WA Technology

History of Welding (Gas and Equipment) Distribution

By Jerry Uttrachi

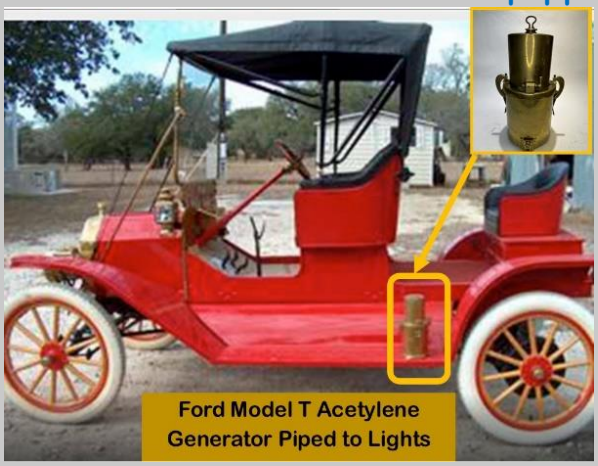
Distribution of welding/cutting gases and equipment in the US is changing. Two large European Industrial Gas companies bought or merged with three major US companies. Two US Industrial gas companies, Airco (*bought by BOC, then AGA who was integrated into Linde AG)* and Praxair (*formerly US Linde.) Third, Airgas who owned about 1/3 of US Gas/Welding distributors.*

Air Liquide (*based in France*) purchased Airgas who had about 1400 distributor locations in the US. Linde AG from Germany merged with Praxair (*formerly US Linde*) who had over 350 distributor locations and in 2023 they bought a very large independent, distribution network nexAir with over 70 store locations. In Europe both Linde AG and Air Liquide sell mostly gases and rent filled gas cylinders/tanks. They sell little related equipment.

An equipment only sales company, Harbor Freight is offering industrial quality thru medium capacity inverter-based welders. Home Depot, Lowes, Tractor Supply, Farm & Fleet and mail order houses offer smaller welders.

Prologue:

An impetus for writing this document was when I had my Street Rod at a local Car Show and talked with a gent 82 years old. He was showing a 1912 Ford Mother-in Law Model T. His Model T was equipped with an Acetylene Generator. The first I had seen.



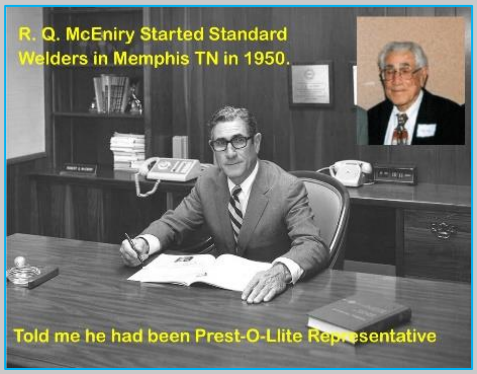
He has homes in West Virgina and near Myrtle Beach. Both equipped with many tools and welders to work on his collection of old cars. He was a wealth of knowledge and a joy to talk with. He mentioned he buys his welding equipment from Virgina Welding, who I knew well.

The company where I began working in welding started with the invention of Acetylene and I wondered how it was distributed at the start. Looked for the History of Virginia Welding and found that it was started in 1917. Surely, they distributed Acetylene and Oxygen at the time, as "gas welding and cutting" apparatus where the major products our company sold, primarily to sell gas!

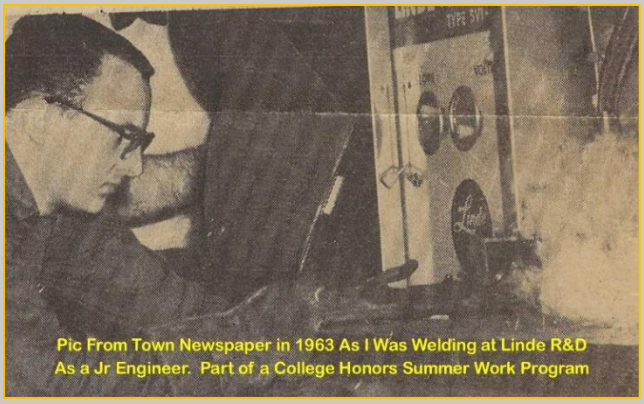
V. S. Rice (right in Pic) Started Virginia Welding in 1917

Virginia Welding was one of our largest Distributors and the biggest purchaser of our gas apparatus under the Prest-O-lite, Purox and Oxweld brands names. Had met Bill Rice Senior and know his son, Bill Junior (right in Pic) very well.

Recalled another very large Distributor who was a large seller of our Gas Apparatus and the companies' welding gases, Standard Welders in Memphis. I worked mostly with his son and their sales manager but recall when we had changed our Brand name to ESAB, at dinner Mr. Mac (*as he was called*,) asked me what the benefit to their company that change would bring! After answering that they would have access to a lightweight inverter stick welder, the ESAB Caddy and other stick welders we did not sell previously he smiled. Then told me he had been a Prest-O-Lite representative before starting Standard Welders in 1950. Recall some of that discussion!



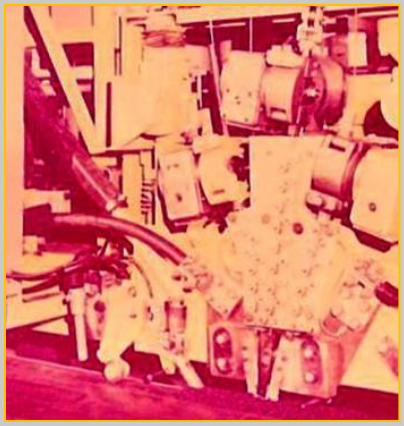
My Entry To The Welding Industry:


Pic From Town Newspaper in 1963 As I Was Welding at Linde R&D As a Jr Engineer. Part of a College Honors Summer Work Program

I knew little about welding in 1963, when as a Junior in College I was in an Honors Summer Jobs Program. I graduated a year later as a Mechanical Engineer 8th in my class.

The great experience I had the prior summer and their oportunity to look at my capabilites made my chocie to work fror Linde in welding R&D.

