


# FAM ACCESSORIES, TOOLS & BURNERS

The optimal solution for  
each application

Fire polishing

A close-up photograph showing a clear glass bowl being polished. A bright, intense yellow and orange flame is directed at the rim and surface of the bowl. To the left, a blue flame is visible, likely from a burner. The background is dark, making the fire and the glass stand out.

Glass is used to make many different types of containers, which can range from the simplest bottles, vases and glass, to more elegant and decorative items. Perfection regarding the latter type of articles is fundamental, and polishing is generally used for this, mainly with acid. The use of acid is, however, not only a danger for operators and the environment, but is also expensive to dispose of. In this article, FAM Accessories, Tools & Burners, a brand of Famor Engineering, presents its solution to this dilemma with flame polishing using natural gas and oxygen burners.



## FIRE POLISHING

### THE ADVANTAGES OF FIRE POLISHING FOR HIGH QUALITY PRODUCTS

Large glass tanks or so-called pot furnaces are used to produce glass. The raw materials such as sand, sodium carbonate, aluminium oxide, lime, and dolomite, to name only the most important, are thoroughly premixed and then fed into the smelting process. Melting occurs at extremely high temperatures, between 1,300°C and 1,500°C, depending on the type of glass.

These high temperatures, in combination with the extremely aggressive nature of the melt, require high quality refractory material to be used to clad the tank or pot. Energy consumption is also extremely high because of the high melting temperature. Complex air pre-heaters are used to optimize this energy consumption. An attractive alternative to

reduce energy consumption is the use of oxy-fuel burners. Their utilization also reduces the emission of harmful substances. This heating technique is being implemented more and more in the glass industry and FAM Accessories, Tools & Burners has many years of experience in this respect.

Moulding, which was, many years ago, a purely manual operation (glass blowing was known before the birth of Christ), takes place after melting. Today, consumer articles such as drinking glasses, household articles, ornaments, vases, etc., are either pressed or blown mechanically.

Fully automatic moulding systems were developed at the turn of the 20th century.

