THE PERFECT FLAME™

LINCOLN ELECTRIC®

HARRIS®

A LINCOLN ELECTRIC COMPANY

Market Problems

- Improper Heat Input causes 90% of brazing problems.
- No way to validate heat input from a torch.
- No way to determine if you have a neutral flame.
- Significant inconsistencies between stations, shifts, and facilities.

Goal: Create “perfect” oxy-fuel flame

Hardware adjustments the flame

Measure and record flame details:
Temperature, BTU Value, & Oxy-fuel Ratio

Software interprets data

Harris can provide:
- Quality consumable alloy
- Quality brazing equipment
- Training for skilled operators
- Equipment that takes the guesswork out of heat/flame variation

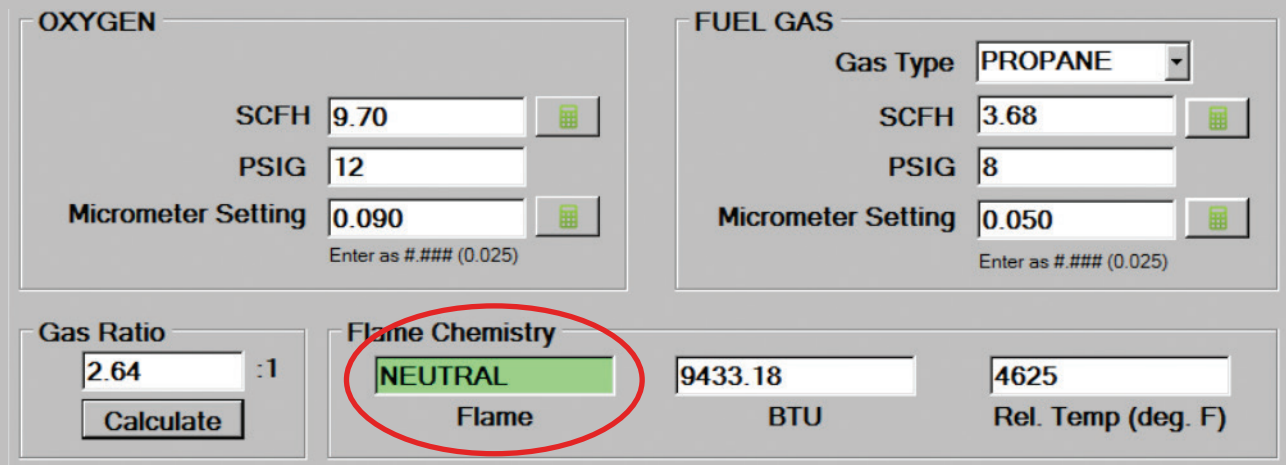
The **HARRIS** Solution

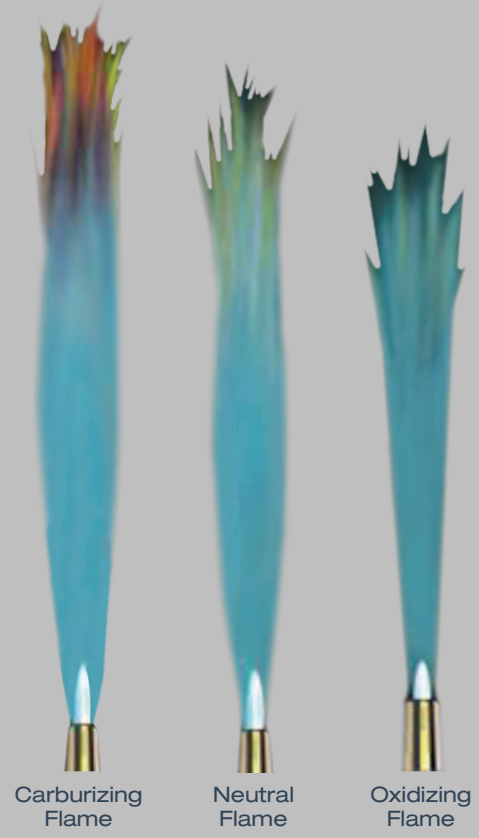
Problem 1: Setting a Neutral Flame

- Alternate fuels make it hard to set a neutral flame
- Oxidizing flames saturate flux, create surface oxides that prevent wetting (flow, penetration), and weaken the bond between filler metal and base material.