Engineering jobs were plentiful in 1964 and all graduates had many offers. With my grades and class rank I wanted to get into the high pay R&D and Linde fit perfectly. The company had an Advanced Systems Department where I wanted to work. BUT as I had worked in the "old" Submerged Arc Welding (SAW) department for the summer, they wanted me back. Was told just do that for a year and then we can place you in another. Yep, looking back it worked out perfectly for me! That Advanced Systems Group was disbanded a year later. Thankfully, I



was working on welding process improvement and the youngest by ~10 years in the group. Studied for an MS in Mechanical Engineering at night with a specialty called behavior of metals. As close as the college got to Metallurgy. Loved Math so took several statistical courses and one Advanced Statistical Design of Experiments. In the Lab was working on a project others had started and were not successful. It was for one using our largest volume Submerged Arc Flux and Wire sales for the manufacturer of high-pressure gas and oil pipe. We had ~100% of the flux business in ~9 pipmills in the US and Canada. Most were steel companies welding the ID and OD of >20 inch OD, 40-foot-long steel pipe pressed into first a "U" then an "O" shape using what was called the UOE system ("E" was for expansion after welding.) That statistical course and partial factorial design used was key to what we discovered! The ability to double the welding speed and kept us the 100% supplier of flux to that industry until little new pipe was needed and steel companies shrunk, or mills closed.

Reading PA
January 1970

Talk Listed On Welding Processes

GERALD D. UTTRACHI

Tw topics will be discussed by the guest speaker during Tuesday's dinner meeting and technical session of the Reading Section of the American Welding Society.

Gerald D. Uttrachi, the speaker for the program to begin with dinner at 7 p.m. in the Garden Room of the Crystal Restaurant, will talk on "Three Wire Submerged Arc Welding"

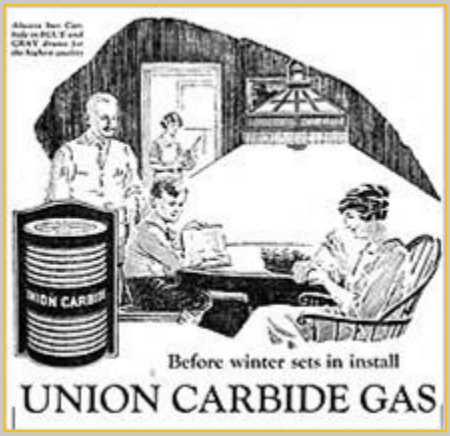
One year the special pipe welding flux we sold was half our total flux sales at a 30% premium price (*and very high margin*) over our only SAW competitor Lincoln Electric. Lincoln always tried experimental pipe fluxes at a Republic Steel Pipemill. I would visit and look at their results Our Region and LAB engineering support was key allowing pipemill engineering and management to dictate the use of our flux! With well over 100 of our 3 Wire Systems successfully making pipe I was "in demand" giving AWS Section talks around the country (*as well as overseas*.) The newspaper clip right shows an announcement for one in PA.

I worked with Norm Schriener, then VP QA. At one time, he had the title VP Unionmelt. The new welding process when he started working in the 1930s. He was an expert in SAW UOE pipe. Also, a person involved in the original SAW flux development before and during WWII, Clarence Jackson. Clarence went on to be AWS President. When his 1-year term was over, he went to OSU teaching Welding Engineering. Clarence was a friend until he retired. He was a member of the High Strength Steel WRC Committee, that I Chaired. Came to every meeting.

The Start of Industrial Gas Distribution

In 1892 Morehead and Wilson accidentally discovered how to make acetylene. When burned in air, it gave a light far brighter than any in use at the time for home lighting. James Morehead, a graduate of the University of North Carolina and a former state senator, to raise cash looked for new uses for his abundant supply of waterpower. This search led him to Willson. Thomas Willson was seeking an economical way to make aluminum. His approach was to reduce the aluminum ore with carbon in a high-temperature, electric-arc furnace, a process explored in the laboratory. When the furnace was tapped and the resulting product thrown into water, it produced a flammable gas thought to be hydrogen, as was expected from calcium.

However, unlike clean-burning hydrogen, this gas burned with a sooty flame, for which there was no ready explanation. During the summer and fall of 1892, they proved that the furnace product was calcium carbide and that the gas as it evolved in water, was acetylene. Although there were no uses for either calcium carbide or acetylene at the time, Willson filed for a patent on this process on August 9, 1892. In 1895, he sold his patent to Union Carbide. Domestic lighting with acetylene gas was introduced about 1894 and bicycle lamps 1896.



Carbide lighting was used in rural and urban areas of the United States which were not served by electrification. Its use began shortly after 1900 and continued past 1950. Calcium carbide pellets were placed in a container outside the home, with water piped to the container and allowed to drip on the pellets releasing acetylene. This gas was piped to lighting fixtures inside the house, where it was burned, creating a very bright flame. Carbide lighting was inexpensive but was prone to gas leaks and dangerous explosions.

The Prest-O-Lite Company

In 1904, the Prest-O-Lite Company was founded, and their acetylene filled cylinders eliminated the need for a carbide reactor. The cylinders originally sold for $10, held 10 cubic meters of gas and lasted for 40 hours. Once the tank was empty, you could exchange it for a full tank for $0.60. Once filled, the cylinders were safe to use.

Prest-O-Lite was the breakthrough product that propelled the fortunes of Indianapolis Motor Speedway founders Carl Fisher and James Allison. Both were established businessmen when they founded the corporation, originally named Concentrated Acetylene Company. Fisher owned one of the first automobile dealerships in the country and Allison was president of Allison Coupon Company and founder of James Allison Manufacturing Company selling watches and fountain pens, most notably the **Allison Perfection Pen**. Despite previous business success, both men took their wealth and influence to new levels through the **1904** introduction of Prest-O-Lite, the first truly effective headlight for automobiles. Headlamps prior to the advent of **Prest-O-Lite** were basically lanterns.

The **Prest-O-Lite** technology preceded electric lights which would not be effectively introduced for several years by Cadillac in 1912. Allison and Fisher were introduced to the idea by entrepreneur **P.C. Avery** who had purchased the patent for compressing the gas in a canister that was fitted to the running boards of automobiles and then delivered to the headlights through tubing.

Acetylene was well known in the industry prior to the formation of **Prest-O-Lite** but manufacturers were wary of its use due to its volatile nature. Prest-O-Lite canisters proved safe for use on cars.

When looking at photographs of old Harley-Davidson motorcycles you'll see a cylinder mounted to the frame or handlebars, about the size of a kitchen fire extinguisher. The cylinder was made by Prest-O-Lite and was filled with acetylene gas. The first motorcycle head lamps used the reaction between water and calcium carbide. A special canister held both the water and the calcium carbide in separate compartments with a mechanism that allowed the water to mix with the calcium carbide at an adjustable rate.

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Manufacturers of Portable (weight 40 lbs.) and stationary, welding, cutting or lighting plants. Supplies of all kinds. Agents wanted. Fulton & Enfield Sts., Bklyn, N. Y.

