



# Air Products' Oxy-fuel Integrated Combustion Solution Yields Major Gains for Asian Borosili- cate Glass Manufacturer

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"We made the right choice to pioneer full oxy-fuel solution adoption in the borosilicate glass industry with Air Products."

Mr. Xu Zengguo, Production Manager at Yongxin



## Improvements in productivity and glass quality, cost savings, and more eco-friendly processes realized in the conversion process

Fuelled by a number of high growth industries as well as key policies underpinning the development of the Chinese economy, the demand for different types of glass has continuously increased in the past two decades. Borosilicate glass - widely used in cookware and laboratory glassware thanks to its high strength and heat resistance - has been experiencing steady growth driven by increasing living standards and growing consumer demand in the Chinese domestic marketplace.

Nevertheless, this picture presents conflicting challenges for borosilicate glass manufacturers. Already more expensive and difficult to produce than most other glass-types, manufacturers are also required to address escalating production costs and increasingly stringent environmental regulations while expanding their production capacities to meet the growing market needs.

From an initial oxy-boost pilot trial to the full conversion to an oxy-fuel integrated combustion solution over a 4 year period, Kunshan Yongxin Glassware (Yongxin), a leading global borosilicate glass manufacturer, has been partnering with Air Products in a journey to realize major improvements in productivity and quality, savings in energy and other costs, together with a reduction of harmful emissions.

## Growing borosilicate glass industry

Thanks to its high strength and thermo-shock resistant nature, borosilicate glass is used in a wide array of applications including laboratory glassware, cookware and infant feeding bottles.

Various sources indicate that the annual demand for borosilicate glass in China is far greater than the total local output. This shortage in local supply, coupling with the robust improvement in people's living standard driving increasing demand, indicates that the growth opportunity for local manufacturers is substantial and promising.

## Challenges alongside opportunity

While borosilicate glass manufacturers are looking for ways to increase production capacity to capitalize on the tide of growth, they are also faced with multiple challenges, including among others, quality improvement. An important quality measurement of borosilicate glass is the high homogenization of product.



Air Products' LOX system for 1<sup>st</sup> phase oxy-boost at Yongxin and now it serves as backup system to enhance 100% O<sub>2</sub> reliability

Boron, as one of the key materials of borosilicate glass, is also an expensive raw material and displays volatility under high temperatures, further driving the production cost comparatively higher than for other glass types. Cost control is consequently a key challenge for manufacturers particularly when planning to increase production capacity.

In addition, with a high melting temperature, borosilicate glass consumes relatively more fuel during the manufacturing process compared with normal soda lime glass products. As a result, manufacturers are faced with the combined challenge of higher fuel costs and emission levels. The need to address the emissions issue becomes more pressing with the introduction of more stringent environmental regulations by the Chinese government in its efforts to adopt a more sustainable development model amidst rapid industrial growth.



High quality molten glass from oxy-fuel technology

## Yongxin partners with Air Products to address capacity issue

Yongxin, a leading supplier in the global heat resistant glass market, is the world's largest borosilicate glass provider for microwave ovens with around 50% share of the global market supplying well-known brands such as LG, Midea, Samsung, and Galanz.

As an industrial leader, Yongxin is a pioneer and has always been looking for innovative solutions to meet its business objectives. The partnership of Yongxin and Air Products actually began as early as 2007 when Yongxin needed to increase its production output and extend the furnace life temporarily to fulfill its growing orders. With over 50 years of global experience in providing original solutions to glass customers, Air Products was considered the right supplier for Yongxin.



Mini Cleanfire® burners offer easy installation and maintenance

## Getting started – a boost to production

To begin with, a comprehensive and detailed site evaluation was undertaken by Air Products' glass-industry experts to better understand Yongxin's requirements. Key among these was Yongxin's target of improving furnace performance to boost production and be able to fulfill the growing sales order pipeline. Furnace stability also needed to be improved to enhance glass quality.

A tailor-made solution comprising Air Products' Cleanfire® Gen 1 Oxy-boost combustion system, flow skid and liquid oxygen supply was recommended. Air Products' team provided consultancy and recommendations on the installation and burner layout to ensure the furnace performance.

The results were conclusive; Yongxin not only successfully increased its furnace production pull rate by 12%, the unit fuel consumption was also reduced by 11% - well beyond Yongxin's original expectation for this project.

Air Products maintained close relations with Yongxin over the following months to ensure continued smooth operations and to monitor the success of the initial Oxy-boost trial.

The experienced Air Products glass experts had a solid understanding of the customer's needs and were committed to continuous improvement. Following almost 2 years of proven operational performance, Air Products then recommended Yongxin move to the next stage of productivity enhancement and change to the innovative Cleanfire® HRI™ burner systems, the most advanced combustion equipment offered by Air Products, which offers higher heat transfer, wider flame coverage, lower flame momentum and easier maintenance.

