

Prices for Argon and Helium More than Doubled Recently The January 2019 Issue of “gasworld” Shows it Will Get Worse! We Show at the End, What Can Be Done About It



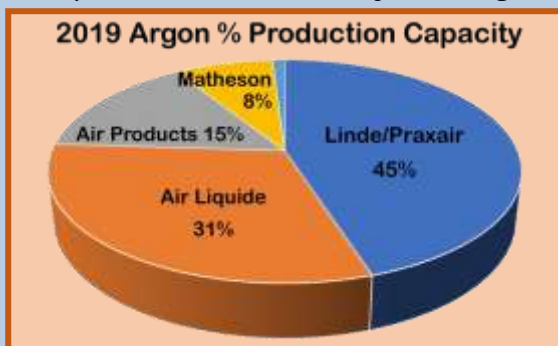
This summary of the January 2019 issue of “gasworld”, ‘Increasing Argon Demand, Tightening Supply,’ presents several article titles listed with key points:

Distributors Jostle for Position as Argon Supplies Tighten

- Some distributors are already on Argon allocation.
- Steve Ruoff at Universal Gases, “The Argon market continues to tighten...”
- Brad Peterson of Mississippi Welders, “The disruption of Air Liquide buying Airgas and Praxair/Linde AG merging are rearranging the chess board.” Distributors won’t “reveal to many cards” about future Argon supply plans!

Argon Growing Tight with Growing Demand

This pie chart shows a major change in US Argon production that occurred with the recent acquisition of US Industrial Gas Supplies by two European companies, Air Liquide (France) bought Airgas and Linde AG (Germany) buying Praxair. Matheson Tri-Gas have been acquiring US gas distributors/producers for a number of years. They are owned by Japan Oxygen!



After Argon prices have more than doubled in recent years, Air Products with 15% Argon production capacity raised prices 40%. Probably with increased acquisition cost pressure they raised price 20% in 2018 and announced another 20% price increase January 1, 2019. They have a larger capacity/market share of Industrial gases than the 15% for Argon and are probably a net purchaser of that limited supply gas from others!

GET READY FOR ARGON ALLOCATION!

Argon: More Uses Than You Think

- Argon plays key role in the welding industry (the #1 market segment)
- It's used in manufacturing aluminum and high-quality steel
- Health Care: Cryo-needles destroy kidney tumors, heart rhythm issues
- Wine Industry: Argon displaces air in aging barrels and bottles
- 3D Printing: For Laser in metal power beds
- Home/Auto: Thermal insulation of windows and car air bag inflation.

The following is our prior report about rising Argon Prices

2017/2018 Brings Major Changes!

Merger of 4 industrial gas producers in has two companies with ~79% of the American Argon Capacity! If you thought doubling of Argon and Argon/CO₂ Shielding gas prices recently was excessive- - HOLD ON TO YOUR WALLET!



Using the data presented in a US Argon Market Report (reference 3) the Argon production capacity graph left was produced! It shows the German company Linde AG who in 2019 is finalizing the purchase of my old company, Praxair (*who divested of their welding and cutting businesses in 1985 and changed their name*) and Air Liquide a French company, who bought Airgas, now have a combined Argon production capacity of 79% in America! It is probably ~75% today- Scary.

My personal experience with European industrial gas companies indicates they don't care about the welding hardgoods or welding filler metals businesses! (*In fact, Air Liquide sold their welding hardgoods businesses when they bought Airgas!*) In Europe they sell gases, their sales people are trained on selling gases and the senior management far prefers a business that has:

- 1) No raw material cost,
- 2) No inventory except cylinders (*which in Europe they only rent,*)
- 3) No obsolescence or spoilage or theft of product,
- 4) Prohibitive barriers to entry (*very high cost for a competitor to enter or expand,*)
- 5) Has prohibitive costs to import from China-etc.!

When I managed a Market Development effort for what was Linde (renamed Praxair soon to be Linde again) the largest Argon producer at the time with ~50% Argon production capacity, our stated goal was keeping Argon demand higher than supply! We also owned many distributors. 100+% of our owned distributor profits came exclusively from selling gases and selling filled cylinders to other small independent distributors!