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Parts and Accessories
WANTED

WANTED—PREST-O-LITE TANKS, WE pay the following prices:
A. Presto tanks (large).....$9.00
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E. Presto tanks (small)..... 6.00
Ship in any quantity, C.O. D. or S. D. B. L.
Erwin Greer & Company,
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Chicago, Ill.

When the two compounds mixed, the result was acetylene gas which was then piped to the head lamp and where it was lit was a built-in striker. This worked well as long as you kept everything adjusted correctly and filled with water and calcium carbide.

The ad left was from 1913. Have no details about early distribution history but selling filled acetylene tanks and getting them refilled required a distribution network. Don't have the history of the start of Acetylene and Oxygen distribution but this old ad shows one company in Chicago was offering to buy Prest-O-Lite acetylene tanks. They probably filled or had them filled and sold them. A tricky dangerous process compressing acetylene generated from Calcium Carbide.

The other, Union Oxy Carbide Co indicates they produced small 40-pound generator (*they refer to as Plants*) They also state they supply (*assumed larger*) generators for welding/cutting or lighting. Also supplies of all kinds so assume welding cutting oxyacetylene torches. AND they are looking for agents.

Oxyacetylene Welding and Cutting

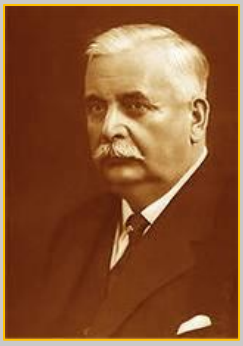
After Morehead and Wilson accidentally discovered how to make acetylene in 1892 it was found that combining acetylene with oxygen produced the hottest known flame temperature. Morehead (Photo Left) went on to found one of the world's leading chemical companies, Union Carbide. In 1917 Union Carbide merged with the US owned Linde Air Products company started by Carl von Linde in 1907 using his process of separating air by liquefaction and distillation. The combination of acetylene and oxygen produced a concentrated flame with a temperature of 5720 F, well above the melting point of most metals.

This allowed the oxyacetylene welding process to develop into a leading metal joining technique. In addition to marketing industrial gases in cylinders, Linde developed the required regulators, torches and accessories needed for the oxyacetylene welding and cutting process. Their trade names were Oxweld, Purox and Prest-O-lite. Union Carbide also funded the development of applications for calcium carbide. The demand for its use in lighting streets and buildings outstripped supply around the World.

From the point of its invention until the late 1920s, oxyacetylene welding dominated the welding industry. Arc welding remained in its infancy, and no other welding techniques offered welders the ability to create strong welds in almost all metals. Oxy-fuel welding kicked off the era of modern welding and obliterated the standards for efficiency that welders were accustomed to at that time.

Electric Welding Starts

Electrodes:



In 1904 Oscar Kjellberg in Sweden (*the founder of ESAB, Pic left*) patented the covered electrode. This electric welding process electrode produced excellent quality; strong welds very fast. ESAB became a world leading enterprise supplying welding equipment, filler materials and welding technology. They purchased Airco's electric welding equipment business in 1985 and in 1989 Linde's (*subsequently renamed Praxair)* former welding/cutting equipment and filler metals business, which had become a separate company, L-TEC. At the same time, they purchased the leading US innovator of flux cored wire and low hydrogen stick electrodes, Alloy Rods.

Power:

In 1911, Lincoln Electric introduced the first variable voltage, single operator, portable welding machine in the world. In 1914, JF Lincoln (left) then President of the company, established the Employee Advisory Board, which included elected representatives from every department. His incentive management system helped Lincoln become a leading producer of electric welding equipment and filler materials. They were instrumental in promoting welding as a reliable, cost-effective metal joining process.

The unique management system employed by JF Lincoln had an influence on the development of welding history. Lincoln also had a product line philosophy similar to Henry Ford who kept the same Model T for 19 years with few design changes just continual cost reduction. Lincoln developed a similar approach to Henry Ford. He wrote: "Following the *'will-of-the-wisp'* new products the sales folks want because they think it has higher profits, takes management focus away from lowering the price on existing products, which is best for the customer. He pressured his folks to eliminate a product IF a new one was needed or desired. They kept the number of salable goods very low with no inventory or even spare parts held in the factory. All were shipped to ~30 district office warehouses based on what they forecast. District managers had to sell what they ordered! (*An interesting anecdote; District Mangers would swap to manage forecast errors*!)

He wrote, if your business expertise is being a low-cost manufacturer follow that philosophy. If it's R&D developing new products you should pursue that approach. That latter fit our corporate company culture and some others like AIRCO our industrial gas competitor, also in the welding business. Neither were, nor tried to be, low-cost manufacturers of welding related products. Both were introducing new welding products and processes (*most used industrial gas.*) Some, like TIG welding had many variant air- and water-cooled torches in many lengths. Also, collets, collet bodies, gas lens etc to fit the torches for various diameter tungsten electrodes. Lincoln would not think of offering TIG torches, partly that they used gas and also they required hundreds of part numbers, in total opposition to his manufacturing simplicity concepts. Was not until the 1990's that they introduced TIG torches (*outsourced as they are today.)* Frankly we and Airco made the vast majority of our profit selling Industaial Gas (Oxygen, Nitrogen, Argon and Acetylene.) Also filling and renting high pressure gas cylinders. Welding was mostly a tool to support gas sales.

We all coexisted during the era of significant welding process and product development. The competition with different businesses goals and methods created innovation!

Lincoln and his successor, William Irrgang who was CEO until 1986 were probably influenced by the early 1900rds competition between gas welding and electric welding. They were selling mostly stick welding electrodes and welding power achieving high market share with inexpensive products.

Lincoln, DISTRIBUTORS AS CUSTOMERS

JF Lincoln's belief was sales, marketing costs and distributors just added to product costs. Recall an incident ~1975 while managing a Welding Materials and Gases R&D Lab for Linde got a phone call from the Lincoln Communications Manager, Bob Mattoon. Bob chaired the AWS Tech Papers committee I was on.

Bob asked if I could send him a range of sales literature on our products. I said sure but to help define what of the many pieces and catalogs, why? He said I want to show our CEO Bill Irrgang what quality literature looks like. Several months later when at an AWS Meeting I asked what happened. Bob said Mr. Irrgang thought it was all very nice BUT we don't need!

