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MIG Shielding Gas Control and Optimization

Also Available as a Short Movie: http://youtu.be/H5nabh9deLE

By: Jerry Uttrachi

Find Out How To:

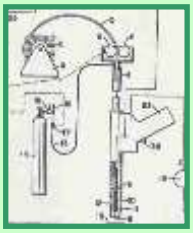
- **Save money by reducing the high gas surge waste at each weld start. *Slash total MIG shielding gas use typically "in half."***
- ***Improve weld quality and reduce weld start spatter*** **by limiting the *"gas blast"* at each weld start that also pulls in air.**
- ***Achieve these benefits easily and at low cost.*** **Our patented gas saving products eliminate past problems with gas surge control devices, like simple orifices and low-pressure devices. *Prices start at $70.00.***
- **Over 15,000 of our patented Gas Saver Systems are in use. *Payback is often measured in months or one cylinder refill!***

This Technical Paper Provides:

- ***A "one page" summary***
- History of MIG shielding gas flow control
- Maximum usable shielding gas flow rates documented
- Methods of setting shielding gas flow
- Maintaining consistent flow when inevitable flow restrictions occur in production
- Why some extra gas is needed at each weld start to purge air in the weld zone and gun nozzle
- High pressure is needed to achieve "coked flow" but causes excess stored gas
- Excess stored gas blasts out at each weld start and causes significant gas waste
- Published reports show average MIG welder wastes up to 80% of shielding gas used
- Fabricator testimonial- shows a 63% total gas savings using a starting gas surge reduction
- Details of patented, inexpensive Gas Saver System provided that reduces starting surge
- Gas Saver System improves weld start quality –includes fabricator testimonials
- Low pressure, surge reducing, "Gas Guard" devices cause significant problems
- Orifices or other flow control at the wire feeder cause problems and frustrate welders
- Causes of gas flow restriction variations when welding are outlined
- Calculations show average industrial MIG welder may waste 7 tons CO_2/year/welder
- References: support comments and findings
- Appendix A: Case examples of fabricators savings with Gas Saver System
- Appendix B: Fabricators report major problems with low pressure, surge reducing devices
- Appendix C: Q & A; other reasons for gas loss;-1) leaks and 2) excess flowmeter settings
- Appendix D: Why Gas Saver System purchases should be made at ***www.NetWelding.com***?
- Appendix E: Check flow at nozzle/cup and demonstrate gas waste:
- Appendix F: ***Argon has recently tripled in Price.*** See why it will continue.
- Appendix G: Author & Company background:

As a Past President of the American Welding Society (*a volunteer position*) Jerry Uttrachi gave technical talks about MIG Shielding Gas Control Optimization at over 20 locations in the USA and conferences in Peru, Denmark, and South Korea. The talk was also presented at the International Institute of Welding (IIW) Annual Assembly in the Czech Republic. This report summarizes the details presented in those talks. Author/company details in Appendix G.

One Page Report Summary



From the introduction of MIG welding in the 1950's the developers knew excess shielding gas flow rate created weld quality problems. Key claims as well as the teaching in the original MIG patent state gas shielding must be: ***"… none turbulent to exclude air from the arc."*** *Several references sited in this report show MIG shielding gas flow rates cannot exceed about 50 to 60 cubic feet per hour (CFH) to achieve this non turbulent flow.*

The engineers that designed the gas flow control systems understood spatter buildup in the MIG gun nozzle and gas diffuser, bending of the small gas passage in the gun cable, etc, could cause significant variations in gas flow restrictions. They used a "choked flow" design, requiring a minimum of 25 psi upstream of the flow control device to automatically keep shielding flow at the preset level. However, the use of this high pressure stores excess gas in the gas delivery hose when welding stops, up to 7 times the physical hose volume. Most of this stored gas "blasts out" of the MIG gun nozzle at every weld start! Most of this excess gas is wasted. About 87% of the excess gas volume is caused by the Gas Pressure/Gas Volume relationship while ~13% is due to hose expansion created by the high pressure. At each weld start, this excess stored gas in the hose from the gas supply to wire feeder exits the MIG gun nozzle at a peak flow rate often exceeding 200 CFH! This causes considerable shielding gas waste and very turbulent flow. The turbulent flow lasts for several seconds even after the preset level is reached, which mixes moisture-laden air into the gas stream. This creates inferior quality weld starts with excess spatter and possibly internal weld porosity.

Published data shows the average MIG welder uses 3 to 6 times the amount of shielding gas they should! *After conducting extensive laboratory and field tests, we have determined a major cause of this waste is the gas surge at the weld start and not the often-blamed gas leaks. A 1982 patent is cited showing that some extra shielding gas is needed at each weld start to purge air from the gun nozzle and weld start area. However, this initial extra purge gas must not occur at a high flow rate that creates excess turbulence - as occurs with most standard shielding gas flow control systems.*

A patented, inexpensive device (our ***GSS™****) that reduces shielding gas waste is discussed.* ***A fabricator employing it was able to weld 632 parts with one cylinder of gas using the same steady state shielding gas flow rate where one cylinder and their existing system was only sufficient to weld 236 parts.*** *An appendix presents tests of other fabricators who saved 40% to 50% shielding gas use with this gas saving system. In addition to gas savings, the reduced peak gas surge, flow rate at the weld start reduces spatter and internal weld porosity. Welders appreciate the system benefits.*

Past attempts at reducing gas surge and gas waste have frequently met with objections by welders. Some devices tried reducing starting gas surge by using either: (a) low pressure, (b) orifices near the gas solenoid or (c) other flow controls mounted at the wire feeder like regulators or flowmeters. Some combine low pressure devices with mounting at the wire feeder. Welders often rightfully reject these solutions or counter their use by setting excess flow rates since they either eliminate: (a) automatic flow compensation by using low pressure causing flow variations or (b) the purge gas needed at the weld start by controlling flow at the feeder. Or, in the worst case, (such as employed for a "Gas Guard" foolish product) using a low-pressure device mounted at the feeder creating both problems! Examples are presented where fabricators removed this and other devices because of poor weld performance.

The patented ***GSS*** *does not alter pressures and allows the welding operator to set any reasonable, shielding gas flow rate. It eliminates the excess "gas blast" at each weld start and limits peak gas flow rate avoiding excess turbulence.* ***The GSS has no moving parts to maintain, set or adjust. Welders appreciate its starting benefits. Over 15,000 are in use in industrial shops!*** *It is inexpensive, easy to install with payback measured in weeks. A patented flowmeter* ***"Flow Rate Limiter and Lock"*** *is discussed that can control the maximum allowed gas flow setting. Argon has doubled in price- See Why in Appendix F.*

No time to read report? Watch this short summary: http://youtu.be/H5nabh9deLE