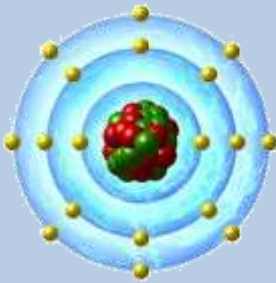
When Linde divested the hardgoods businesses to focus on the industrial gas business, I became VP of the welding, cutting and filler metals business that formed L-TEC!

From their own market research, the gas producers know over 2/3 of the shielding gas bought is wasted! Our WA Technology business is focused on reducing that waste with our low cost, patented products and knowledge!

The following provides some perspective on the cost issues related to Argon and Helium shielding gas and mixtures that include these gases. It also presents an inexpensive solution to cut gas costs. References to articles where some of this information was obtained are cited and provided at the end of the report.

ARGON

Argon is the third most abundant gas in air, after Nitrogen and Oxygen. Although Argon is less than 1%, (0.93%) that is 24 times the next most abundant gas, Carbon Dioxide at only 0.039%. This small amount gets all the press! Argon is produced by liquefying air and then distilling the Argon out in a large column. Several steps are required to achieve welding grade purity. AWS A5.32, "Specification for Welding Shielding Gases" defines 99.997% required purity and a maximum moisture of 10.5 parts per million (ppm) for liquid and gaseous Argon. A first stage distillation column produces what is called "Crude Argon" containing 1 to 2.5% Oxygen and 1 to 2% Nitrogen. The "Crude Argon" can be reacted with Hydrogen to eliminate the Oxygen. Another "Pure Argon" distillation tower is then used to remove the remaining Nitrogen and Hydrogen. This process and the extra capital equipment needed to produce Argon are very expensive. Many gas liquefaction plants built over the years did not include this extra capital cost.



Of interest, some companies have tried to market, "Crude Argon" for welding. The small amount of Oxygen present is typically not a problem when welding steel. However, the Nitrogen can be a significant problem. Reference 1 defines that 2% Nitrogen in the shielding gas is sufficient to produce internal porosity in single pass welds and as low as 0.5% produces porosity in multipass welds. Ludwig, (reference 2) used a bubble chamber and mixtures of shielding gas with various amounts of Nitrogen. He concludes, for his single pass welds, that shielding gas should not contain more than 1% and preferable 0.5% maximum Nitrogen.

Production Capacity: The pie chart on the top of page 1 from "gasworld Magazine" shows the North American Production capacity of the various Industrial Gas manufactures. The chart shows two companies dominate the market. Argon is a byproduct of Oxygen and Nitrogen production; companies must manufacture and market those gases to make Argon production economical. When very large volumes of Oxygen were being consumed by the steel industry, US Linde (renamed Praxair) installed large gas production facilities at these mills. They mostly supplied oxygen in pipelines to the mills. The large gas liquefaction plants were equipped with the added capital investment to produce Argon.

As the American steel industry reduced in capacity, the amount of oxygen needed did not require operating these plants at high capacity. However, the demand for Argon was high and growing (as it is today.) To satisfy customer demand, the plants were occasionally operated to mostly produce this 0.93% content product, Argon! Production is not economical in this situation.

Even at high Argon prices, the electric power and capital equipment investment required to liquefy air, to sell only 0.93% while venting 99% is not justifiable.

The same situation exists in the current economy; Argon demand growth is reported to be 8 to 10%, far exceeding growth of Oxygen and Nitrogen. Reference 3, states that some gas production plants are operating inefficiently to produce Argon and that the industrial gas producers are adding Argon capacity in attempt to meet demand.

Effects on Argon Prices: With demand for Argon increasing beyond that for Oxygen and Nitrogen, expect costs to increase. The following are some of the recent price increase public announcements:

After Argon prices doubled in recent years, Praxair announced a 15+% increase January 1, 2017 after increasing 35% in 2016! Air Products increased Argon 20% in 2018 and another 20% was announced January 1, 2019.

Argon gas mixtures have unique welding properties. When MIG welding steel, they provide: 1) higher weld quality, 2) reduced spatter, cutting post weld cleaning costs, 3) reduced welding fumes and 4) other weld shape benefits. Expect Argon to continue to be in demand for welding applications.