JF Lincoln, followed by Irrgang believed improving production efficiencies and products to make them cheaper was the *"Christian Thing To Do."* Quoting *"The Christian ethic should control our acts. If it did control our acts, the savings in the cost of distribution would be tremendous…Competition, then, would be in improving the quality of products and increasing efficiency in producing and distributing them; not in deception, as is now too customary."*

That comment about distribution costs set the tone for how they treated distributors.

Lincoln was no doubt aware of the oligopoly practices of the Industrial Gas Business. Prices were always increasing and controlled by long term contracts, the few competitors would not break. Cylinders had to be rented (*through JF Lincoln's death in 1965 even small cylinders were rented and distributors nor manufactures would fill a user's owned cylinder*.)

Barriers to entering the Industrial Gas business are huge. Air septation plants are complex and very expensive. The cost to purchase and fill high pressure cylinders, fleets of cryogenic liquid gas trucks, storage tanks etc, required a large amount of capital. *BTW, can't afford to liquify air and distil only the 0.9% Argon, why its price is high.* Not the case with welding equipment. Companies like Miller Electric, who started the business in 1929 in Wisconsin or Hobart Welding started in OH in 2025 only needed a fraction of that capital. *Both now acquired by ITW.*

JF Lincoln thought the only discount distributors earned was to buy in large qualities where Lincolns costs were lower and could offer a small discount and sell to fabricators in smaller quantiles at higher prices and have a modest margin. On 40,000 lb. truck load qualities of filler metals, the most economical for Lincoln to ship the distributor discount was only 5%. Was surprised when Don Hastings in his book "Behind The Mask" said they were often called "Stinkin' Lincoln" and wasn't sure why. He did not mention the low distributor discounts and the fact that they often sold direct to fabricators.

Another anecdote was told to me by Charley Sanborn who had automotive supply stores in Ohio in the 1940s, 50's etc They offered engine rebuilding and ither other machine shop services. He said he approached JF Lincoln directly as he wanted to be a distributor and sell stick welding products. He said after the discussion he realized Lincoln had no use for distributors!

Hastings, in his Book, "Behind The Mask" stated as a salesman when he went to Cleveland to be trained there was no mention of dealing with distributors!

Lincoln salesman would often take larger fabricator business directly so many distributors would not bring them into an account. They had over 30 warehouses in their sales districts so could serve smaller accounts. We, Linde did not often sell most products direct to fabricators and typically give a minimum of 20% distributor discounts so were "liked more!" Our salesman would often say, *"Wish my distributors hated us as much as Lincoln and bought a lot of our product as they do theirs!"*

SIDEBAR (Understanding Profits from Gases and "Hard Goods")

It's good to understand gas industry economies and profits for the Producers and Distributors. When Director of Welding Market Development in Linde's Corporate Office my group was funded 2/3 by gases, mostly Argon profits. At that time, we had ~60% of the US and Canada Argon production capacity. We sold about half, our overall gases market share and the remainder to the few other major Industrial Gas Competitors at wholesale prices. We controlled the market price! Distributors typically sold about half gases (including cylinder rent) and half machines, gas apparatus and other what are called hard goods. Many made 80+% profit from gas sales.

From my study of Lincoln Electric through Irrgang being CEO thru 1986, I believe understanding the oligopoly high pricing practices of the Industrial gas business was a factor in their aversion to gas using processes. If JF Lincoln or Irrgang were alive today where ~75% of the North American Argon production is held by two foreign companies and seen the Argon price increases, it would just reinforce their belief! Messer Griesheim a German gas producer just came into the US buying some FTC required gas production plants. Bit of a joke! Japan Oxygen (Matherson Tri-gas) has been in the US for years. All just follow price increases.

Product Pricing Was Totally Different at Lincoln:

***Part Numbers:** We validated during a strike at our welding wire plant in Ohio, that the Lincoln welding wire Product Manager had nothing to do with Pricing!*

Lincoln was totally opposed to Unions. Our Linde Welding Products Business Manager Bob Cockling knew Bill Irrgang, Lincoln's CEO at the time. He asked if they would make the most common MIG welding wire we and they sold, an AWS ER70S-3 and put in our boxes. Irrgang said fine.

We delivered our boxes to the Lincoln wire plant. Our Product Manager who established Part Numbers and Pricing talked with his Lincoln counterpart. He was surprised to hear he had nothing to do with part numbers and pricing, which was all done by the CEO!

*Having very few parts numbers was reinforced when our welding materials business segment was looking at getting into the stick electrode business (**which my boss and I thought was crazy.**) There was a tentative agreement with the European Company, Oerlikon to buy their technology. However, the President of Linde, Jack MacLean, asked Bob Cockling to visit with Bill Irrgang and see if they would brand label electrodes rather than increase capacity of a slowing stick electrode business in the US. Cockling relayed details of the visit. Irrgang asked which products? Cockling mentioned 10 different types in all sizes. He said Mr. Irrgang turned to a loose leave 8 ½ X 11 book behind him with all their part numbers. He said there is no way we can add that many part number in our plant!*

***Pricing:** Had heard that only the Lincoln CEO prices products based only on cost. It was obvious, as bonded flux, where we competed directly, in their typical annual price increase might increase $0.001 Crazy, why bother. It was obviously done on a cost times a factor formula. I was on the NEMA (National Electric Manufacturers Association) Statistical Committee. We periodically had meetings on issues with our quarterly Volume reporting by product categories. We all reported our sales volumes and NEMA personnel would consolidate the confidential information and report the totals. Lincoln on many committees always had a VP as a member. They had few VPs but some AWS and NEMA committees were very important. At lunch I recall Dick Sabo their VP committee member, mentioned only two people at Lincoln have anything to do with pricing. I interjected; I thought it was all done by the CEO. He said, that's true but someone must bring him the product cost information and when he finishes defining the new prices someone must get those implemented. That person is ME!*

***No Time Wasted Negotiating Price**: Recall a discussion with Lincoln salesperson who had worked in other industries. He said one thing he liked about Lincoln was there was no time spent negotiating price, as in his former job. I just tell the customer only the CEO can alter a price and he does not do that!*

***Lincoln the Low Cost Producer in Welding Equipment**: **Lincoln set the Industry price.** We were higher with added features. Miller and Hobart were similar however closer to Lincoln's price. The Lincoln CEO (thru Irrgang) controlled all prices and part numbers! Lowering prices was the goal. Keeping minimum part numbers was important with their production and distribution system.*

Welding Distribution From Mid 1960's

When I started in the industry in the mid 1960's in welding R&D for Linde we and Airco dominated Industrial Gas production, filling high pressure cylinders and sales to distributors. A user could not own even small size cylinders as no one would fill them. They usually sited safety reasons.

