WA Technology

The Gas Saver System (*GSS*™) Provides Low Moisture and Gas Permeability

An anylisis using data from an AWS Welding Jornal technical article, shows our ***GSS***, because of it's unique design, may have over 10 times lower moisture and gas permeation compared to a conventional 1/4 inch ID gas delivery hose made from the same material!

Background/Hose Construction:

Moisture and gas permeation (the diffusion of moisture and gases) into the shielding gas delivery hose can be a problem, particularly when welding aluminum, high strength steels, titanium, and for other critical welding applications. It is especially noticeable when welding in a hot humid environment.

An AWS Welding Journal article (July 1999) entitled; "How Weld Hose Materials Affect Shielding Gas Quality" presents some interesting test data that indicates our patented ***GSS*** construction may provide more than 10 times lower moisture and gas permeation.

Our custom extruded ***GSS*** (patented, inert gas delivery hose system) is made from a material considered having low permeation, 8 times lower than rubber, for example. Like other shielding gas delivery hoses, it is made from self-extinguishing, polyvinyl chloride but with a unique size and multipart construction.

The ***GSS*** hose is extruded in two layers with internal fiber reinforcement between them. The outer layer is dark gray in color while the inner layer, in contact with the shielding gas, is clear. It has an 1/8 inch ID, half that of more conventional 1/4 inch ID gas delivery hose. It also has a very heavy wall thickness and a much larger OD than typical hose with a similar ID. In addition to typically providing a 40 to 50% reduction in gas use (by reducing waste caused by the "*gas blast*" that occurs at each MIG or TIG weld start) its unique construction has some interesting properties that significantly reduce moisture and gas permeation. For its gas saving characteristics see:
http://netwelding.com/How_GSS_Works.htm

Data From Welding Journal Article:

The first item mentioned in the subject AWS Journal article is *the larger the exposed surface area the greater the gas permeation.*

The ***GSS*** hose has half the ID and about half the OD surface area of a conventional 1/4 inch ID gas delivery hose. Since the rate of permeation is directly proportional to surface area there is about half the OD area exposed to the atmosphere so the rate of permeation entering the hose should be about half that of a conventional 1/4 inch ID gas delivery hose made from the same material. The inner surface is also half of a conventional ID hose. The ***GSS***'s exposed area to the shielding gas is half that of a conventional 1/4 inch ID hose.

The second item mentioned in the AWS article is *the length of the diffusion path*. The ***GSS*** has a very heavy wall thickness compared to conventional hose having a similar ID. It is thicker than many 1/4 inch ID hoses, however it is difficult to quantify how much thicker. That is dependent on the specific 1/4 inch hose being compared. It is safe to say it is at least as thick.

Therefore based on OD and ID surface area and the same wall thickness it may provide one-half times one-half or 25% of the gas permeability based on just the size, or 4 times less.

Hose Color

The AWS article presents test data comparing black PVC hose with clear Tygon hose that some have used in attempt to reduce permeation. In a test of an 8-foot hose, they found the moisture permeation was 8 ppm for the clear Tygon hose and only 5.5 ppm for the black PVC hose. Oxygen permeation was even lower, 0.7 ppm for the clear Tygon hose and only 0.1 ppm for the black PVC hose. They attribute the superiority of the PVC hose compared to clear Tygon hose to the coloring agents employed, which reduce permeation.

Gas Velocity, Exposure Time:

An Air Products fabrication shop using our ***GSS*** hose reported significantly lower moisture permeation compared to a special lined hose they tested, our first thought was the reduced exposure time, and ID area may have been the main contributing factors. The AWS article presents test data based on differing flow rates. A clear Tygon hose was tested and exposed to an external environment of about 55%

humidity. Gas flow rate was varied and the following moisture pickup data obtained:

Gas Flow Rate CFH (cubic feet/hour)	Moisture Permeation ppm (parts per million)
20	9
15	11
10	18
5	34
2	95

The gas flow exposure time will be 4 times faster in our 1/8 inch ID ***GSS*** hose compared to a 1/4 inch ID hose since the area is 25% less. Using the above data and comparing 20 CFH with the 5 CFH moisture permeation provides a ratio of 34 to 9 ppm or 3.8 times less as would be expected, since exposure time is one fourth.