There are other Argon markets like the gas used between thermal window glass and other applications being developed.



One that will see wide use is the recently introduced Argon Plasma Scalpel! It is seeing medical use where 3000-degree Argon plasma allows cutting tumors from difficult areas like the liver with little blood loss and healing starts medically.

The solution to controlling shielding gas costs is to reduce the significant waste the average MIG welder experiences. An article in The Fabricator magazine (reference 4) defined the average MIG welder uses up to 5 times the needed shielding gas. It quantifies the excess gas surge at each weld start as a major cause of gas waste. An article in Trailer Body Builders magazine (reference 5) quotes an industrial gas supplier engineer indicating their fabricator shop survey findings show the average MIG welder consumes over 5 the amount of shielding gas needed!

Details are presented below about our patented Gas Saver System, which users report typically saves 40 to over 50% of their gas usage.

HELIUM

Unlike Argon, there is virtually no Helium in earth's atmosphere. Helium is a limited worldwide resource. The small amount of Helium available on Earth is produced by radioactive decay in materials like those in granite. Helium is obtained as a byproduct in a limited number of natural gas deposits where it is present in quantities that make it economical to extract.

Why does the Helium used not stay in the atmosphere?

Because it's so light, it escapes the earth's atmosphere and goes into outer space (only 0.0005% is in air!) Helium prices are high and increasing demand for applications such as medical uses, prices can be expected to increase.



Large price increases (~30%) for Helium started in 2013. Not only the high price, but because of limited supply, availability of Helium was allocated to a percentage of prior year use.

If you are using Helium or Helium Argon shielding gas mixtures, limited availability may be as important in reducing gas waste, as cutting cost.

BOTTOM LINE

Expect shielding gas prices to rise. The barriers to entry for companies to enter the business are so large it can't happen just because of high market prices. Argon, for example, is less than 1% of the air around us. It cannot be obtained other than to liquefy air and then distill the 0.9% Argon from that liquid. The cost of compressing and liquefying air is the major production cost. Unless a company has the ability and resources to market the Oxygen and Nitrogen it is not cost effective to only produce Argon. In fact, Argon prices would have to be more than an order of magnitude higher to justify the energy waste of liquefying then evaporating the other 99%!

To sell the Oxygen and Nitrogen requires a very large capital investment in liquification plants, transportation trucks and large cryogenic cylinders to store liquid gas in essential huge vacuum bottles! Even the best insulation causes some of that liquid gas to vent if not in use daily from the tank.

It's not viable to transport this liquid by ship from overseas. Even if that could be done, Argon is in short supply even in China where it is essential for processes such as TIG welding!

The cost of adding two expensive distillation columns to a gas liquefaction plant is very high and becomes a significant cost of a production plant. Many smaller gas liquefaction plants can't justify these extra distillation columns!

WHAT CAN YOU DO?

FIRST: HOLD ON TO YOUR WALLET-ARGON PRICES WILL INCREASE

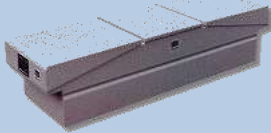
SECOND: CUT YOUR ARGON (AND ARGON/CO₂) SHIELDING GAS WASTE!

OUR PATENTED GAS SAVING PRODUCTS CUT WASTE 50+%

How Much Shielding Gas Can Our Gas Saver System Save in Your Shop?

The best way to show the gas savings and other benefits of our patented Gas Saver System (**GSS™**) is with examples from our industrial customers.

RKI, Inc a Texas truck box manufacturer evaluated the **GSS** system on a repetitive job, welding doors. They tested gas usage using two full gas cylinders. With their standard gas delivery hose, they welded **236 doors** with one full cylinder. Just substituting our patented **GSS** for their gas hose, maintaining the same flow settings, they welded **632 doors** with the other! That's a 63% reduction in gas use. Therefore, it would take 2.7 cylinders of shielding gas to weld 632 doors with their standard gas delivery hose.



After about a year of use they added 10 more welders and the purchasing manager called and asked for, "10 more the magic hose!"