Distributors often rented filled cylinders from the gas producers and intern they rented to fabricators etc.

Airco had a full line for welding equipment from Gas welding and cutting, Stick electrodes (*they manufactured.*) Also, Airco brand labeled Stick welding machines and engine driven welders they bought mostly from Miller Electric. We, Linde had a full line of Purox and Oxweld gas welding and cutting, air propane and air acetylene Prest-O-Lite gas apparatus we also sold to the HVAC gas distribution network. We made MIG wirefeeders, and bought Linde branded power supplies from Glenn Pacific and others. However, we did not make or sell stick electrodes (*the dominant filler metal in the mid 1960's*) nor stick welders or engine drives. Linde owned no distributors, all were independent. They would buy stick electrodes/power and engine driven welders from Lincoln or Hobart.

The increase in welding after WWII and Korea War by smaller fabricators made increased distribution essential. Some soldiers coming back wanted to start a welding supply business Linde made it easy, only a small amount of money was needed as they rented filled gas cylinders, then in turn rented to end use customers at a high margin. As new welding/cutting technology and products evolved, our Reginal sales and field engineers helped train distributor personnel. We and Airco had cylinder filling locations all around the US and Canada. Only Linde (or Airco) cylinders would be filled by the respectful company.

Large fabricators were supplied directly with cryogenic liquid gas tanks filled and owned by the gas producer and rented to the fabricator. Linde and Airco had their own fleet of cryogenic tank trucks. Few conflicts, Airco stores could not buy Linde welding equipment and vice versa. It was referred to as "Exclusive Distribution." Typically, only one Airco or Linde "Welding Supply" was in an area. The dominant Linde distributor often also had an Exclusive with Lincoln. In that period there was little conflict as Lincoln did not sell gas shielded products until the late 1970's. And we sold no stick power or stick electrodes. The only conflict was SAW but not with the distributor as few handled the product. We both sold SAW equipment, flux and wire directly. In that case most distributors did not want to deal with the process, or the flux involved. Unlike Gas, Stick TIG and MIG welding could not see what was occurring under the flux. Made it more difficult to understand and fix user welding problems. Had many distributor owners tell me they did not like to handle the 100 lb paper bags of flux. If their forklift broke one bag on a pallet all profit was lost. Also made a mess in their warehouse!

I'll focus on Linde where I had direct observation of Linde distributors, but Airco was probably similar. Since most Linde distributors in an area were large and if tied with Lincoln, they were also exclusive. Lincoln had little chance to sell to Airco Distributors as Airco had a full line of stick electrodes and Miller brand labeled Airco stick welders including engine generator welders.

Smaller independent distributors often bought welding related products from Miller and Hobart. Might be several in an area and Miller was typically not exclusive and would sell to all the smaller distributors. Logical no choice.

Hobart was similar except where the Linde distributor was selling Hobart not Lincoln equipment and stick electrodes. Multiple Miller distributors in an area lead to price cutting of their product.

Where a Linde distributor with an exclusive would try to sell a MIG machine at MSRP with their costs 75% of that price, Miller welders often sold 10% over cost. (*Of interest, just talked to a Linde salesman and when I mentioned Miller machines selling for only a 10% profit he said today it's more like 5%.)* Our Linde Distributor with an exclusive for our gas, equipment and filler metals had a "gas customer" who wanted a quote for Miller welders. Because they were the "Big Dog" distributor on the block (*as often Airco Distributors were*) Miller would sign them up to sell their product. Since the majority of their profit came from gas sales, if they quoted a Miller power source higher than others it reflected their gas prices! Purchasing managers knew that was a factor and often got bids from all distributors then leveraged the best price from their gas supplier! Remember one distributor owner who said he would quote Miller at *"on the doc in a box,"* i.e., if he got the bid would just drop off the same packed product Miller supplied.

2nd/ 3rd Generation Involved in Distributor Business:

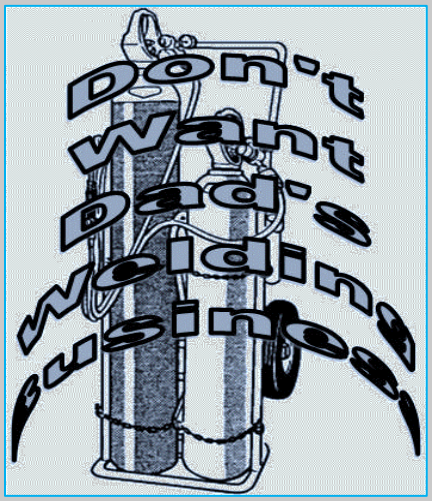
Through the 1970's it appeared things had stabilized. In the late 1970's after I moved to Corporate office as Director of Market Development for welding equipment, filler metals and welding/cutting gases, I attended Distributor Advisory Groups making a presentation. Most of the dialog centered around the high price they paid for gas! Typical of the very profitable gas business these were held in places like Pebble Beach with golf being a key part of the meeting!

Then the 2nd 3rd generation family members were getting into the business. Where Dad was happy renting cylinders from Linde and renting to users at a high margin, the younger folks felt no obligation to Linde who often got Dad started and having a very profitable business. Why rent those often 50+ year-old cylinders? They could buy their own cylinders, pressure test as needed and meet DOT requirements. And if Linde would not accept and fill them at their facilities they would buy gas as a liquid and fill their own. Some would also generate acetylene using calcium carbide and fill their own cylinders (*very risky and dangerous compared to filling high pressure oxygen cylinders.*) We, Linde were getting most acetylene from Union Carbide chemical processing plants!

Linde dragged their feet accepting Distributors backward integrating as it was a significant loss, cost issue. Linde had many underutilized cylinder filling facilities. Between that loss, loss of cylinder rent and the cost of specialty gas expansion, what was referred to as the "Packaged Gas Business" was not very profitable. The Bulk Gas Business (*transporting and selling liquid gas)* is where the majority of the Divisions high profits were made! Linde started to buy some of the distributors who were changing ownership to 2nd and 3rd generation managers.

Where there were several siblings, they had to split the gas distributorship sale among each, some having no interest being involved directly in the business.

Enter Peter McCausland: The difficulty for the 2nd/3rd generation owners was many with siblings who had no interest being involved in "Dad's business." BUT they also didn't want to pay the high capital gains tax from the sale!



McCausland started his business when as a corporate lawyer working for Air Products they had elected not to buy a distributor he had been working to purchase in Connecticut. He asked if he could buy it, which they agreed and he left Air Products. He devised a great way to buy distributorships giving the sibling owners his "Airgas Company" public stock. That could be split amongst siblings with no tax unless the Airgas stock was sold.