Solution: Perfect Flame

- Software Determines Neutral Flame
- Proves there is not excess oxygen





The **HARRIS** Solution

Problem 2: Consistent, Repeatable Flame

- Each operator sest their own pressures
- Each operator controls their own flame at the torch
- “Tribal Knowledge” determines flame, not work procedures

Solution: Perfect Flame

- Consistent, Repeatable Flame from:
  Station to Station
  Day to Day
  Plant to Plant (worldwide)

- Reduces downtime between joints
- Less operator training
- Help standardize work rates

The **HARRIS** Solution

Problem 3: Measureable Flame

- No way to measure BTU output or flame temperature

Solution: Perfect Flame

- Opportunity to Impact Change

- Increase throughput (more BTU)

- Reduce part failure (same BTU, lower temperature)
  Won't distort the surface, but will transfer heat to joint

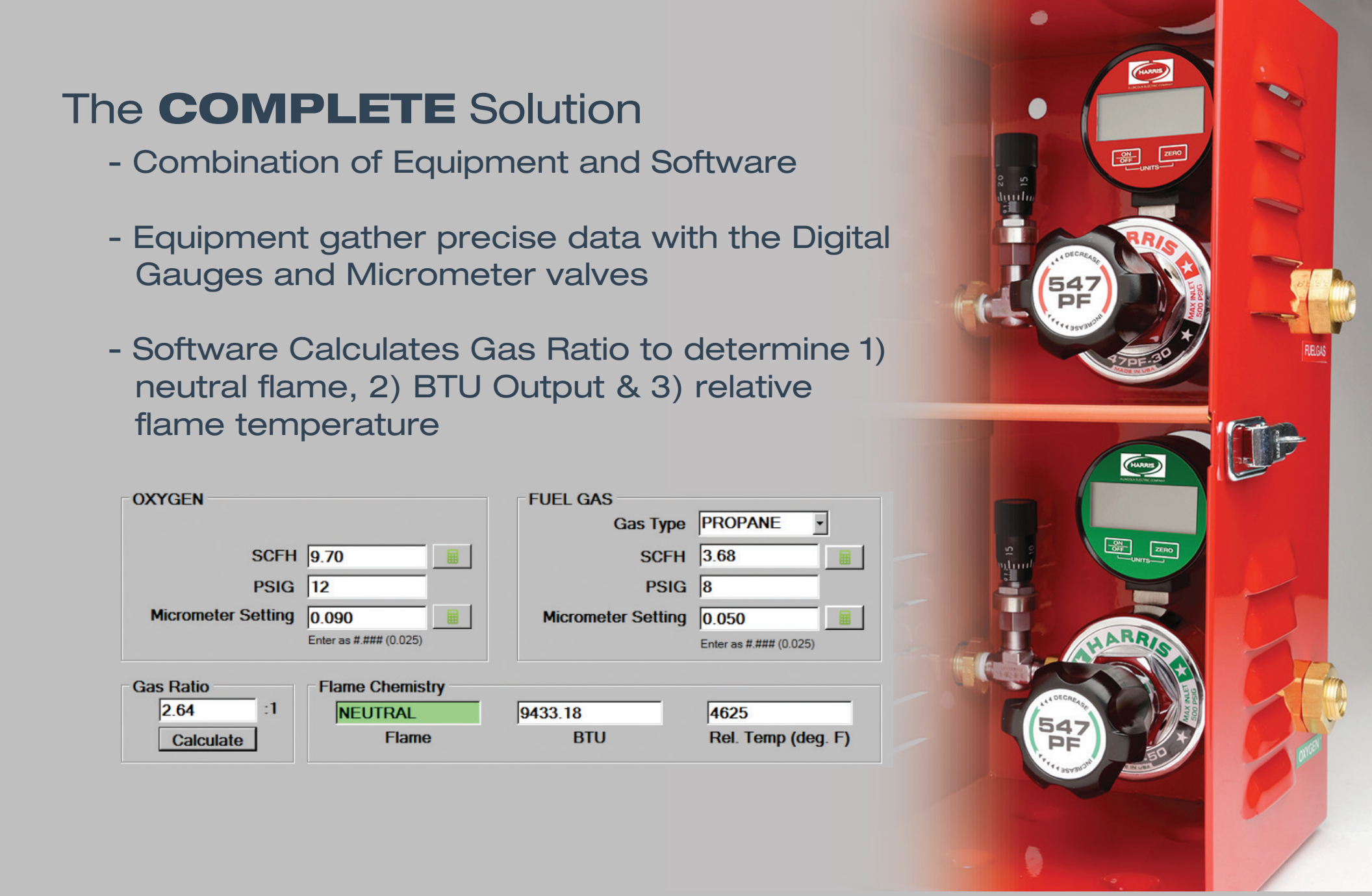
- Lower temperature will transfer heat to the center of the joint so that alloy does not solidify before it reaches other parts of the joint.