Inspired by the success of the initial oxy-boost trial and their growing confidence in Air Products, Yongxin decided to commit to the Cleanfire® HRI™ burner, which resulted in fuel savings as well as more efficient production.

These investments over a 2-year span enabled Yongxin to boost overall production output and to reinforce their market leading position.

## Embracing advanced full oxy-fuel combustion to meet increasing demands

The Yongxin – Air Products partnership developed to the next level in 2011. In their continued discussions with Air Products, Yongxin specified that they required even further increases to their production capacity as market demand continued to develop. Furnace stability and reliability also needed to be enhanced for improved glass quality, which would be reflected in high product homogenization. They stipulated that the furnace operations should be easier to operate and maintain, and all this while reducing unit combustion cost.

With the Chinese Government introducing more stringent environmental regulations with specific fuel and nitrogen oxide (NOx) emission reduction targets for the glass industry, Yongxin understood the strategic importance of adopting a combustion solution that would help achieve eco-friendly production while at the same time bring operational and economic benefits.

In other words, they were looking for a solution that could further increase production and improve product quality with the same furnace space, while simultaneously facilitating convenient furnace operation plus fuel and emission reductions.



**Air Products' PRISM® VSA system provides cost effective and reliable on-site oxygen supply for Yongxin**

Air Products' integrated oxy-fuel combustion solution was chosen to address these requirements. This solution delivers multiple benefits to glass manufacturers compared with the traditional air fuel system including:

- up to 80% reduction of NOx emissions
- over 25% increase in productivity
- lower capital investment
- 25-60% energy savings
- maximizing furnace life by eliminating the regenerator or recuperator problems
- an overall improvement in glass quality.

Specific to the borosilicate glass industry, full oxy-fuel combustion can also minimize borosilicate volatilization and reduce flue gas thereby helping to manage production costs.

## The way forward – ensuring long term benefit

The full conversion to Air Products' oxy-fuel integrated solution took place in 2011 with the adoption of the oxy-fuel combustion solution in one of the furnaces.

In addition to the Cleanfire® HRi™ burners and automatic flow control skid, a PRISM® vacuum swing adsorption (VSA) oxygen generator was brought on-stream in 2012. VSA provides more reliable and economic oxygen supply and is a more cost effective long term option when compared to liquid oxygen.

“We are truly honored to be the trusted supplier to support Yongxin's production and business expansion. We make every effort not only to understand the customer's needs, but also to anticipate them. With our integrated combustion solution approach and industry-leading technical expertise, we are able to deliver customized solutions to address the customer challenge. We are delighted with the success of our close collaboration,” says Richard Huang, Asia Industry Manager for Glass at Air Products.

Throughout the entire process from the initial oxy-boost trial to post-VSA installation, Air Products maintained close communications with Yongxin to ensure the project's smooth progress and successful outcome. As part of the integrated solution, Air Products' experts delivered a turn-key project management approach which included a series of value-added services from consultation on furnace design, engineering communication and discussion to process optimization as well as operational data tracking and analysis.

## Full conversion brings impressive results

Significant results were achieved right after the conversion to full oxy-fuel combustion was completed. Total fuel consumption was effectively reduced and the production pull rate was increased. In addition, the new furnace also cut emissions by more than three quarters and glass quality also improved.



Close collaboration between Yongxin and Air Products

“Through our long term partnership with Air Products, we have benefitted from their technical knowledge and expertise in industrial glass making combustion. Their experienced local experts backed by global resources inspired a high level of confidence. And their on-site trials and successful installations of oxy-fuel technology across China and the world convinced us that they were the right partner for us to work with for such a key strategic initiative,” says Mr. Xu Zengguo, production manager at Yongxin.

“The benefits in terms of production cost savings, productivity increase, quality improvement, and emissions reduction all outperformed our original expectations, again proving that we made the right choice to pioneer full oxy-fuel solution adoption in the borosilicate glass industry with Air Products” Mr. Xu concludes.

## A template for the industry

As the demand for heat resistant glass in the household sector, as well as in other areas such as laboratory glassware, continues to expand so does China’s borosilicate glassware market. Manufacturers need to adopt a more sustainable approach to their operations that balances higher production demands and product quality with lower energy consumption and emission levels. Yongxin’s success demonstrates that oxy-fuel combustion is the best solution in addressing this challenge.

Air Products has long been committed to the China glass market, aiming to support the industry’s growth and sustainability needs via its innovative combustion technologies. With over 50 years of experience in oxy-fuel technology and more than 1,500 Cleanfire® burners installed around the world, Air Products has a proven track record of delivering oxy-fuel integrated solutions across Asia and worldwide that significantly improves the combustion efficiency of furnaces and cut energy consumption. From gas supply to oxy-fuel burners and technology, customized control systems, technical and design expertise, commissioning services, safety and site training, maintenance contracts and project management, Air Products has been partnering with firms such as Yongxin in a journey to improve their competitiveness and better address the market needs of a low carbon economy.



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## For more information

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