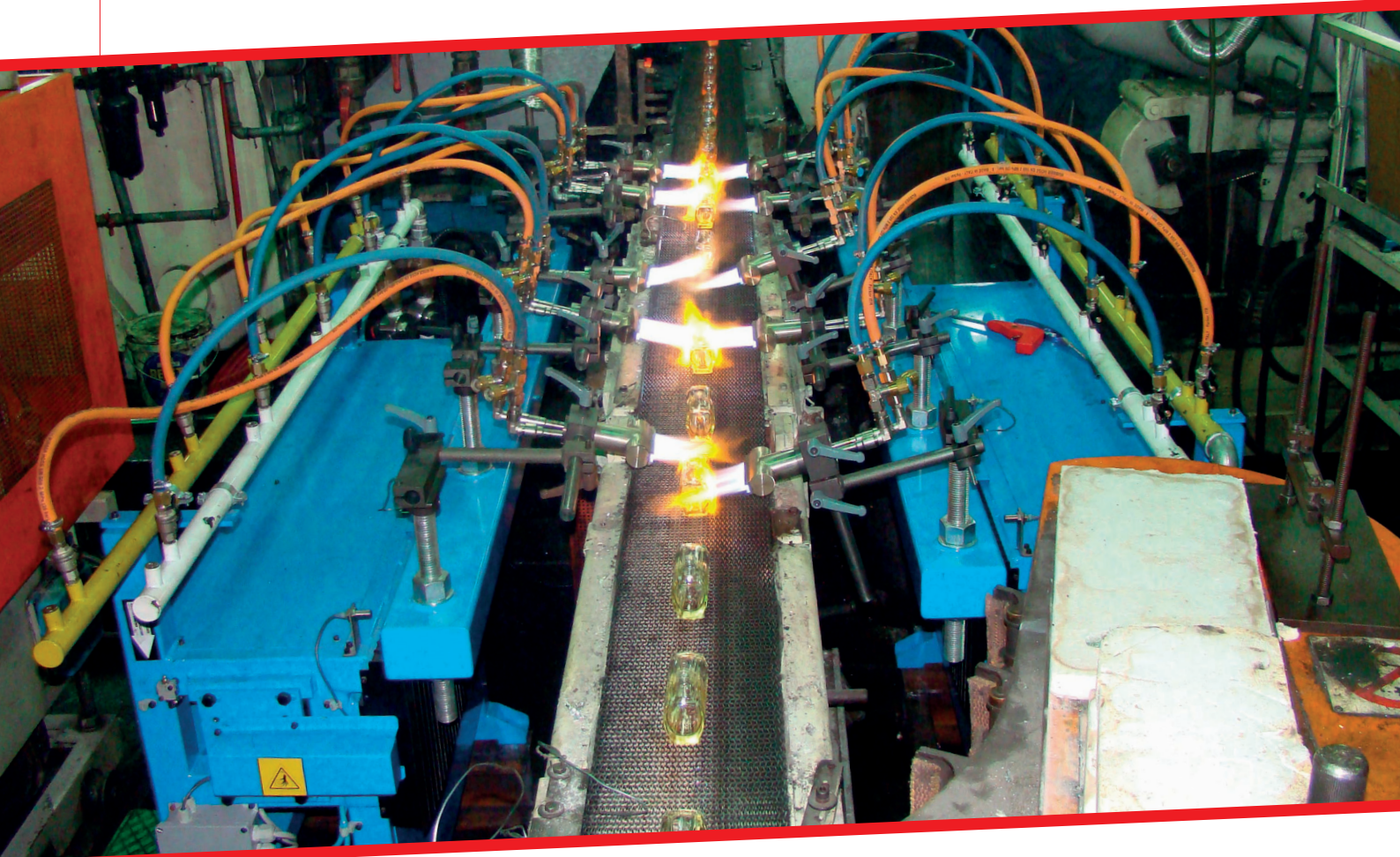
### FIRE POLISHING

Glass is a versatile raw material that can be moulded into practi-

cally any shape, and is far more resistant to chemicals than most other substances. It is also the perfect material for the preservation of foodstuffs.

Besides its ease of moulding, it is also easy to decorate and colour. As a result, it is highly suitable for the manufacture of decorative items, which range from the production of high-quality champagne bottles, wine glasses and decorative perfume bottles, right through to vases and statues made of gracefully crafted glass. Such articles must have a perfect surface or even the smallest imperfection will spoil the overall impression of the object. These high-quality demands can only be achieved by means of polishing.

The use of acid polishing is a common practice to achieve these goals. However, its use results in





an additional process step as well as a hazard to both operators and the environment.

The disposal costs of the waste acid are also rising continuously. FAM Accessories, Tools & Burners offers an environmentally friendly and financially viable alternative in the form of fire polishing using oxygen burners.

This technique is easy to integrate into the existing process while being suitable for use with all glass types.

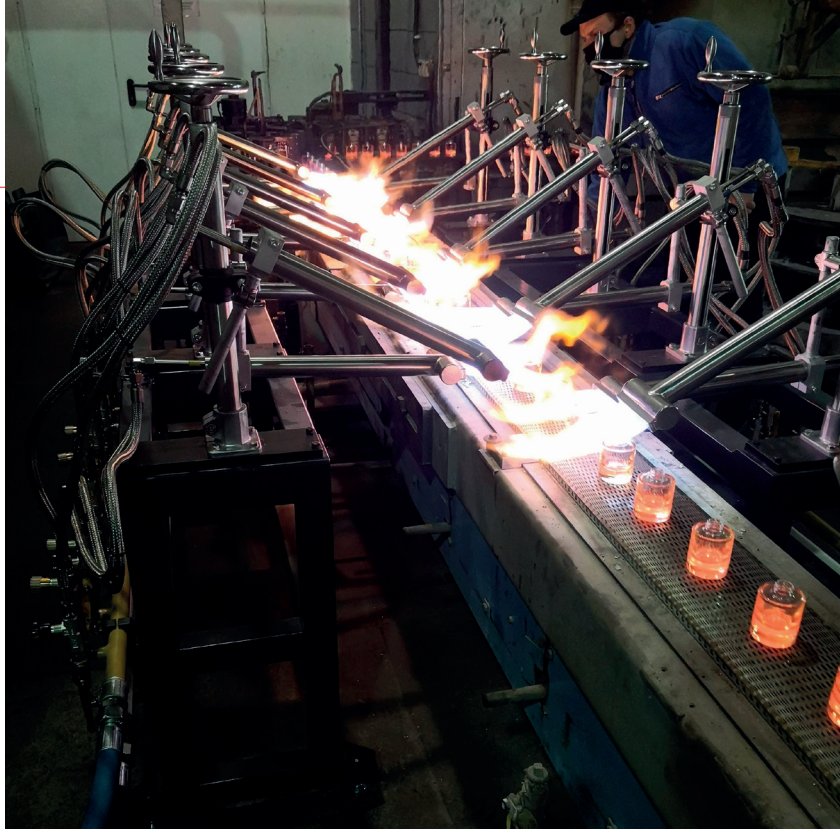
### **SURFACE TREATMENT**

A perfect surface is especially important for high quality products, with the quality of the mould having crucial importance. This, in turn, depends on the selected materials, as well as the care with which the mould surface is prepared.

However, small surface imperfections on the moulded glass are unavoidable, no matter how thoroughly the form surface has been prepared. Only appropriate surface treatment allows to obtain the desired surface structure and brilliance of the glass to reach its full potential.

Acid polishing is a commonly applied practice, particularly in lead crystal manufacturing. The moulded glass is placed in a concentrated hydrofluoric acidic bath where the surfaces are etched, and small imperfections and impurities are thus removed. The result is smooth flawless surfaces.

