

# **SAFEFLAME**<sup>®</sup>

## **A NEW SAFER FLAME FROM WATER**

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Distributor :

# A NEW..... SAFER FLAME FROM WATER

A NEW GENERATION DEVICE THAT WILL MODERNISE THE TRADITIONAL METHODS OF OXY-ACETYLENE AND GAS-AIR BRAZING.

SAFEFLAME is the development of a 'Safer and better brazing flame' using Hydrogen and Oxygen from Electrolysis of de-ionised water needing only water and electricity and no chemicals.

The Safeflame project (www.safeflameproject.eu) is the result of EU funded research project (1.8 million Euro) from 1st November 2011 to 31st October 2014.

Safeflame (UK) Ltd was the company set up to exploit the project results on behalf of the SME AG which is made up of EABS (European Association of Brazing and Soldering), CESOL (Spanish Welding Association), BESA (Building Engineering Service Association).

**NEW Safeflame torch design** producing a new "FLAME" (Very different from the traditional Why is it gas/air or gas/oxy FLAMES)

# SAFER?

- **NO premixed gases**,
- NO gas cylinders,
- **NO light back**,
- No corrosive chemicals.



**Safeflame**®

torches LINKED to **ELECTROLYSERS** with **SEPARATE streams of HYDROGEN and OXYGEN** gases.

# From WATER

What's

This "new" safeflame compliments rather than competes with existing commercially available flame. it's a "new" additional flame now available to the market.

**NOT** to be confused with flames from electrolysis of water (mixed gas) which uses corrosive **chemicals** 

# Fuel Gases for Flames

Where & who do we get existing fuel gases from...

#### **Why** has Hydrogen generally been the last choice for fuel gas?

- Low CV (Calorific Value) 330 btu/cf,
   Natural Gas 1000btu/cf,
   propane 2500 btu/cf,
   Acetylene 1300 btu/cf
- Perceived safety issues, particularly with Oxygen and light back
- Safety issues with chemicals from existing HHO flames from water (mixed gases)
- Inconvenience of supply from cylinders for both hydrogen and oxygen.
- Lack of real Knowledge and experience in the supply chain compared to other fuel gases.

### Why choose Hydrogen and oxygen now?

- Recent developments with Electrolysis (separate gases) have reduced electrolyser costs so hydrogen and oxygen can now be conveniently sourced from water
- New Safeflame® burner designs produce a new flame with no light back, less intense, controllable and safer.
- So, for the first time unique benefits of hydrogen and oxygen can now be used safely from a convenient source of supply.

Gas Utility .... Natural gas (Methane)

. Liquefied Petroleum Gas (LPG)

(Propane/Butane/ Propylene)

... Industrial... .... Acetylene

gas company

**Reformed Natural gas** 

Hydrogen....

**Electrolysis of water** 

### **Requirements for combustion:**

**Gas + O**kygen **= FLAME** 

### Where does Oxygen come from?

- Air (20% Oxygen/80% Nitrogen
- Oxygen from a cylinder, generator

Oľ

Mixed Gas or Separate Gases
 (Electrolysis of water)

#### **Types of Electrolysis** Range of Commercially available electrolysers

- Flame brazing is used in ALL industries including Automotive, Aerospace, HVACR and Heat pumps and many more sectors.
- Manual and automated methods
- HVACR and heat pumps is a huge global industry.
- Dominant "Joining process" is FLAME BRAZING
- Manually flame brazing holding a gas /oxygen hand torch.

### Two BASIC burner Designs

### **Pre-Mixed & Post-Mixed**

### An 'unpiloted' single-orifice

Gas-Oxygen Burner nozzle



#### Post mixed Gas-Oxygen burner nozzle



- Automated brazing mainly by gas/air
- How many application / persons involved in HVACR Industry?
- F-Gas Directive means every person and company handling refrigerant gases have to be registered and Qualified? To what standard?
- UK over 40,000 individuals, who need to use FLAME BRAZING during their day to day job function.
- In Europe, maybe over 400,000 individuals.

- Separate gases have two separate outlet connections for
   Hydrogen and Oxygen.
- Acidic (PEM) with no KOH but uses built-in catalyst
- PEM available for 5+ years

#### **Mixed Gas called HHO**

#### To Battery Ground HHO To Initake Wia Air Filter - Side Attracts Oxygen (\*) Distilled Water with 1 tsp. Sodium Hydroxide (electrolyte)

#### **Separate Gas**



- HHO mixed gas has one outlet connection.
- Hydrogen and oxygen gas immediately mix together
- Alkaline type with KOH (electrolyte)
- Available for 60+ yrs

#### **Range of Burners and Torches** Single and Double Safeflame Torches





Various sizes of Safeflame burner nozzles are available. Size range – The higher the number the smaller the port size. 15,18, 20, 23 are common sizes