Conclusion; *GSS* Hose Permeation

Gas permeation of a ***GSS*** hose based on the physical differences versus a 1/4 inch ID gas hose made from the same material could be 16 times less!

1. Four times less due to surface area exposed to moisture and external gases, and
2. Four times less retained volume when not welding and exposure time of the shielding gas in the hose while welding.

Therefore 1/4 X 1/4 = 1/16. At least a 10:1 improvement should be possible.

Other Factors Effecting Moisture Content in Shielding Gas

There are other factors than permeation in the gas delivery hose affecting gas contamination:

1. In addition to the quality of the gas source itself, the pipeline delivery system can have a significant influence on moisture and gas intrusion. Threaded joints in a gas pipeline can leak with welded joints being preferred. These can be checked with a leak detect solution. Ultrasonic leak Detectors have come down in cost, under $500, but have some limitations. We have found they pick-up small air leaks so air pipelines should be shut off. They also pick-up “arc noise” and motor brush electrical noise so testing needs to be done when these are not being used.
2. Hose fittings can also leak and must be checked. Of interest, the Compressed Gas Association, inert gas fittings used for our ***GSS*** hose have the same hose barb length as that used for normal 1/4 inch ID hose. Therefore, the hose barb to ID is double for the ***GSS*** hose providing a better gas seal. We also employ a constant tension hose clamp to assure a consistent quality gas seal. As with all fittings these can be checked for leaks with a leak detect solution.
3. Gas cylinder regulator valve seats can cause leaks. We have found several newly filled cylinders with regulator seat leaks. *All fittings should be checked for leaks with a leak detect solution.*
4. Internal connections in a welding machine and at the TIG torch/MIG gun hose connections should be checked. These should be checked periodically for leaks and replaced as needed. We found a leak from inside a welding machine using an Ultrasonic Leak Detector that would have been impossible to isolate without talking the sheet metal off, which had to be done when it was indicated it was coming from inside the machine.
5. For most MIG guns, there is a backflow of gas into the wire inlet to the gun. This should be minimal but; when gas leaks out of an opening, moisture and atmospheric gases will diffuse back though the same opening based on partial pressure differences.
6. We recommend, checking shielding gas flow rate at a MIG gun nozzle or TIG gas cup using a quality portable flowmeter (like our WAT PFM.) Check with gas flow set at the welding rate. Then with the same flow setting, check the gas flow going into the welder by removing the gas delivery hose connection from the wire feeder or welder. Then insert that hose fitting into the same portable gas flow meter. A difference in flow readings defines leaks in the system.
7. An additional benefit of the ***GSS*** hose is the purge time required is only 25% of a standard 1/4 inch ID hose. If welding is intermittent, the gas contained in the gas delivery hose when welding was stopped should be purged using manual activation of the gas solenoid or preflow. If using preflow, the contents of a ***GSS*** hose will purge in 25% of the time of a 1/4 inch ID hose. In a semiautomatic MIG operation, this is less frustrating for an operator who is more likely not to alter the setting!

   One customer with 62 TIG systems making critical aircraft aluminum duct welds using ***GSS***’s said they were able to cut their preflow time from 4 seconds to 1 second.

Fabricator Testimonial

The Air Products fabrication shop, that initially found lower moisture results when using our ***GSS***, manufactures cryogenic gas tanks and gas liquefaction related products. After several days of testing, they stated; *"The **GSS** hose demonstrated properties that show a high degree of resistance to moisture aspiration."*

This fabrication plant has purchased over 230 ***GSS's*** for their TIG and MIG welders. Most important, they report for the past several humid summers, after installing ***GSS***s the incidence of moisture related welding problems have essentially been eliminated! Weld moisture related defects, mostly porosity in critical aluminum welds, had previously been a problem in the summer months.

In fact theyreplaced their TIG gas hose from welder to TIG torch with ***GSS*** hose because of the results they have achieved! They have some long gas delivery hoses and very long gas hose from TIG welders to TIG torch, some 100 feet long.

