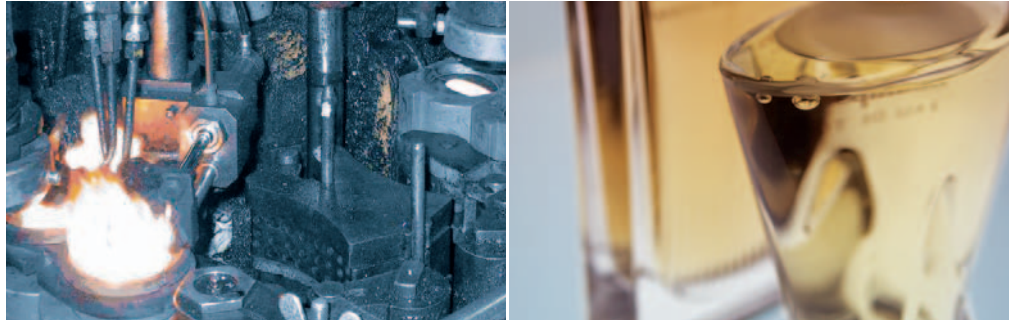


Improved glass quality and higher output

Mould surface-coating with CARBOFLAM®



Challenge

The container glass industry faces stiff competitive pressures. The growing penetration of PET containers is forcing glass manufacturers to reduce production costs and optimize processes. Increasingly strict environmental legislation adds to the challenges. One area offering scope for process efficiencies is surface coating. The use of carbon offers a number of advantages over traditional surface-coating methods (manual lubrication and spraying and insulating with graphite suspensions, waxes, emulsions etc.). These include improved glass quality and the reduction in workplace concentrations of vapors and mists produced when using oils and emulsions.

Solution

Linde developed the CARBOFLAM® process to capitalize on the benefits of surface-coating with carbon. CARBOFLAM® is a versatile process that can be used for all glass types (mainly containers). Leveraging the positive separating and insulating effect of carbon, it is the most effective technique for surface coating and offers excellent process stability.

Technology

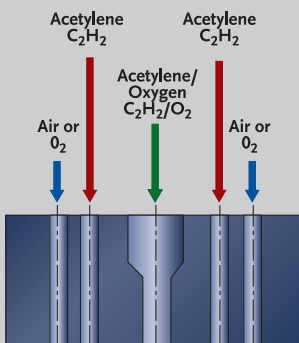
The CARBOFLAM® process is based on an understoichiometric acetylene/oxygen flame. Burnt under precise conditions, pure acetylene separates into carbon and hydrogen. Nearly 100 percent of the resultant carbon is deposited in a thin layer on the surface to be coated.

The carbon coat is applied using an outside/post-mixing burner. Acetylene and oxygen are ignited by an acetylene/oxygen flame that burns permanently. The acetylene is shielded by an oxygen stream.

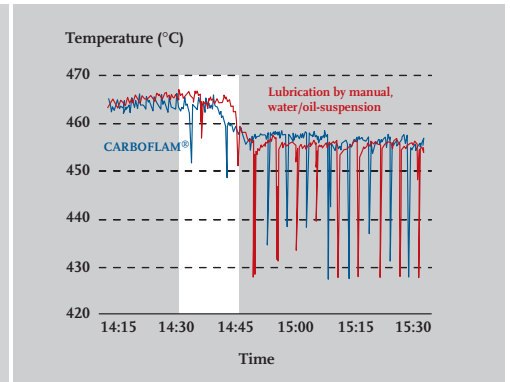
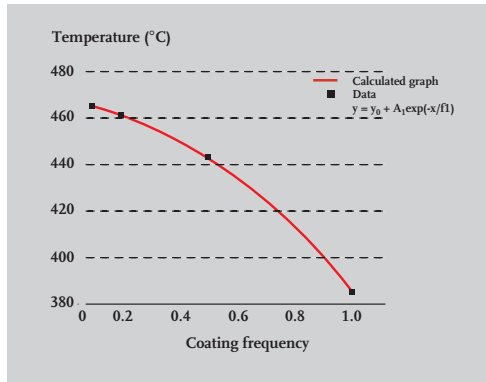
CARBOFLAM® systems consist of a central pressure panel, modules for IS machines and carrousel, burner fittings and the burner. Thanks to the modular design and variable number of nozzles, CARBOFLAM® units can be adapted to individual needs.

Due to its precisely defined production conditions, carbon coating cannot be equated with sooting or smoking. Acetylene carbon particles are generally physiologically safe. And thanks to the short coating periods (less than 0.1 seconds), the workplace concentration of harmful substances is significantly lower compared with spraying and burning oils or suspensions.

With manual lubrication the temperature profile is not as stable as the temperature profile with CARBOFLAM®. The temperature level using CARBOFLAM® is also higher than the level using manual lubrication. With CARBOFLAM® the temperature level can be defined by the coating frequency.



Burner principle



Mould temperature levels with CARBOFLAM® as a function of the coating frequency (sample)

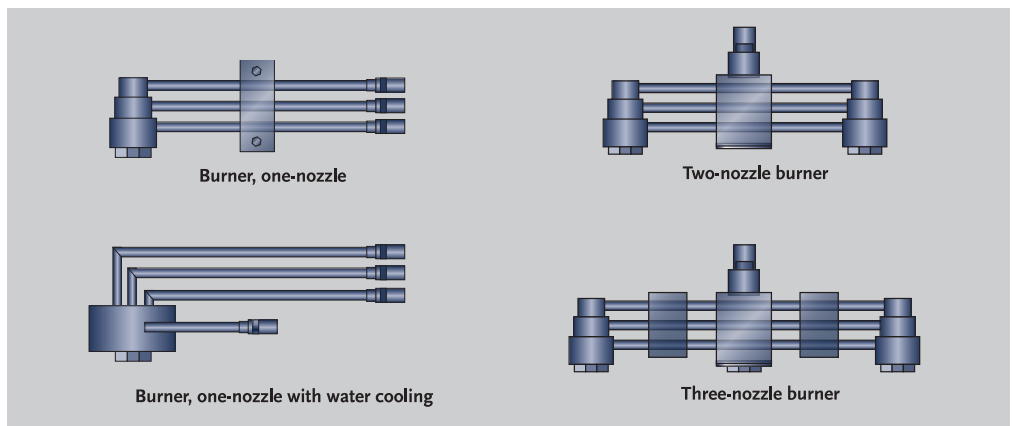
Mould characterization by IPMS with and without CARBOFLAM® (sample)

Benefits

- Greater productivity thanks to improved process stability (adjustment, automatic) and higher mould duration
- Higher glass quality – especially glass surface quality – through reduction/minimization of defects resulting from the manufacturing process, i.e. cold waves
- Possibility of new products on a basis of a better glass distribution due to possible higher mould temperatures
- Reduced maintenance costs through process optimization
- Enhanced safety thanks to dramatic reduction in workplace pollution compared with other applications (cracking applications in particular)
- Energy savings

Features

- Surface/post-mixed burners
- Electric/electropneumatic control units
- Cooled/uncooled burners
- Standard burners/custom-designed burners
- Materials: brass, stainless steel



CARBOFLAM® burner design principles

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