The **COMPLETE** Solution

- Combination of Equipment and Software

- Equipment gather precise data with the Digital Gauges and Micrometer valves

- Software Calculates Gas Ratio to determine 1) neutral flame, 2) BTU Output & 3) relative flame temperature



Value Proposition

Value to Management

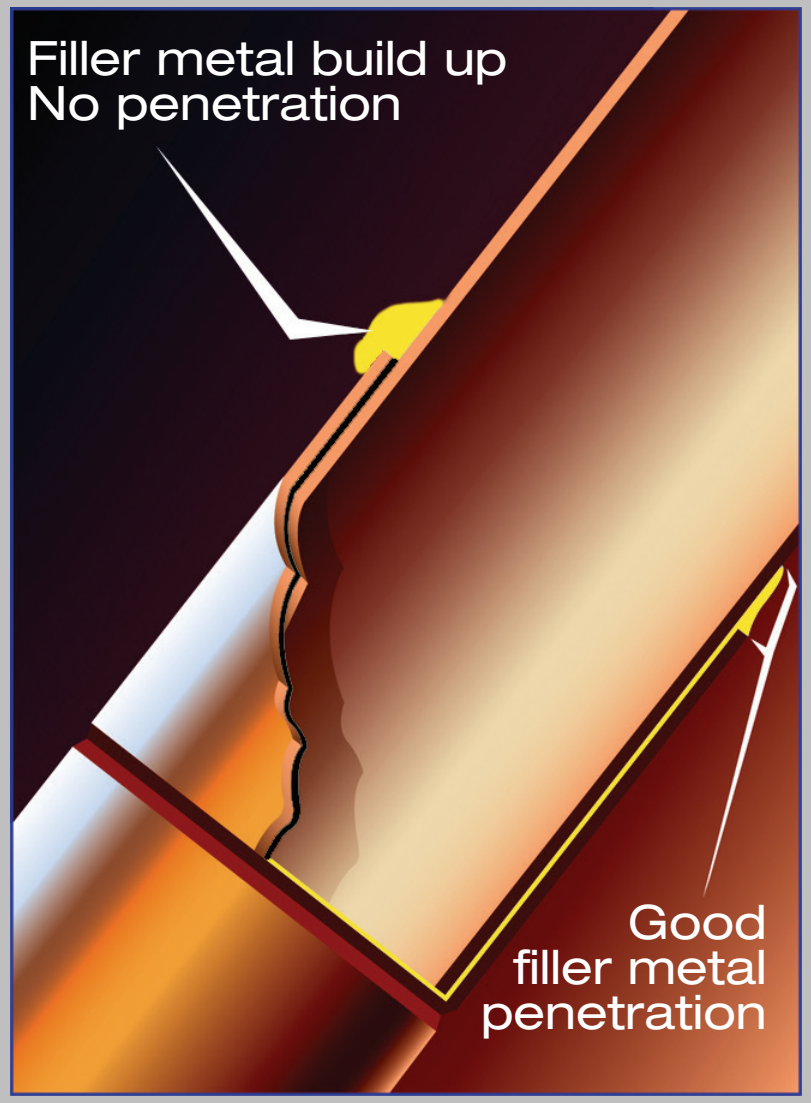
Finally have control and can specify the right tool for the right job
Standardizing flame setting between operations, shifts & plants
Measure flame variables
Ability to add flame temperature and BTU output to your work instructions
Decreases training time for new operators