But suppose the Airgas stock declined in price? McCausland guaranteed the price by just giving more Airgas stock when it declined a certain amount to make up for the decline in stock price. Bought and sold Airgas several times making ~3 fold profit. Sold one time because McCausland got the Board to allow diluting the stock value by issuing several hundred thousand dollars in new stock!

In 2016 when the stock was bought by the French Air Liquide for 10 billion dollars Airgas had acquired ~500 distributors from the 1982 start or about 1/3 of the US "Welding" Distribution. He owned about a billion dollars in stock!

Then German Linde merged their business with my old company, US Linde who had changed their name to Praxair (*a name they could use overseas as only German Linde could use the name in most other countries*.) Between the two European based companies *gasWorld Magazine* showed they had over 70% of the Argon gas production capacity. Argon has tripled in price!

Many smaller air liquefaction plants could not justify adding the extra Argon production distillation columns and purifying steps. This can be an additional 20+% cost to the plant. If, as some Industrial Gas companies did, building and operating plants for customers who say just needed Oxygen, the Argon extra production equipment and operating costs was not justified.

Current Distribution:

- **Air Liquide with the Airgas acquisition in 2016 has over 1400 distributor locations.**
- **Linde AG (*who merged with Praxair*) just acquired nexAir with 73 stores and has over 450 stores.**
- **The Independent Welding Distributor Cooperative (IWDC) has ~140 distributors with ~800 store locations**
- **The Association of Welding Distributors (AIWD) members started in 1999 with members from the US and Canada have 350 store locations.**
- **I'm listing Harbor Freight because they now sell lower capacity "industrial quality" Inverter welders. They have 1400 store locations. Recently toured the 2 million square feet highly automated warehouse in SC. They mostly distribute to their stores or ship to customers directly.**

I added Harbor Freight because of their size, breath of offering and now three levels of product performance. They have developed a 3rd Tier quality/professional level for many of their products: grinders, auxiliary power and welders are some. Their low-end home user MIG welder, for example, is old technology, transformer based by Chicago Electric that uses self-shielded flux cored wire and sells for ~$125. The medium level "industrial type" welder is their Titanium Inverter based line with a 170-amp capacity MIG welder that sells for $570. The top-of-the-line Vulcan 250-amp MIG welder has a $900 price tag. The Vulcan 205-amp Pro TIG/Stick welder sells for $1200 (*a comparable Lincoln >$2000*.)

A key for the small production shop buying say a Vulcan is their insurance offering. Rather than deal with repair, which many welding distributors have stopped performing, they just replace a failed unit with a new one!

Gas/Welding Distribution Future

BACKGROUND:

In 2002 the Distributor/Supplier Association changed their name from NWSA (National Welding Supply Association) to GAWDA (Gas and Welding Distributor Association.) It reflects why Industrial gas producers like Airco, Linde, Air Liquide and Linde AG – eliminated their involvement in designing and manufacturing welding equipment and filler metals (Stick electrodes, MIG wire, etc) to focus on the highly profitable gas business. Particularly their financial managers like the idea that their raw material is air, there is no obsolescence and product slippage due to theft, damage, excess none moving inventory etc.

When we formed our levered buyout of the "welding business" from US Linde, I was VP Marketing and Business Management of the new company L-TEC. Linde had ~20 owned distributors with many stores.

On average they made ~105% of their profits selling gas and renting filled gas cylinders. Yep, lost money (*on paper with Linde accounting practices*) selling what were called 'hardgoods!' In fact, soon after forming our leveraged buyout Linde devested of most of their owned distributors (*before acquiring some back*!) The VP sales and marketing for the "owned distributors" (*and friend in Danbury*) bought one as did the manager of the "packaged gas business" and others.

I was on the Board of our German L-TEC business, which increased sales 4-fold in the 4 years before we sold the business to ESAB (*for twice the purchase price*.) Their distributors were interesting to me as they sold no gas. Could not, Linde AG and Messer Griesheim sold gas and rented full cylinders. Recall one of Linde AG stores was very close to where the L-TEC distributor had his very nice building with a large training center. Discounts on MIG welders were 50%, for example. In the US we offered a 25% and Lincoln as I recall on smaller welders was only 20%, less for larger capacity welders. For that 50% discount the German distributor connected the power cables, torches and tested the unit before delivering to a customer. They would help train welders on the new machine.

In the US typically a distributor at that time sold about ½ gases and ½ hardgoods. The hardgoods typically were half machines, gloves etc and ½ welding electrodes, MIG wire and straight rods for gas and TIG welding. When I saw mostly stick electrodes boxes in very large German distributor's warehouse I asked the owner what his ratio was of filler metals to equipment sales. He said 25% filler metals. I mentioned in the US it was typically 50/50. He said the use is probably the same here as well but often filler materials are sold directly to end use customers by the manufacturer.

WHAT IS THE FUTURE DISTRIBUTION IN THE US AND CANADA?

I'll start with relevant anecdotes and some inside info. I have an internet business selling a patented "shielding gas saving system." It's based on 4 US patents I've had since starting the business. Early in the develop and soon after the US patent issued met a very shape Engineering Manager for Air Liquide in Canada. He was very interested in the "Gas Saver" as he wanted to use it to capture completive bulk gas accounts. In Canada, Linde was the gas sales market leader, but Air Liquide was very strong. After testing at an account, he wanted to get a patent in Canada. They paid for the attorney and my US Patent was also in Canada. I gave them an exclusive using an approach I had offered Lincoln for Plasma Cutting in the US in our L-TEC days. (Don Hastings, sales manager at the time, wanted to get into the Plasma Cutting business.) For Air Liquide I offered a 5-year renewable exclusive license of the Canadian patent (*and offered to supply bulk product at a good price*) with a minimum purchase amount annually. It started low but increased by year 5. He and the sales manager agreed to the terms. They came close to that required year 1. Year 2, a new air Liquide North American president came from France, as apparently occurred periodically. The Engineering Manager was told, *"Our job is selling shielding gas not saving it!"* When they told me I said you have a 5-year agreement, if you don't want to sell the product I'll offer to Linde (*then renamed Praxair*.)

I knew the Praxair Canadian Management and since they were probably well aware of the Air Liquide success with our *GSS* acquiring some of their Argon accounts! Could have sold product to them. Air Liquide elected to pay me the full exclusive license requirement for the 3 ½ years remaining! After, I set up our former L-TEC Canada President who had retired to sell the product in Canada!