With their two plants they have purchased over 30,000 feet of ***GSS*** hose!

PLANT NEAR OCEAN

The Air Producst plant in the South is located on the coast and can experience high humidity. They relayed the following experience:

They operate only on one shift and their ~70 foot TIG torch lines are coiled when they are idle. In the morning they found they had to purge the torches and lines for 4 to 5 minutes. The Welding Enginerer stated that moisture could be seen exiting the torches during the initial purge time!

With the ***GSS*** hose replacing the standard TIG gas hose that purge takes less than a minute!

ANOTHER FABRICATOR REPORT

Chart Industry making natural gas liquefaction equipment has over 500 ***GSS***'s for MIG and TIG welders. They found TIG torch hoses were leaking gas. Below picture is from a video they sent showing what they found testing a IG torhc:

The picture was captured from the video and shows gas leaks with hose pressure equal to when it is flowing gas while welding, 4 psi. Most gas was escaping near the torch end where it flexes significantly but it was also leaking along the length. At full pipeline pressure, 60 psi with the hose blocked, water was coming out of the bucket!

When flowing gas, the hose pressure is only 4 psi as pressure drops in the flow control when welding. That is a feature called "automatic flow compensation," "compensated flow," or "choked flow." This feature is built into quality MIG and TIG gas flow systems and has been since the processes were introduced in the 1950's! The flow is determined by the pressure upstream of the flow control needle valve or orifice flow control as long as it is above 25 psi. Flow remains at the preset level regardless of typical downstream flow restrictions that occur when welding. This is a key feature maintained by the ***GSS*** since it does not alter the system pressure.

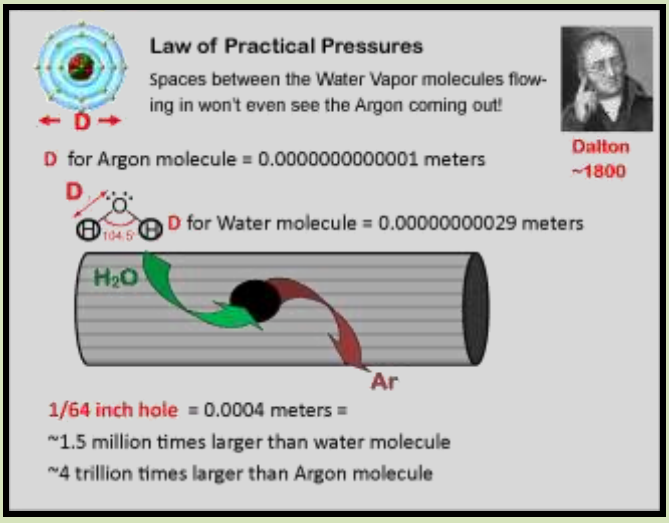
The fabricator replaced all their TIG torch hose with ***GSS*** hose.

ENGINEER SOLVES POROSITY PROBLEM

A Miller field welding engineer tried a number of possible cures without success to remedy a porosity problem in a TIG welding aluminum automotive application. He installed a ***GSS*** from cylinder gas control to welder. Then replaced the 50 foot gas hose from welder to TIG torch with a ***GSS*** hose and eliminated the porosity.

GAS LEAKING OUT MEANS GAS LEAKS IN!

Remember, as Dalton in 1800 defined, gas molecules are so small (compared to a hole in the gas hose) that water vapor flowing back into the hose won't collide or even know Argon is moving out! It follows the laws of "Partial Pressure."



For further information, Email:
Jerry_Uttrachi@NetWelding.com

WA Technology

$ave 30% to 50+% of MIG Shielding Gas And Improve Weld Start Quality

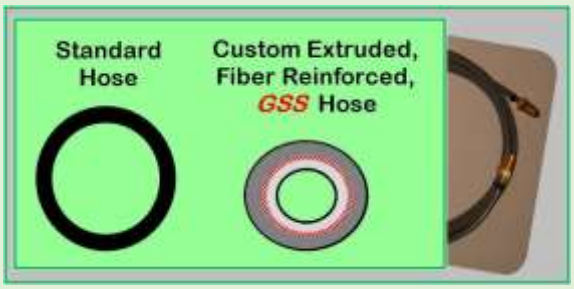
THE PROBLEM:

An article published in Trailer Body Builders Magazine quotes an engineer from Linde/Praxair, a leading manufacturer of shielding gases, indicating the average fabricator consumes 3 to 5 times the gas needed.

