

Delivering value for glass manufacturers

KEVIN LIEVRE EXPLAINS HOW THE SPECIALIST GLASS, COMBUSTION AND R&D TEAMS AT AIR PRODUCTS WORK TOGETHER FOR THE BENEFIT OF THE COMPANY'S CUSTOMERS

Image courtesy of Air Products and Chemicals, Inc



AERIAL PHOTO OF AIR PRODUCTS' MAIN CAMPUS

Air Products and Chemicals is headquartered in Allentown, Pennsylvania in the USA. The company is active in the glass, metals, metals processing, non-ferrous metals, cement, foods and cryogenic segments. Some key growth markets for the company include semiconductor materials, refinery hydrogen, home healthcare services, natural gas liquefaction and advanced coatings and adhesives. It has annual revenues of US\$9 billion, operations in over 40 countries and more than 20,000 employees in total.

Air Products is a leading supplier of industrial gases, chemicals, equipment, technology applications and services to the global glass industry. Glass segment customers include producers of flat glass, container glass, fibreglass (insulating

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A TECHNICIAN PERFORMS A BURNER TEST IN THE COMBUSTION LAB FURNACE UNDER SIMULATED GLASS PRODUCTION LOAD CONDITIONS

wool and textile), TV/CRT glass, lighting, tableware, flat-panel displays, fibreoptics, hand glass, art glass and many other manufacturers of speciality glass products.

THE COMPANY'S HISTORY

Air Products was founded by Leonard P Pool in 1940 in Detroit, Michigan, who had the revolutionary idea of producing and selling industrial gases, primarily oxygen, on-site. At the time, most oxygen was sold as a highly compressed gas in cylinders that weighed five times more than the gas product. Air Products proposed building oxygen gas generating facilities adjacent to large-volume gas users, piping the gas directly from the

generator to the point of use and thereby reducing distribution costs. A year later, Air Products leased its first oxygen gas generator to a small local steel company.

During World War II the company started designing and manufacturing mobile generators to produce oxygen for use by the military in high-altitude flights, moving to Chattanooga, Tennessee in the process.

At the end of the war, Air Products moved to its current headquarters near Allentown, close to the industrial markets of north-east USA. Today, it also has European headquarters near London, UK and Asian headquarters in Singapore, with offices in Tokyo and Hong Kong.

THE GLASS TEAM

Having started supplying oxygen to the steel industry, the combustion applications developed for that sector provided a sound basis to enable Air Products to develop products, services and specialised applications for the glass industry, which it has now been doing for over 50 years. One of the Global Glass Support Team's primary objectives during this time has been to develop ongoing and long-lasting business relationships with glass companies. It also places an emphasis on having the right people in the team, reflecting the values of company founder Leonard Parker Pool.

Air Products' glass team includes people with experience and expertise in raw materials, glass chemistry, furnace design and operations, refractory materials, combustion flow control systems, inerting atmosphere flow control systems, glass plant management, combustion science, mathematical and computational fluid dynamic (CFD) computer modelling, and other aspects of glass production and relevant research and development (R&D).

The glass team has specialists located around the globe; its mission statement is "To provide world-class support to the glass industry using our experienced, technology focused, in-house, Glass Support Team – providing customer solutions through persistent innovation and application of team know-how." To this end the team works closely with customers to recommend and install custom-designed solutions to help improve manufacturing processes.

The vision for the glass team included identifying potential glass industry needs and identifying how Air Products might fulfil those needs. Team members are empowered in their roles and responsibilities to enable each team member to make direct contributions to company performance through their efforts and results produced in the glass segment. These are key considerations for keeping a good team intact.

Image courtesy of Air Products and Chemicals, Inc



AIR PRODUCTS' CLEANFIRE HRI FLAT FLAME BURNER WITH OXYGEN STAGING TECHNOLOGY

THE FACILITIES

In order to continually develop new products and processes, Air Products invests heavily in research and development. There are four separate R&D facilities at the company's headquarters site, with others located throughout the world and plans to add more.