Also have some inside information that Air Liquide and probably Linde AG will get their owned stores to be more like Europe. The pressure will come from their success in Europe etc dealing with industrial gases that operate as an oligopoly because of the huge barriers to entry. It also relates to a conversation with Linde's owned distributors VP marketing and sales, Joe. He bought one of the distributors Linde sold soon after our leverage buy-out. Great guy. He was asked to manage a Buying Co-Op of "hardgoods" for Linde Distributers most sold, some still owned. (*Most sold to former Linde employees for little money but agreement to rent filled cylinders from them.*) One of our L-TEC Region Managers talked to one of those distributor owners who said they wanted to buy a brand labeled gas apparatus outfit. I had an aversion to brand labeling from our consulting with Frank Lynn Associates. I hired them to help define what we should do as L-TEC. Frand Lynn said avoid brand labeling as today they buy from you next year a copy product made in China! Visited Joe and mentioned the concern.

Joe was a friend and said if they insisted, we could offer something as the Linde owned and recently purchased distributors were large buyers of our profitable gas apparatus. He said don't worry in our first meeting we could not agree on whose gloves to buy! We don't sell gloves because they are a great money maker. We sell them to support our "gas customer." If they want Steiner gloves that is what we stock. If they want Tillman, that is what we stock supply as well *to maintain our profitable gas business!* If we could not agree on gloves, we won't touch gas welding outfits. They never did.

Adding to what Joe told me is a more recent anecdote by our early customer of our patented Gas Saver System (*GSS.*) A fabricator of bar joists. They were using a lot of gas, the welding engineer knew it was excessive. BUT their welders wanted more flow! When I visited saw the problem. They had been using a supposed "gas saver" the Harris Gas Guard that mounted at their wire feeders. These were removed some time before as welders were setting the gas flow near the maximum on the gauge of 80 CFH. He had replaced those with less expensive ESAB 19X76 fixed orifices (*list price $76.*) Those with their 55 psi pipeline pressure set flow to ~50 CFH. However, welders wanted more flow! I showed him why! Both the Harris low pressure device (*which has even more documented problems)* and a fixed orifice flow control provide no extra purge gas at the start. It's like starting in air. Welders see the issue and try to increase the steady state flow to compensate. Only a partial help! Asked them to get two cylinders of the gas mix they use, and we'd test our simple *GSS* and check possible savings.

We found:

1) **The *GSS* supplied some start gas needed to purge the weld start area.**
2) **When we set flows using a regulator flowmeter at the gas cylinder we got better starts with even 35 CFH! In bar joist manufacturer welders stand side by side. The one using our *GSS* system had starts that were much better and much lower spatter. Measured savings were ~40%.**

The welding engineer installed our *GSS* on all 50 welding machines.

The ESAB 19X76 control orifices were moved to the pipeline drop. Our simple patented *GSS* custom hose (~$75 each) with a peak flow limiting orifice at the feeder end delivered ~80 CFH for ~1.5 seconds quickly purging the start area.

The welding engineer a year later said their bulk gas supplier asked if production was down as gas purchases decreased by over 30%. It was not!

How Not Stocking MIG Tips Relates to Welding Distribution: **Their distributor welding supplier was Holox. They were an industrial gas producer/supplier in the Netherlands. They did not get their bulk gas contract it went to another supplier. Perhaps it was with a manger from Europe's influence, who was used to selling only gas and renting gas cylinders - BUT this large customer for welding "Hardgoods" was told *"we can no longer stock your contact tips."* There was a large tip stock in his office! Yep like Linde AG in German, where I was very familiar from our L-TEC business, they sold NO "Hardgoods." Very nice stores with only gas cylinders in the small showroom and a dock to load filled cylinders in the back!**

Holox sold their US stores to Linde AG!

I Was Remined: *Of the comment our then Senior VP Sales and Marketing, Bill, said when the welding "Hardgoods" business was split from Linde. It was very confidential where I and only a few others had been involved. There were a few managers in the small conference room. He looked at me and said you'll do far better as you are aware we don't have sufficient capital for the profitable bulk gas business leaving zero for welding. He turned to the manager of the "Packaged Gas Business" and said IF I thought we could exit without your business I'd sell it!" Soon after the then President divested of most Linde owned distributors. When Bill became President soon after, they bought some back!*

WHAT'S THE FUTURE? MY SWAG (Scientific Wild-Ass Guess!)

The only easy way to avoid not having what your gas customer wants in the way of various supplies etc, is don't offer any to sell! Gloves are an interesting example. When needed, it's often needed NOW. So, you have to stock what they typically order. If they change brands you may be stuck with excess old inventory!

The other issue is the very different welding customer size. Below is a table I developed when Director of Welding Market Development for Linde with the help of our very smart market research group (*been continually updated*.)

U.S. MARKET SEGMENTATION, (Industry and Establishment Size)

Estimated by, Jerry Uttrachi

			Welding Segmentation By Industry & Size			
				% Market by Account Size		
				Large	Medium	Small/Hobby
Industry Segment	Description	SIC NAICS	% of Total Market	> 10 Welders	10 to 1 Welders	< 1 Welder
Machinery (non-electric)	Earth Moving, Agricultural, Mining, etc.	35	15.7%	4	11.2	0.5
Fabricated Metal Prod.	Vessels, Bridge Girders, Trusses, Sheet Metal, etc.	34	15%	4	10.5	0.5
Transportation (non-auto)	Ships	372-379	11%	4	6.5	0.5
Construction	All Types	15-17	8.4%	2	5.9	0.5
Motor Vehicles	Cars, Trucks and Vans	371	6.6%	3	3.6	0
Repair Services (auto, etc.)	Auto and Truck Repair, etc.	75-76	5.7%	0.2	2.5	3
Mining, Oil Extraction	Oil Well and Mining Equipment	10-14	4%	1	2.5	0.5
Primary Metals	Steel Mills, etc.	33	1.9%	1	0.9	0
Electrical, Electronic	Switch Gear, etc.	36	2.7%	0.5	1.7	0.5
Public admin.	--	--	2.2%	0.5	1.2	0.5
Other Industrial	--	--	14%	1	11	2
Non Industrial	Home User, Farmer, etc.	--	12.8%	0	10	2.8
		TOTAL	100%	21.2	67.5	11.3

Turned out although gases cover a wide use area, "number of welders and flame cutters" was one of the best fit indicators for even gas demand. That was found with the detailed surveys Linde made in sample areas of gas use customers. Welders and flame cutters are SIC (*Standard Industrial Classification*) and more current NAISC (*North American Industrial Classification System.*)

Had shared this data with distributor owners as could abstract from their Argon and acetylene purchases the approximate percent market share they had of MIG and gas apparatus for example. Note that only about 20% of this market are in shops >10 welders. About 55% are in smaller ships with 1 to 10 welders. Home and farm use have many customers, but only larger farms etc would list welders. There is a very large market segment, the 1 to 10 welder shop that a distributor salesperson is not likely to call on. That segment is more likely to visit the Gas/Welding store or "other" supplier to buy "welding hardgoods." Some may be on a Gas/Welding distributors route to deliver filled gas cylinders and pick-up empties but many may do that themselves to avoid delivery cost.