Gas usage savings data from 14 other industrial fabricators is available at: http://netwelding.com/production_test_results.htm

Weld Performance Improvement:

A small shop owner, Al Hackethal, provided this feedback after he purchased a **GSS** for his MIG welder. He reported these findings:



"Well, I can't believe it. I never thought a hose could make that much of a difference. I had a small job that's been waiting for a while. The weld quality, and even penetration is considerable better. Almost no spatter! The weld seemed to be hotter and I turned my MIG down a notch.

Initially thought that my imagination had kicked in, but then realized that the gas I'm buying is actually working the way it's supposed to. Glad I found your website. This is one of the few things that really works better than any info could suggest. I understood the theory, though in practice I understood much better after the first couple of welds. Now I have better looking welds and almost no spatter, which means less grinding and finish work! In addition, the tip was cleaner after the job I just did.

This will provide savings in time, labor and maybe even consumables too. As a one man shop there's never enough time for anything. Thanks for making products affordable".

Auto Exhaust Mfg. with 6 Foot Gas Delivery Hoses Saved up to 40+%



The amount of shielding gas waste and therefore the potential **GSS** savings depends on a number of factors. The length and diameter of the shielding gas delivery hose determines the amount of excess gas stored when welding stops. The number of starts and stops are a key factor. The pressure in the gas delivery system is also important.

However a minimum of 25 psi is needed to maintain the Automatic Flow Compensation, which is significantly higher than the 3 to 7 psi needed for gas flow. Quality gas control systems use from 25 to 80 psi regulators. For pipeline gas supply 50 psi is often used also producing a high gas waste.

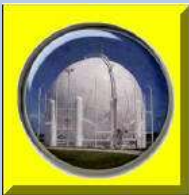
Tenneco manufactures automotive exhausts employing 128 MIG Robot Welders in one plant. They have only 6-foot shielding gas hose from the flow control at the gas source to the gas control solenoid. After a large number of tests of the **GSS** conducted during a Black Belt Lean Manufacturing Study, the welding engineer measured from 25 to 40+% shielding gas savings depending on the specific weldment. After the results, they quickly installed **GSS's** on all 128 of their Robotic Welders!

In addition, the controlled amount of shielding gas delivered at the weld start, at a starting flow rate that DOES NOT pull air into the gas stream, may allow the elimination of preflow. With the **GSS** optimum starts are achieved without wasting valuable cycle time for preflow.

Since the **GSS** retains the systems higher gas delivery pressure, Automatic Flow Compensation is maintained. In Robotic Welding operations, high duty cycles can clog welding torch gas passages such as the gas diffuser and nozzle with spatter. The gas passage in the conduit often doubles as the hose holding the wire spiral liner and can partially clog with debris from the welding wire.

Major Industrial Gas Producer Reduces Helium Gas Waste:

Air Products is a leading producer of industrial gases purchased over 250 of our patented **GSS's** for their MIG and TIG welders to conserve Helium and save money! Argon Helium gas mixtures are used to fabricate aluminum cryogenic tanks. They also found the **GSS** custom extruded hose, because of its unique design, has a significant additional benefit. It has much less moisture permeability! Result, the elimination of porosity problems they previously always encountered in humid weather due to the hydrogen in water vapor!



Want more details on reducing gas hose moisture permeation and reduced hydrogen induced porosity? Email TechSupport@NetWelding.com

How Does The **GSS** Work?

Gas waste occurs every time you pull the MIG gun (or TIG torch) trigger, even if only to make tack welds or are inching the wire to cut off the end.



To keep flow at the preset level, the gas pressure in a cylinder regulator/flowmeter is set between 25 and 80 psi. Regulator/flowgauges (those with a flow calibrated outlet pressure gauge) also operate in this pressure range.) However, to flow shielding gas though the welder and MIG gun (or TIG torch) typically requires only 3 to 7 psi, depending on restrictions. Therefore, every time welding stops the pressure in the gas

hose raises to the regulator or pipeline pressure. The increased pressure stores up to 7 times the shielding gas as the physical hose volume. At each weld start, the excess gas contained in the hose “*blasts out*” of the MIG gun nozzle (or TIG cup) at peak flows we have measured can exceed 200 CFH!

