HARRIS
A LINCOLN ELECTRIC COMPANY

2015

Turn to the Pros

NOW IS THE TIME
ALTERNATE FUEL ANALYSIS

Despite countless attempts to replace oxy/fuel processes over the years, flame cutting, heating and brazing still remain some of the most indispensable manufacturing processes in the industrial world. Perhaps in years to come oxy/fuel processes may be replaced by more advanced technology but until that time Harris technology can be optimized by the proper combination of fuel gas and equipment. The key to performance and efficiency is to select the right fuel gas and equipment for the right process.

NOW IS THE TIME TO EVALUATE YOUR OXY/FUEL PROCESSES!

WHY ALTERNATE FUEL?

PRODUCT PERFORMANCE

- More BTU per cubic foot
- Less chipping and grinding
- Less top edge roll-over
- Less hardening of cut face
- Very broad flame adjustment range

SAFETY

- Highly resistant to flashback and backfire
- Can be used at higher pressures
- Less UV protection required
- Not sensitive to shock
- Less soot

LESS EXPENSIVE TO USE

- More BTU per dollar
- Less cylinder handling cost
- Less cylinder rental
- Equipment lasts longer

CYLINDER CONVENIENCE

- More product per cylinder
- Less weight per cylinder
- Less costly to maintain

CHANGING JUST THE TIP IS NOT ENOUGH.

If you are using an alternate fuel with equipment specifically designed for acetylene, you may not be realizing all the benefits of an alternate fuel. It often takes more than just changing the tip. Achieving the best performance from your alternate fuel gas may require converting to an injector mixer.

HERE'S WHY:

- Injector mixers designed for alternate fuels mix the oxygen and fuel gas thoroughly for increased BTU output and maximize flame temperature.

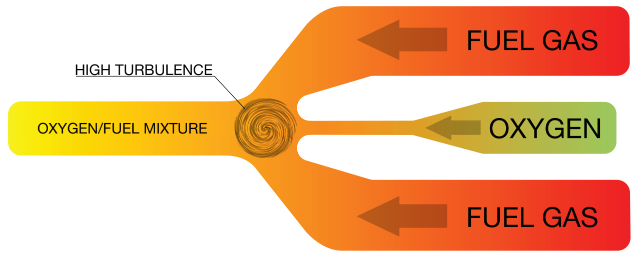
- Injector mixers provide exceptional flame stability. As opposed to equal pressure mixers, a minor fluctuation in gas pressure does not adversely affect flame stability and torch performance.

- Injector mixers are easier to adjust and operate. Adjusting the oxygen valve provides more or less preheat because the injector automatically maintains the optimum oxy/fuel ratio.

- Injector mixers can operate efficiently on fuel gas pressure of less than two PSIG

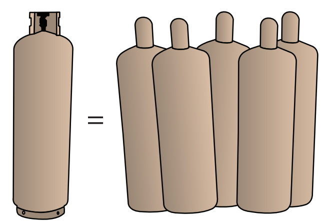
HOW DOES AN INJECTOR MIXER WORK?

The flow of oxygen through the mixer creates an aspirating action or suction to pull the fuel gas through the mixer. Properly designed, the mixer will always pull the correct amount of fuel gas for the optimum oxy/fuel ratio. An increase or decrease in oxygen flow will automatically increase or decrease the fuel gas volume for the optimum mix and best performance. The fuel gas pressure in an injector mixer is not as critical as fuel gas pressure through an equal pressure mixer. The injector mixer is designed to work efficiently even when the fuel gas pressure available is as low as 4 ounces.



The oxygen passes at a relatively high velocity through the injector mixer creating turbulence at the mixing point. The turbulence thoroughly mixes the oxygen and fuel gas allowing for greater combustion efficiency.

FACTOID:
With the proper gas apparatus, one large cylinder of alternate fuel will do the same amount of work as approximately five larger cylinders of acetylene.



Harris alternate fuel injector mixers are designed to give you the most BTUs for your dollar, higher flame temperatures and reduced pre-heat times.

FUEL GAS TECHNICAL DATA

	ACETYLENE	PROPYLENE	PROPANE	NATURAL GAS
MAX. FLAME TEMP °F	**5720**	**5240**	**5130**	**5040**
OXY/FUEL COMBO RATIO (MAX. TEMP.)	1.5:1	3.6:1	4.5:1	1.9:1
NEUTRAL FLAME TEMP °F	5620	5190	5090	5010
OXY/FUEL COMBO RATIO (NEUTRAL)	1.1:1	2.6:1	3.7:1	1.5:1
BTU's PER CUBIC FOOT	1470	2370	2563	1000
% BTU IN OUTER CONE	65	84	89	97
BURNING VELOCITY IN O_2	22.7 / SEC.	15.0 / SEC.	12.2 / SEC.	15.2 / SEC.
FLAMMABILITY LIMITS IN O_2	3-93%	2.5-60%	2.4-57%	5-59%
FLAMMABILITY LIMITS IN AIR	2.5-80%	2.0-11.1%	2.3-9.5%	5.3-14%
SPECIFIC GRAVITY (AIR=1@60 °F)	0.91	1.45	1.56	.55
VAPOR PRESSURE (PSIG @ 70 °F)	250	135	120	LINE PRESSURE
LBS. / GAL. LIQUID	-	4.8	4.35	4.28
CU.FT. / LB. GAS	14.6	9.0	8.66	23.6
CU.FT. / GAL LIQUID	-	43.5	43	37