Value to the Operator

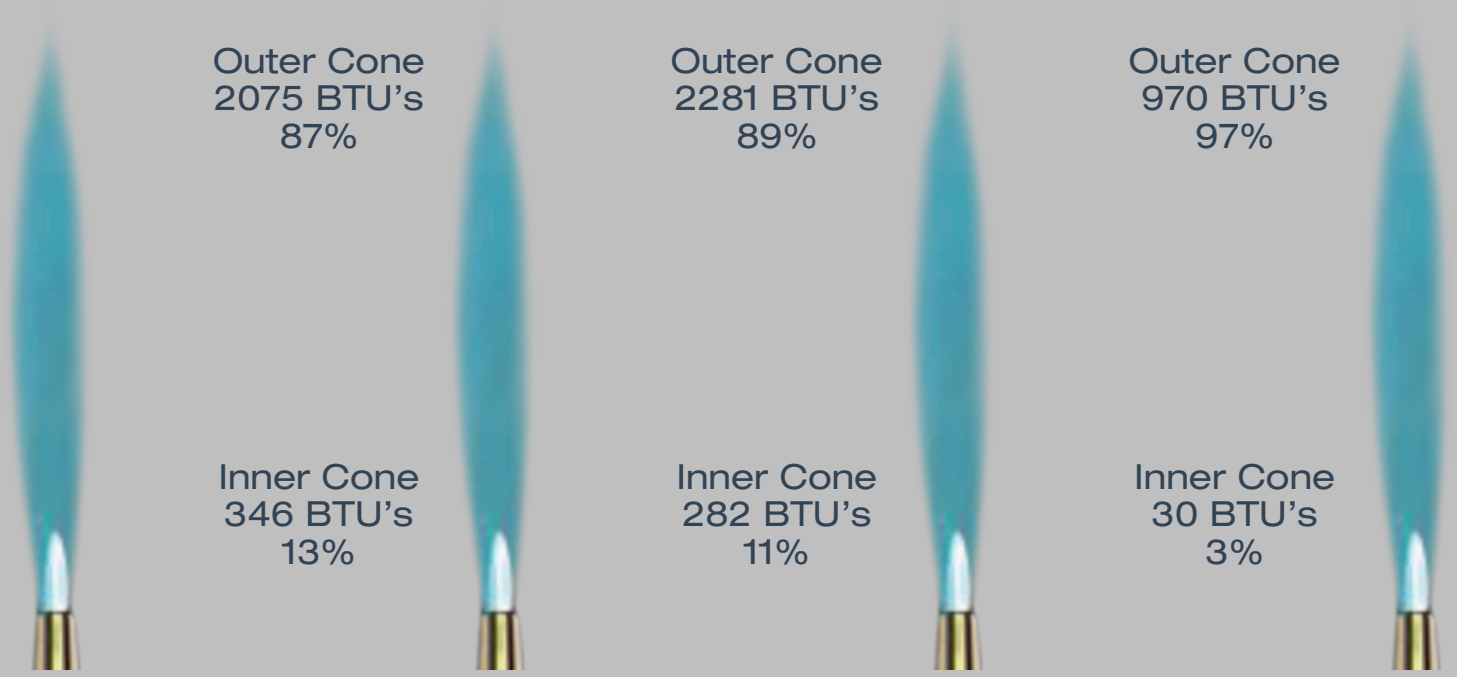
Safety with the Model 50 which eliminates open flames
Increased Production
Consistent pressure setting day to day