# **Compressed Gases or mains gas**



corrosive chemicals required

	1 litre	2 Litre	3 Litre	4 Litre
H2 Output (LPM)	1	2	3	4
O2 Output (LPM)	0.5	1	1.5	2
Power Supply (AC)	200-240v 13A	200-240v 13A	200-240v 13A	200-240v 16A
Max Power Consumption (W)	450	850	1350	1750
Water Tank Capacity (L)	1.5	1.5	2.2	2.2
Water Consumption	60 ml/hr	120 ml/hr	180 ml/hr	240 ml/hr
Dimensions (cm) (HxWxD)	52 x 34 x 40		61 x 45.5 x 50	
Weight (Kg)	25	30	38	42
Compatible Torches	Micro Torch	Micro Torch Single Head Double Head	Micro Torch Single Head Double Head	Micro Torch Single Head Double Head
Brazing Capability (Max Pipe)	1/4"	3/8"	1/2"	5/8"

• The gas pressure inside the Electrolyser is very low (< 0.5 bar) which is below any safety regulation for high pressure vessels .

- No hydrogen and oxygen gases storage ; machine produces the hydrogen and oxygen gases on demand.
- Brazing does not require the operator to wear any special glasses.
- The fumes are reduced by about 60-70%.

• The Hydrogen flame is environmentally friendly. The combustion of Hydrogen and Oxygen produces water vapor and does not produces CO2 emissions, resulting in a better working environment for the brazing operators.

The system eliminates the usage of

Compressed gas cylinders and reduces the possibility of gas cylinder explosion.

Oxygen

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**UUA ITY** • The flame is neutral and concentrated; heat is therefore localised and does not spread, eliminating the risk to overheat the brazing piece and nearby assembly components. Such a flame drastically reduces the oxidation inside the brazed pipes. For the refrigeration/air-conditioning industry with less oxidation inside the copper tubing will result in extended life-time of the compressor

5 Litre	6 Litre	7 Litre	8 Litre	9 litre			
5	6	7	8	9			
2.5	3	3.5	4	4.5			
200-240v 32A	200-240v 32A	200-240v 32A	200-240v 32A	200-240v 32A			
2250	2650	3200	3700	4100			
6	6	6	6	6			
300 ml/hr	360 ml/hr	420 ml/hr	480 ml/hr	540 ml/hr			
	93 x 51 x 55						
52	55	58	65	68			
Micro Torch Single Head Double Head	Micro Torch Single Head Double Head	Single Head Double Head	Single Head Double Head	Single Head Double Head			
5/8"	3/4"	3/4"	1"	1"			



# Electrolyser 9LPM&2LPM

 Thanks to the neutral flame and high temperature the brazing alloy penetrates deeper into the joint producing stronger connections.

• The Hydrogen and Oxygen gases from the electrolyser are mixed automatically at the tip of the torch thus eliminating the human intervention, the flame's quality is always consistent therefore quality of brazing improves

# Practicality



 Torch is ergonomically designed and light weight (about half the weight of a conventional torch) which improves operator productivity.

Our products eliminate light-back; the operator does not lose confidence of the system, productivity is not affected.
All our machines use distilled or de-ionised water to generate the gases ; the water is fed to the machine automatically without the operator intervention.



 Safeflame generate gases from de-ionised water and electrical power supply only, and nothing else.



- Cost of gas (cost of gases are rising).
- Cost of cylinder rental and cylinder transportation.
- Cost of investment to comply with safety regulations within every brazing work cell.
- Cost to train operators to set gas mixture of a conventional torch.
- Cost of manufacturing. Brazing temperature is reached 2 to 3 times faster when compared with a conventional system.

With Safeflame, you don't have these costs and Safeflame requires less skill for the brazing operator. This will result in production efficiencies.



# **Applications**

- Flame Brazing
- Flame polishing
- Flame Treatment
- Flame heating
- others

### **Markets**

- Heating Ventilation Air
  - **Conditioning and**
  - **Refrigeration (HVACR)**
- Jewellery industry
- Education Schools/Colleges

### **Exploitation of Safeflame**

### in the markets

# What we need to do is fully identify the flame needs, drivers and economic route to each market.

- HVACR flame size/capacities 2 to 50 l/min
- Jewellery flame size/capacities 0.5 to 61/min
- Education flame size/capacities 1 to 10 l/min
- Plastic polishing flame size/capacities 1 to 5 l/min

We have to match and link suitably sized Safeflame burners/torches to suitably sized and priced electrolysers to offer commercial "safeflame packages" that can deliver this NEW SAFER FLAME



- Plastic Industry
- Automotive/Aerospace
- And many others

# TIME FOR CHANGE

HYDROGEN FLAME IS ABOUT 2700 °C.

AND for the first time, SAFEFLAME CAN provide the full range of Quality Safe Electrolyser units from 1LPM to 14LPM and above at competitive prices.

The Hydrogen Flame from Safeflame with its specially designed torch is safer, greener and can provide precise control of the new flame.