A MAJOR CAUSE OF GAS WASTE

Typical regulator outlet pressures are 25, 50 and 80 psi; pipeline pressures are often about 50 psi. However, the pressure needed at the feeder to flow the shielding gas though the solenoid, fittings and gun is typically 3 to 7 psi. When welding stops gas continues to flow into the gas delivery hose, until pressure increases to the output of the regulator or pipeline. When welding is started, the pressure drops rapidly to that needed to provide the desired flow. The excess gas that built-up in the hose is expelled in a very short time, wasting gas.

PATENTED GAS SAVER SYSTEM



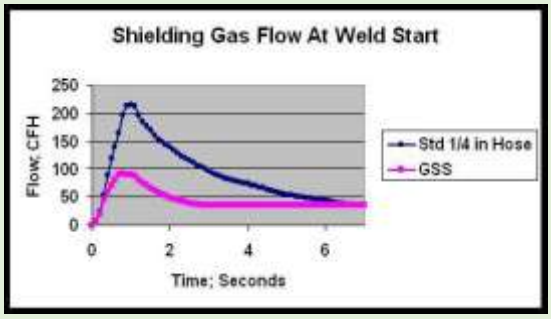
A simple way to significantly reduce shielding gas waste is to employ a shielding gas hose with a smaller ID.

Secondly, incorporate a flow restriction orifice on the wire feeder end of the gas hose. This has the benefit of additionally reducing gas waste and improving weld start quality. The ***patented Gas Saver System (GSS™)*** incorporates a small ID, heavy wall thickness hose with a flow restrictor built into the hose connection at the wire feeder end. The flow restrictor is reduces start surge but allows the welder control of the steaty state flow.

The ***GSS*** maintains system pressure to retain "automatic flow compensation" used since the introduction of MIG welding in the 1950s! This also supplies a small amount of extra gas at weld start, needed to purge air.

PRODUCTION RESULTS

The following is a graphic presentation of test data from a pipe fabricator. The gas surge at the weld start was reduced by 85%. They achieved a 50% reduction in total gas usage and significantly improved weld starts quality:



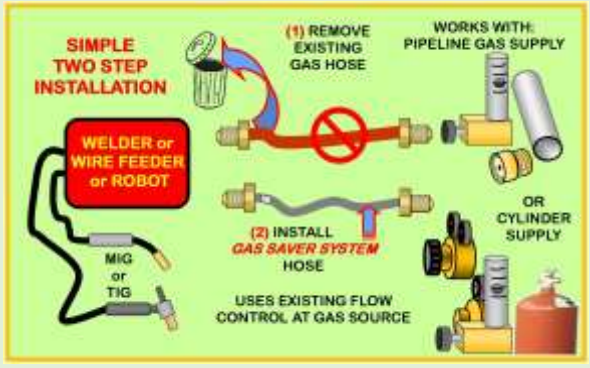
With a standard gas delivery system the surge flow rate is turbulent and mixes air into the shielding gas stream causing excess spatter and porosity. For this pressure piping application all welds must be UT inspected. The ***GSS*** restriction orifice eliminated problems caused by air in the gas stream and significantly reduced internal weld porosity at the start.

Our website, www.NetWelding.com has much more information - visit.

BOTTOM LINE

The WA Technology *GSS* has no moving parts to wear, or leak; no pressures to set or knobs to adjust.

It's easy to install on cylinder or pipeline gas sypply. Just replace the existing gas delivery hose with our patented *GSS.*



Welder's can set any reasonable flow rate with exiting flow controls. They also LOVE the improved starts. Well over 15,000 sold.

It Works!

US Patent Number 6,610,957,
www.NetWelding.com

Welding Accessories Technology