Acid polishing, however, has decisive disadvantages: a separate process step is required for the polishing phase, which can lead to health risks for the operating staff that cannot be eliminated and, at the same time, a not-negligible environmental risk always exists. Disposal costs of waste acid are of decisive importance. Stricter environmental legislation also results in persistently escalating disposal costs. Alternative processes are thus continually receiving more acceptance.



### **FLAME POLISHING**

Flame polishing, in alternative to acid polishing has, as its most important advantages:

- no disposal of waste products needed.
- can be integrated into the forming section; and
- environmentally friendly, health risks are reduced.

With fire polishing, the surface or edge of already moulded glass shapes are re-melted using a small burner. This is performed on a carousel directly coupled to the moulding step (which can be a mechanical press, blowing or centrifugal casting). Here the glass is still hot but no longer malleable.

Through the rapid melting of the glass surfaces, defects such as beads, tool marks, and streaks, as well as small breakages and sharp edges, are smoothed out without thermally stressing the structure.

Only a very thin layer is melted, which solidifies just as rapidly again, resulting in immaculate and brilliant surfaces. Small oxy-fuel burners are particularly well suited to heating small precisely defined surfaces to a high temperature in a short space of time. They allow to heat a specific part of the glass surface without heating the entire structure and thereby damaging it.

For flame polishing, the ideal situation is when the hottest part of the flame touches the glass surface. The distance from the burner to the glass is thus a critical parameter that needs to be accurately controlled within a narrow band. To achieve this, multiple burners are usually employed to follow the contours of the product as closely as possible. In this manner, the best possible results can be achieved.

### **FAM ACCESSORIES, TOOLS & BURNERS – THE OPTIMAL SOLUTION FOR EACH APPLICATION**

FAMOR ENGINEERING, with its brand FAM Accessories, Tools & Burners, manufactures a large range of different types of





## FIRE POLISHING

burners that are capable of coping with a broad spectrum of applications. The primary characteristic of these burners is their layout. Size and version can, however, also be adapted to suit individual requirements.

### EXTERNAL MIXING BURNERS

These burners have been developed in recent years. Both the fuel gas and the oxygen required for combustion is transported to the front exit plate on the burner head through separate holes. The mixing of the two gas streams therefore occurs outside the burner. The resultant flame is somewhat 'softer' with a slightly reduced temperature.

The construction method has the following advantages:

- no danger of a flame flashback due to improper operation and resulting damage to the burner;
- the 'softer' flame allows the sharp edges of pressed ornaments to be retained;
- an excellent turn down (control range) from a minimal (hardly visible) flame right through to full capacity.

The newly introduced model, developed by FAMOR ENGINEERING, is producing excellent results, with crystal and lead crystal glass showing the following:

- immaculate surfaces;
- no damage to the sharp edges of decorations;
- high brilliance.

Fire polishing represents an interesting and economically viable alternative because these high-quality demands are achieved without the need for any acid treatment.

### CUSTOMER CHALLENGES

The main challenge is to maintain accurate burner flame control, independently from the gas line's pressure oscillations. In addition, the risk of leakage must be reduced to the lowest level due to use of

dangerous gasses. Last, but not least, a robust and compact solution is appreciated, to maintain the machines as small as possible.

### FAMOR ENGINEERING & ELECTRONIC SOLUTIONS

FAMOR Engineering & Electronic Solutions offers electronic systems assembled on a manifold with customized paths.

Natural Gas and Oxygen flows rate can be controlled by Servo Electronic Valves or by MFC systems. Thanks to their easy installation, the compact systems ensure the convenient operation of a complete (closed) control loop.

Where different Natural Gas or Oxygen lines must be controlled Famor Engineering offers the NEW MULTI PACK System, which include a series of valves, pipework, and their respective connections into a simplified and smart solution.

The main advantages of this solution are:

- no leakage due to the reduction of single components;
- compact and robust solution;
- precise control with all parameter available via BUS COMMUNICATION;
- in addition, the end user will receive an easy to maintain solution thank to the device being fixed on the manifold with only two screws.



### CONCLUSIONS

Acid polishing is becoming increasingly replaced by fire polishing. The handling of hazardous materials, as well as related personnel and environmental risks are therefore eliminated. Associated factory space, machinery and storage containers are no longer required, while disposal costs no longer arise. Fire polishing is simply integrated into the existing process between the moulding and annealing steps.

Thanks to the flexible FAM Accessories, Tools & Burners brand of FAMOR ENGINEERING, this application can be implemented across all glass types, from soda lime to lead crystal, opal, and borosilicate glass, and on all Fire Polishing Machines present in customers' factories, even if they were not built by FAMOR ENGINEERING. ■

# FAMOR

## FAMOR ENGINEERING SRL

Via Avigliana, 3  
10040 Cottino-Rivalta (TO) - Italy  
Tel.: +39 011 952629  
Renato TROTTA  
Sales Director  
E-mail: r.trotta@famoreng.com  
[www.famoreng.com](http://www.famoreng.com)