ISSUES WITH HEAT INPUT

Most common braze problem



BTU distribution in oxy-fuel flames



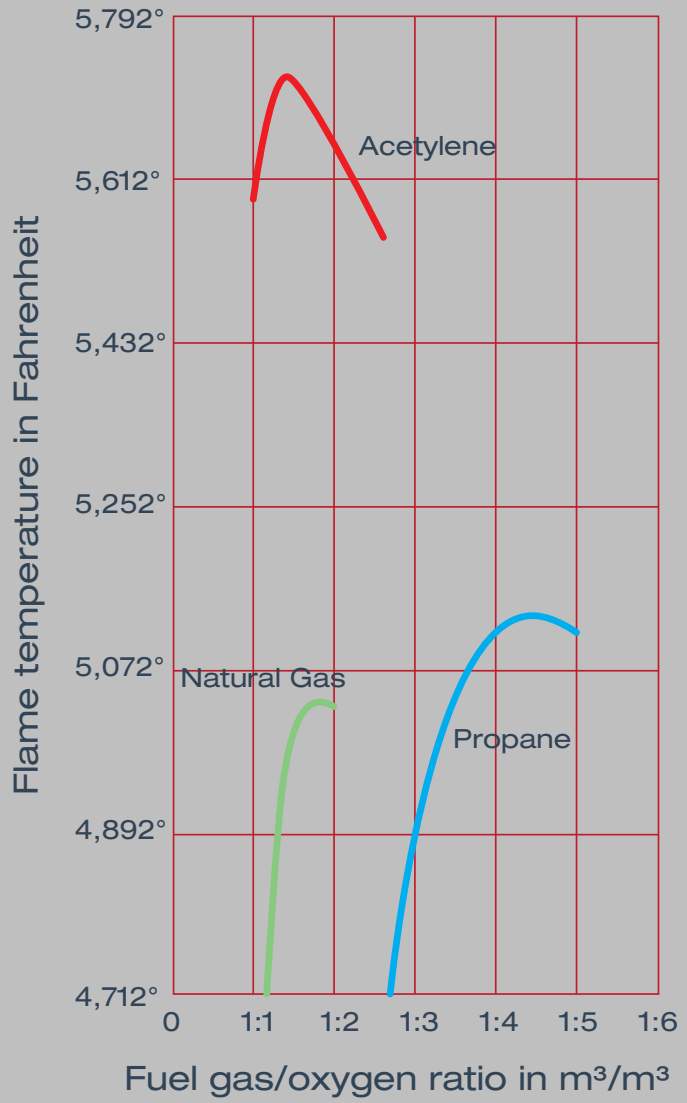
Acetylene
Total BTU/ft3
1470

Propylene
Total BTU/ft3
2370

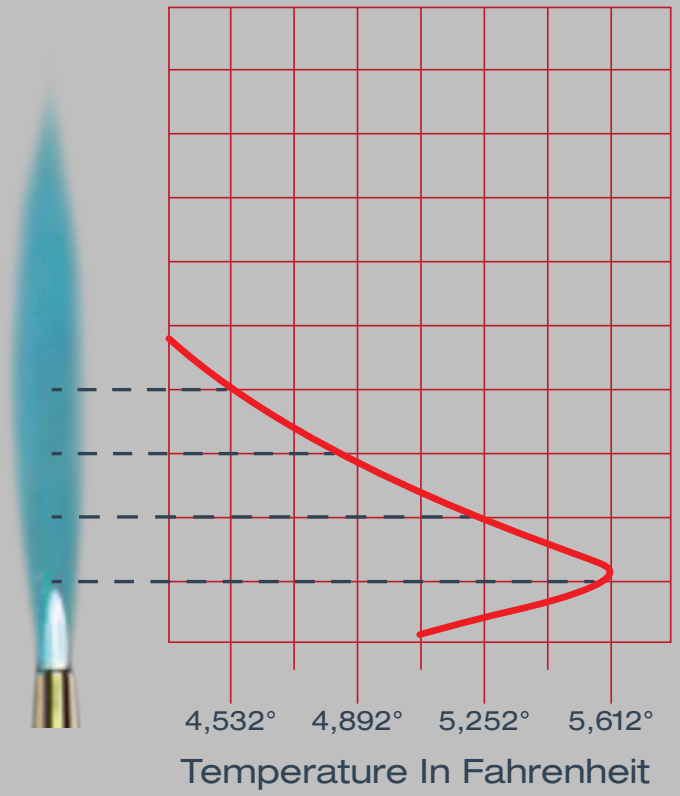
Propane
Total BTU/ft3
2563

Natural Gas
Total BTU/ft3
1000

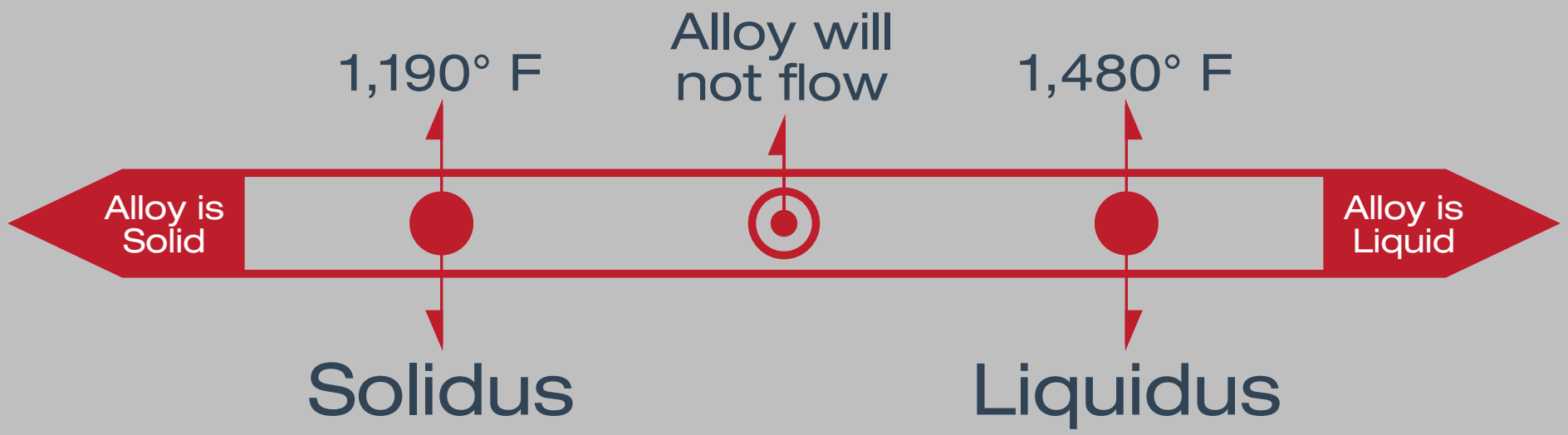
Various gas temperatures



Temperature distribution within an acetylene/oxygen flame



HEATING: Alloy Melting Range



PROGRAM DETAILS

Program Details

Digital Gauges

- Measure Pressure to:
  - 0.1 PSI Oxygen
  - 0.01 PSI Fuel Gas
- Battery Powered Digital Readout
- Includes international setting

Micrometer Valve

- Allow you to control and measure the orifice to 250 places.
- Calibrated for precise accuracy
- Essentially replaces torch valves