One large Gas/Welding distributor Group looked at their sales in a large geographic area and compared with the number shops listed as reporting employing welders and flame cutters. They realized they had a high market share of larger fabricators but poor in smaller shops. They had no interest in home users (*who are in the millions but buy little*.) But the 1 to 10 welder group are significant buyers of gas and cylinder rent. They looked carefully at developing a proactive phone solicitation sales program to that group.

Lowe's, Home Depot, Tractor Supply and in some areas Farm & Fleet cover the home and farm use folks but the small shop with 3/4 to 10 welders could yield significant revenue. Harbor Freight may become a useful source for supplying "Hard Goods" equipment to this smaller size segment. Their sale of "Insurance" may be a key as a small production shop may not be able to wait to have a welder repaired (*if they can find a shop to do repair properly.*) Combined with their typical low price Harbor Freight is very competitive.

Frankly unlike older transformer based welding machines, where repair was something many welding distributors did in the past, few do it today. And repair of industrial level inverter based welders is more like a TV, repair by replacement. All a repair shop can do is replace the expensive PC boards. The Harbor Freight replacement using insurance may be the best approach for smaller shops!

Some Recommended Reading

- **"Lincoln's Incentive System" By James F. Lincoln, 1946**
- **"Incentive Management " By James F. Lincoln, 1951**
- **"A New Approach to industrial Economics" By James F. Lincoln, 1961**
- **"The American Century of John C Lincoln" By Raymond Moley,1961**
- **"Lincoln Electric: A History" By Virgina Dawson, 1999**
- **"Behind the Mask" By Donald F. Hastings & Leslie Anne Hastings, 2014**

Internet References:

Dated, but interesting article about gas /welding distibution from 1990 to *2015:*
https://www.leaders-llc.com/sites/default/files/Changing%20Landscape%20M&A%20Deveaux.pdf

Original Paper, Updated and Expanded:
http://netwelding.com/Taylor_Ford_Lincoln_Business_Ideas.pdf

How L-TEC Managed to Successfully Compete With Low Cost Producers:
http://netwelding.com/Competing_with_Low-Cost_Producers.pdf

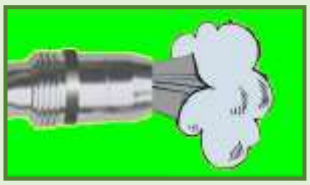
Competitive Capitalism Created Most Modern Welding Processes
http://netwelding.com/Competitive_Capitalism_Created_Most_Welding_Processes.pdf

WA Technology

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

A MAJOR CAUSE OF GAS WASTE

Typical pipeline pressures are about 50 psi. Regulator outlet pressures are 25 to 80 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. Pressure quickly increases to the output of the regulator or pipeline. When welding is started, ***the excess gas stored in the hose "Blasts Out," wasting gas.***

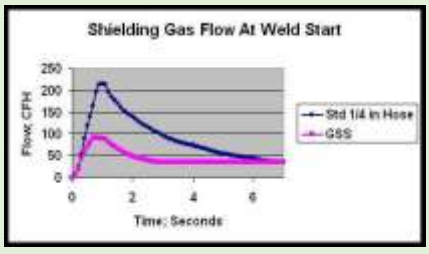
PATENTED GAS SAVER SYSTEM

We invented simple way to significantly reduce shielding gas waste using a smaller ID hose.

It incorporates a flow restriction orifice on the wire feeder end of the gas hose. The orifice helps reduce gas waste and eliminates turbulence improving weld start quality. The ***patented Gas Saver System (GSS™)*** flow restrictor is sized to reduce the surge at the start but allows the operator to have control of the welding gas flow rate.

The ***GSS*** maintains system pressure to retain "automatic flow compensation" used since the introduction of MIG welding.

PRODUCTION RESULTS



Graph left is test from a fabricator showing gas surge at the weld start was reduced by 85%. With a standard gas delivery system the surge flow rate caused a turbulent gas shield causing weld defects. Air was being pulled into the shielding gas stream causing excess spatter and internal porosity. For this application all welds must be UT inspected. The ***GSS*** system eliminated problems caused by air in the gas stream and significantly reduced internal weld porosity at the start.

Our web sit; www.NetWelding.com has much more information including published testimonials also showing a 50+% shielding gas savings.

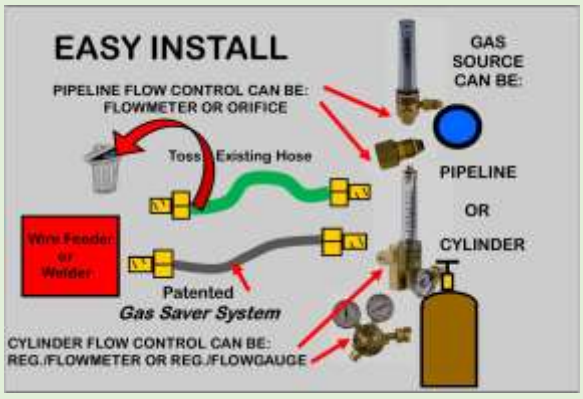
BOTTOM LINE

The WA Technology *GSS* has no moving parts to wear, or leak; no pressures to set or knobs to adjust. It's unique, patented design maintains the gas pressure in the delivery hose. This allows a small amount of extra gas flow at the weld start to quickly purge air from the weld zone, gun gas cup and gas lines when welding is stopped. Maintaining the higher pressure also retains the systems ability to "automatically compensate" for varying flow restrictions and pressure drops in the delivery hose and when the gun gas diffuser and nozzle clogs with spatter.

The hose is made with a heavy wall thickness and fiber reinforced construction to provide a robust product. For most applications the *GSS* will pay for itself in gas waste reduction alone in a matter of weeks. *Welder's also LOVE the improved starts. Over 15,000 sold -it works!*

IT'S INEXPENSIVE AND EASY TO INSTALL

It works equally well on pipeline or cylinder gas supply. Many customers use 50-foot-long systems and some up to 100 foot. Over 15,000 in use.



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

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