GAS COST ANALYSIS

AVAILABLE IN ELECTRONIC FORMAT ON HARRIS WEBSITE:
http://apps.harrisproductsgroup.com/gascost/

TABLE 1: VALUES FOR CALCULATIONS

	ACETYLENE	PROPYLENE	PROPANE	NATURAL GAS
BTU's PER CU.FT.	**1470**	**2371**	**2563**	**1000**
AVERAGE OXYGEN TO FUEL RATIO	**1.5:1**	**3.0:1**	**4.0:1**	**2.0:1**
LBS. / GAL. LIQUID	**-**	**4.35**	**4.2**	**-**
CU.FT. / LB. GAS	**14.6**	**9.03**	**8.66**	**23.6**

STEP 1 - SELECT PROPER FUEL GAS

Current fuel ______________________ Proposed fuel ______________________

STEP 2 - BACKGROUND DATA FROM CUSTOMER. (CUSTOMER MUST SUPPLY INFORMATION IN OUTLINED AREAS)

A. Current fuel gas volume per month* ______________________
B. Fuel gas cost per 100 Cu. Ft.* ______________________
C. Oxygen cost per 100 Cu. Ft. ______________________

STEP 3 - DETERMINE PROPOSED FUEL GAS COST PER 100 CU. FT.

Proposed fuel gas cost per 100 Cu. Ft. ______________________
* If the fuel gas cost is priced per lb. or per gallon, use the following formula to convert to $/100 Cu. Ft.

FORMULA $\frac{\text{Price per lb. (or gal.)}}{\text{CU. FT. per lb (or gal.)}} \times 100 = \text{Price per 100 Cu. Ft.}$

ANALYSIS OF CURRENT FUEL GAS COST

STEP 4 - WHAT IS THE CURRENT FUEL GAS COST PER MONTH?

(LINE A) x (LINE B) / 100 = (   ) x (   ) / 100 = $ ________________ Per Month

STEP 5 - WHAT IS THE PRE-HEAT OXYGEN VOLUME PER MONTH?

(Line A) x (Oxy/Fuel Ratio From Table 1) = Pre-heat Oxygen Volume Per Month

(   ) X (   ) = ________________CU. FT. Per Month

STEP 6 - WHAT IS THE PRE-HEAT OXYGEN COST PER MONTH?

(Line C) x (Oxy. Volume From Step 5) = Pre-heat Oxygen Cost Per Month

(   ) x (   ) / 100 = $ ________________Per Month

ANALYSIS OF PROPOSED FUEL GAS COST

STEP 7 - WHAT WOULD BE THE PROPOSED FUEL GAS VOLUME PER MONTH?

(Current Gas BTU CU. FT. From table 1) x (Line A) / (Proposed Gas BTU CU. FT. From table 1) = (   ) x (   ) / (   ) = ________________ CU. FT. Per Month

STEP 8 - WHAT IS THE PROPOSED FUEL GAS COST PER MONTH?

(Volume from Step 7) x (Cost from step 3) / 100 = (   ) x (   ) / 100 = $ ________________ Per Month

STEP 9 - WHAT IS THE PROPOSED PRE-HEAT OXYGEN VOLUME PER MONTH ?

(Volume from Step 7) x (Oxy/Fuel Ratio From Table 1) = Proposed Pre-Heat Volume Per Month

(   ) X (   ) = ________________CU. FT. Per Month

STEP 10 - WHAT IS THE PRE-HEAT OXYGEN COST PER MONTH ?

(Line C) x (Oxy. Vol. From Step 9) / 100 = (   ) x (   ) / 100 = $ ________________ Per Month

SAVINGS SUMMARY

CURRENT COST

Fuel Gas $ ________________ (step 4)

*Pre-Heat Oxygen $________________ (step 6)

Total $________________

PROPOSED COST

Gas $________________ (step 8)

*Pre-Heat Oxygen $ ________________ (step 10)

Total $ ________________

MONTHLY SAVINGS $ ________________

ANNUAL SAVINGS $ ________________

*The fuel gas selected does not affect the cutting oxygen volume.

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