

Operation

The gas purifier system is installed in the shielding/backing gas lines between the welding power supply and the torch. Hose lengths between the purifier and torch should be kept as short as possible to obtain the highest quality gas at the torch. Short hose lengths minimize permeation of airborne moisture and oxygen through the hose walls.

The system can handle flow rates up to 60 ft^3/h (28.3 L/min). The lifetime of a 4-L (20.34 ft^3) system operating around the clock at 30 ft^3/h (14.2 L/min) with an impurity level of 10 ppm is approximately one year. Intermittent use will, of course, result in proportionally longer service life. No external heating or cooling is required to operate or control the system. A built-in fiber-optic sensor signals when the resin is spent. The probe measures the inherent color change of the resin as it goes from the active to inactive state. The sensor output is a red-light-emitting diode (LED) that illuminates as the resin approaches inactivity. The resin should be replaced within two weeks after the LED shows red.

Conclusions

The quality of welds made by GTAW will depend on the purity of the welding gas as well as the welding practices used. Purification at the point of use ensures consistency. Purification of argon shielding gas and backing gas improves impact toughness of Ferralium 255 duplex stainless steel and E-Brite 26-1 ultrahigh-purity ferritic stainless steel.

Regardless of the alloy system being welded, a purification system incorporated in the welding process will ensure that the best possible gas is delivered consistently to the weld environment. Variability in shielding and backing gas quality due to cylinder-to-cylinder variations, manifold cross-contamination problems, and/or minute piping leaks, will be essentially eliminated.

The ability of purifiers to handle impurity surges will provide insurance against major system upsets. Downtime (due to system upsets), as well as costly repairs (for rework of defective welds), should be minimized also with the use of purifiers. ♦

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