Program Details

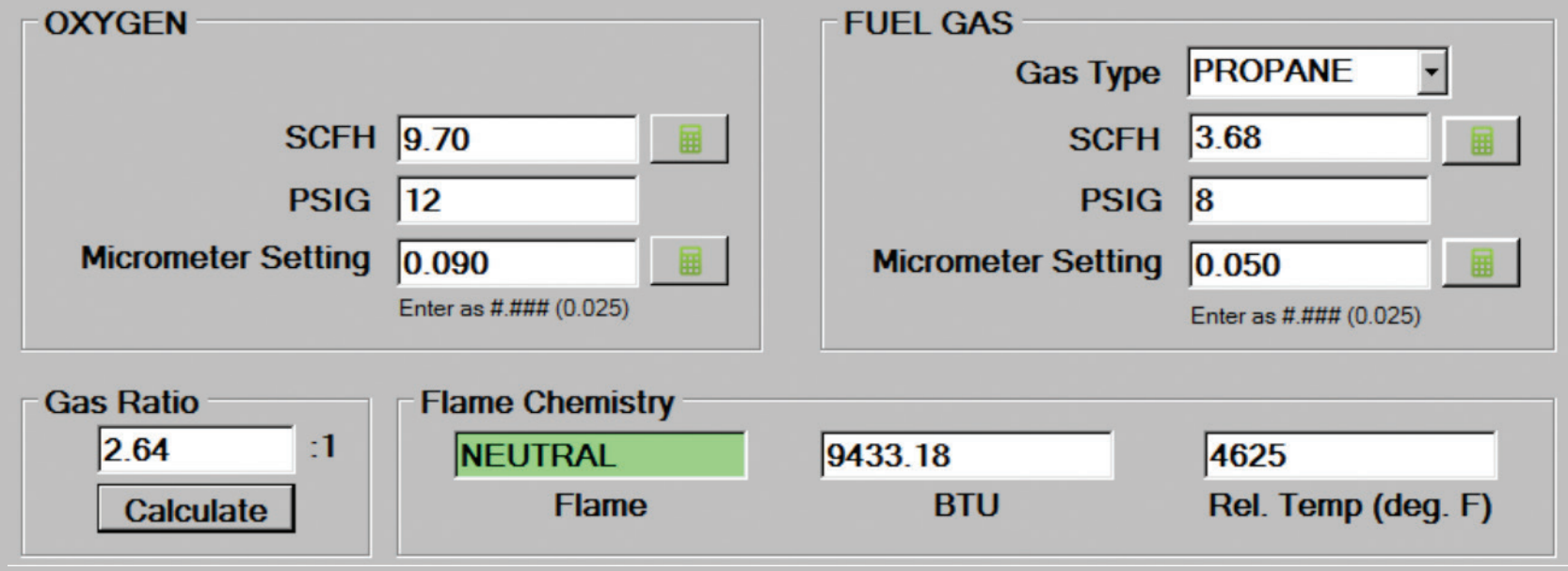
Valveless 50-10 Torch

- Flow settings removed from the torch
- On/Off level for fast and convenient gas flow
- Lockable Case

  Gives you complete flame control with no adjustments needed

HARRIS flame software allows you to:

- Measure exact characteristics of the flame
- Specify temperature and btu's on the part specification
- Confidently set a neutral flame
- Know your flow rates and gas ratio