As one of the key areas of interest to glassmakers is combustion, and in particular the use of oxy-fuel combustion, Air Products established a Combustion Center of Excellence (COE) within the R&D organisation. This group is staffed with experts in the field of combustion and has impressive combustion laboratory facilities.

The establishment of the Combustion COE has led to the transfer of combustion concepts across different customer industry segments served by Air Products, resulting in the development and commercialisation of several combustion-related applications technologies, including many key advances made in oxy-fuel combustion. This team also continues to provide the industry with extremely advanced oxy-fuel burners and other developments in combustion technology equipment.

PRODUCTS AND PROCESSES

Air Products supplies both industrial gases and chemicals, supplying the glass industry with oxygen, nitrogen, hydrogen, argon, helium, amongst others. These products are used for:

- inerting applications such as the tin bath atmosphere of a float glass line
- flame cutting, polishing and

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THE ENTRANCE TO ADMINISTRATIVE BUILDING 6

finishing operations (as used in lighting, tableware and speciality glass processes)

- coating applications to produce low-E glass, self-cleaning window glass, optical fibreglass and electrochromic glass, for example
- filling applications for products such as insulating or integrated glass units (IGU), liquid crystal display panels (LCD) and light bulbs.

The most widely-used gas for glass applications is oxygen for combustion, and equipment and processes must be developed to safely make use of the oxygen in the most effective manner. Air Products develops application technologies for industrial manufacturing, specifically developing and commercialising combustion applications in the glass, ferrous metals, non-ferrous metals, cement, metals processing, pulp and paper, refining and chemical processing industries.

The team of in-house combustion experts enables cross-industry knowledge sharing to produce improvements; among its commercial successes are patented processes and several patented oxy-fuel burner product lines, such as Rapidfire®, Purefire® and Cleanfire®.

MELTING TECHNOLOGY AND BURNERS

The Cleanfire burner product line is specifically developed for the glass industry and features non-water-cooled tube-in-tube oxy-fuel burner technology. Air Products' oxygen-staged flat flame Cleanfire HR™ and Cleanfire HR₂™ burners provide oxy-fuel combustion technology with high quality, high efficiency, low pollutant emission glass melting. The burner diverts a portion of the combustion oxygen away from the low-momentum oxy-fuel flame; this generates higher flame radiation toward the glass melt while lowering refractory superstructure temperature, thereby reducing NO_x emissions and lengthening the flame to produce greater flame coverage above the glass melt.

Air Products has also developed a glass melting technology that can reduce the amount of energy required to melt glass, compared to many current systems. The new Cleanfire HGM™ (Hybrid Glass Melter) technology uses oxy-fuel combustion in the batch charge end of the furnace and air-fuel combustion with heat recovery in the down-tank section of the furnace.

Air Products believes that the hybrid furnace will emerge as the optimal fossil fuel glass melter as it offers a number of advantages over both air-fuel and oxy-fuel furnaces. According to the company, the hybrid furnace technology provides increased production, improved glass quality, fuel savings, better furnace temperature control, a more stable batch pattern and significantly reduced emissions compared to air-fuel. The company also claims that the hybrid furnace delivers similar production levels

as 100% oxy-fuel, with lower overall oxygen cost and the potential for reduced levels of foam on the glass surface, and therefore improved glass quality.

OPPORTUNITIES

Air Products is expanding into different geographical markets and glass sectors. The company has established relationships in many developing economies through joint venture partnerships which are often, over time, assimilated into wholly owned entities of Air Products – recent examples of this include San Fu Chemical Company and Korea Industrial Gases. The company also serves as a leading supplier for projects with established companies in the glass sector, such as the one with Pilkington in Russia last year.

Air Products' glass applications technologies have been used in over 200 furnaces around the world, producing more than 10,000 tons per day of glass. The team continues to improve and develop new technologies in industrial gas supply, combustion systems, technology assistance, safety training programmes and consulting services. ■

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AIR PRODUCTS' MAIN CAMPUS

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PEAR TREES LINE THE WALKWAY BETWEEN ADMINISTRATIVE AND RESEARCH FACILITIES

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