The patented **GSS** stores over 80% less gas than typical shielding gas hoses. In addition to reducing the wasted gas (which you can hear when you pull the gun trigger), the very high flow causes air to be pulled into the turbulent shielding gas stream created by the high flow. This entrained air produces excess spatter and possibly internal weld porosity.



Turbulent shielding gas flow takes a short time to become smooth, none turbulent (laminar) flow even after the starting peak gas surge reduces. That can take several seconds so at weld starts, when making short welds or tack welds you’re not getting all the benefits of the shielding gas purchased! The **GSS** incorporates a peak flow rate-limiting orifice in the welder/feeder hose end fitting, controlling peak flow rate and avoiding excess turbulence.

SUMMARY:

The **GSS** can cut shielding gas use in half or more by having 80% less stored gas in its reduced internal volume. It also incorporates a surge restriction orifice built into the fitting at the welder/wire feeder end. That orifice limits peak flow to a level that avoids excess turbulence for better starts. Note, the orifice does not limit any practical flow set on the existing flow control device. A controlled amount of extra shielding gas is still quickly provided to purge the weld start area of air. Welders appreciate the starting benefits.

Simply replace the gas hose from cylinder or pipeline supply to welder/ wire feeder with our patented **GSS**. It is available in various lengths at www.NetWelding.com The inexpensive **GSS** will pay for itself in a few months of use. With Helium mixtures, the payback is measured weeks.

REFERENCES

Lead Article- **News Alert:** "gasworld" Industrial Magazine, Vol. 57, Number 1, January 2019

1. MIG Welding Handbook, ESAB Welding & Cutting Products, October 1996.
2. Ludwig, H. C., Nitrogen Effects in Argon Arc Welding Atmospheres, The Welding Journal, Vol. 34, Number 9, September 1955.
3. Garvey, M.D. & Turley, C.E., CryoGas International, July 2011
4. Standifer, L. R., Shielding Gas Consumption Efficiency. The Fabricator, Vol. 30, Number 6, June 2000.
5. Weber, R., How to Save 20% on Welding Costs. Trailer/Body Builders, Vol. 44, Number 3, January 2003.

Report by Jerry Uttrachi

About the Author

Jerry Uttrachi is President of WA Technology, a company he founded in 1999 dedicated to helping companies reduce costs, improve weld quality and welding productivity. Four of six recent products he invented and patented, relate to reducing shielding gas waste and improving weld quality. Two welding helmet patents, granted in 2012 and 2013, provide filtered breathing air that is also cools a welder, employing thermoelectric cooling modules.

Mr. Uttrachi started his career in the welding field over 45 year ago in R&D at the Linde Welding and Cutting Laboratory. At the time, it was a leading company developing welding gases, filler metals and equipment. (Linde a US company was a Division of UCC. It was renamed Praxair when they divested of the welding equipment, cutting machine and filler metals businesses in the 1980's. Ironically, they were just purchased by a Germany company, Linde AG!) After managing the companies Material Technology Laboratory developing welding shielding gases and filler metals, he became Director of Welding Market Development. When the welding division became a separate company, he was named Vice President of Marketing for the newly formed company, L-TEC, a name he coined! He was responsible for Business/Product Management, Marketing, Communications and Customer/Technical Service. When the business was acquired by ESAB in 1989, he remained in that position for the L-TEC brand and for ESAB's Equipment business. In 1999, he left to form WA Technology.

As an active volunteer of the American Welding Society, Mr. Uttrachi has served on numerous volunteer committees including recently being on the AWS Board as Director at Large, three years as Vice President and the 2007 President of the Society. He served as a Board member on the Societies Education Foundation and Chaired that Board for 6 years through 2014. He is currently a member of several AWS committees, including the Technical Advisory Committee (TAC) that reviews all Welding and Materials Standards and other Welding Practices documents.

He is a life member of the American Society of Mechanical Engineers and Chair of his local ASME Section.

He holds a Bachelors and Masters degree in Mechanical Engineering (Specialty Behavior of Metals) and a Masters in Engineering Management from New Jersey Institute of Technology.