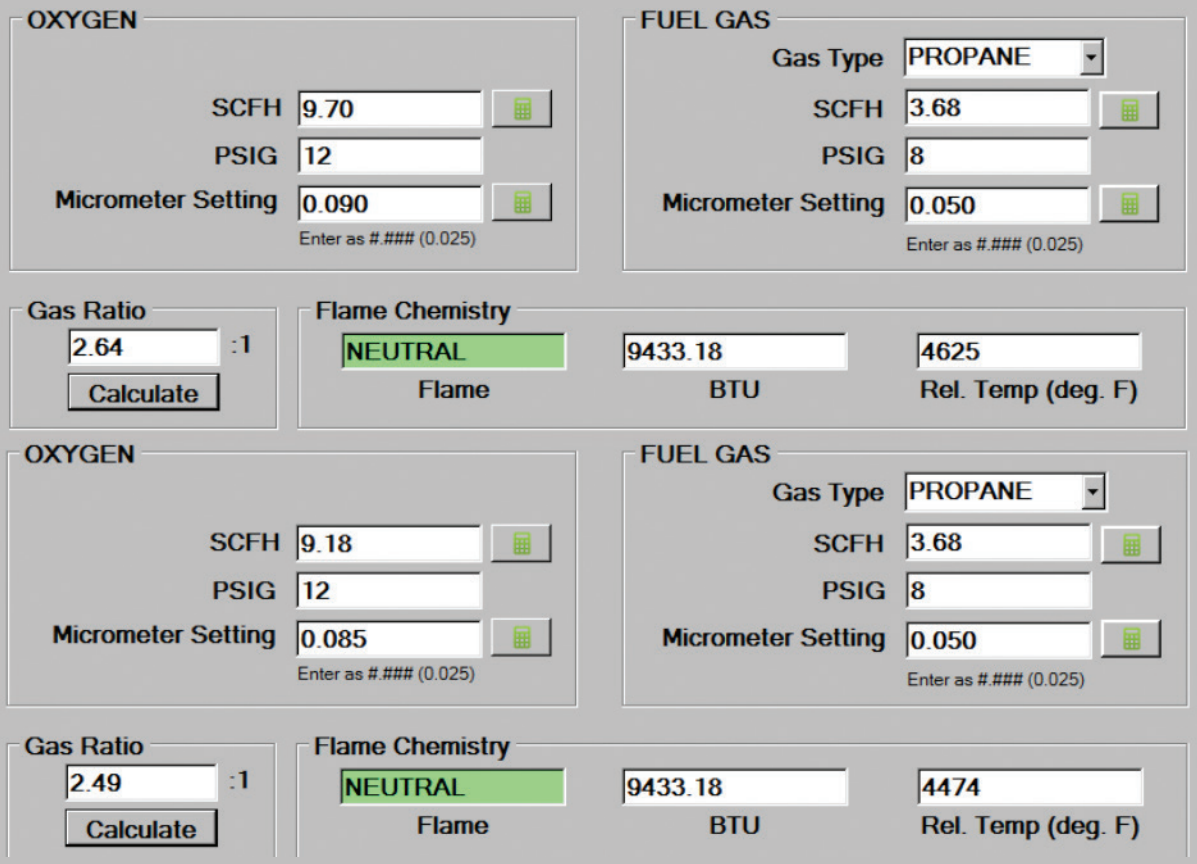


HARRIS flame software

Example: Decrease the Oxygen Micrometer by .005

Difficult to visibly see a change in the flame

We actually decreased the temperature by over 150 degrees

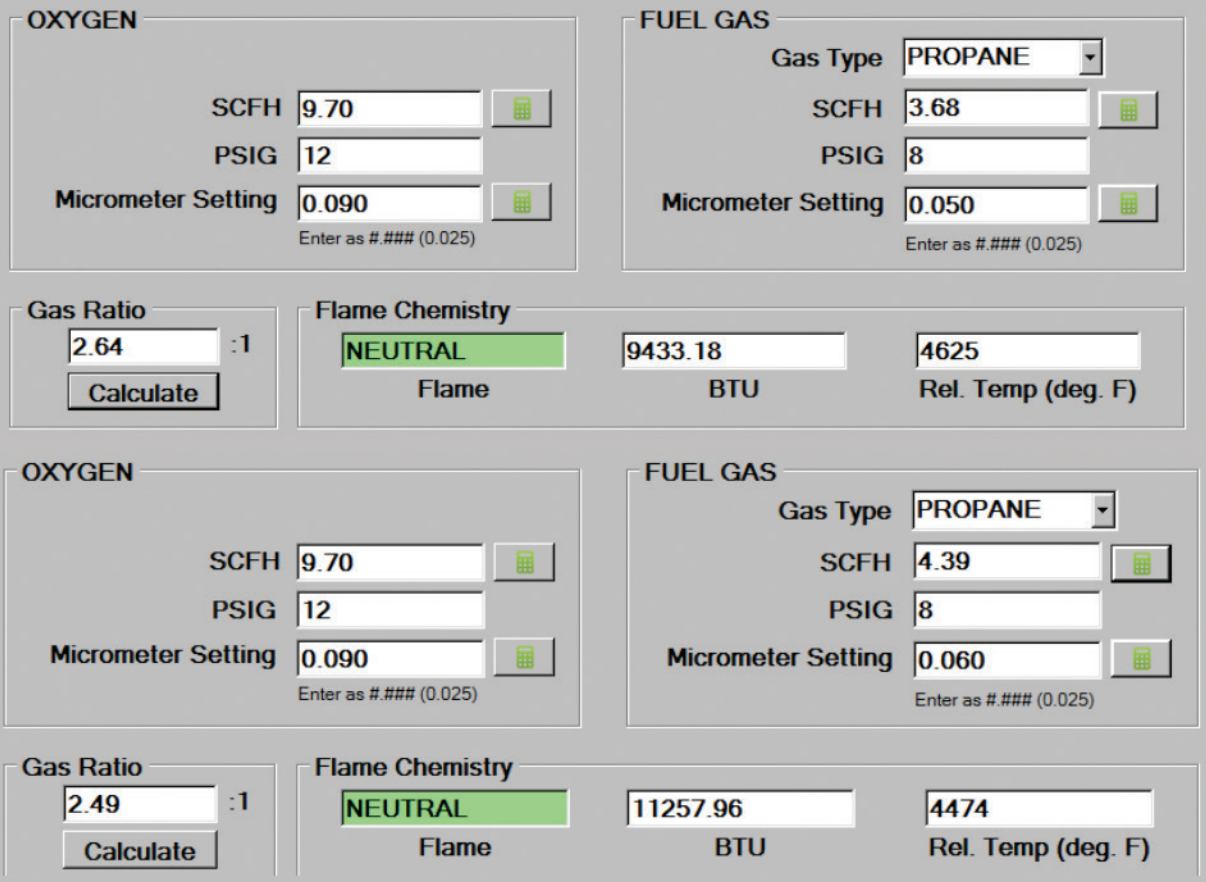


HARRIS flame software

Example: Increase the Fuel Micrometer by .010

You can see the difference in the Flame but how much did it change?

Over 1,800 BTU's which is more than 20%



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