Optimising oxy fuel projects

More and more companies are turning to oxy fuel glass melting. By carefully managing some key issues, such as defining the basic oxygen requirements and analysing production and supply technologies, project success can be guaranteed.

The decision to move to oxy fuel is always the result of various combined factors specific to each individual project. However, whatever the project may be, the selection of an appropriate oxygen supply mode and the specification of adequate combustion technology are both vital steps.

The oxygen supply issue is addressed by defining the basic oxygen requirements and analysing the available oxygen production and supply technologies. To specify the combustion technology, the type and quality of glass must be defined in relation to the design and operation of the associated glass furnace. Other specific objectives and constraints must also be considered, such as the local environmental regulation.

Application requirements

The basic oxygen supply specifications concern the product characteristics, application features and site characteristics:

- **Oxygen product characteristics**: the flow (average quantity and consumption profile), the purity and the pressure. The flow mainly relates to the projected furnace design and operation. Iterative heat and mass balances are typically performed to calculate average oxygen flow and essential flexibility (consumption profile). The oxygen purity and pressure are linked to the forecasted combustion technology (burners and flow control equipment).
- **Glass-melting application features**: for oxy fuel, a full back-up fuel and oxygen supply is necessary. The length of time that it is necessary for often correlates with the anticipated furnace life.
- **Site characteristics**: the main factors of concern are safety requirements (such as industry type and hazardous area), site conditions (such as climate, geography, altitude, soil and seismic area), available space, environmental issues and the availability of utilities (such as electricity, steam and cooling water).

Supply systems/combustion technology

There are three basic methods of oxygen supply for oxy fuel glass melting: bulk transportation (liquid cryogenic oxygen), pipeline supply and on-site production. Short-term needs are satisfied with bulk supply. If available, pipeline is the preferred supply mode for long-term needs, though, as the pipeline network is rarely close to the glass plant, on-site production is the most frequent method used. Adsorption techniques (VSA) are used for medium demands (below 140tpd) and cryogenic generators are chosen in case of high demands (above 100tpd). The value of the size boundaries depends on the site's location and the customer's specifications.

Today, there are two main categories of oxy fuel burners:
- Conventional pipe-in-pipe technology, producing cylindrical flames with NOx emission at around 0.8kg NOx/t glass (soda lime)
- Staged combustion burners (ALGLASS FC™), producing flat, efficient, low NOx emission flames (0.2kg NOx/t glass)

Whatever type of burner is used, the patented oscillating combustion technology from Air Liquide can also be advantageous to the user in other ways, such as providing fuel and oxygen savings and ultra low NOx emission (up to 0.1kg NOx/t glass). This technique involves the creation of fuel-rich and fuel-lean zones within the flame through forced oscillation of the fuel flow rate to the burner.

Oxy fuel project: the key to success lies in using the appropriate oxygen supply mode, teamed up with adequate technology such as oscillating combustion.

Air Liquide experience has proven that the key to a successful oxy fuel glass melting project often lies in sound coordination between the oxygen supply selection procedure and the combustion technology approach. Over the past ten years, the company has been involved in many oxy fuel combustion projects for industry customers across the globe.

Author

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