The glass industry is facing massive competition. At the same time, manufacturers of glass products from all areas (especially in the container glass industry, but also in art and tableware, specialty glass, flat glass etc.) are under growing pressure to cut production costs and to keep improving the process efficiency. Increasingly strict environmental legislation further adds to the challenge.

One area of glass production that makes room for more efficient processes is the surface coating of moulding tools with carbon. Compared to alternative methods for surface coating (manual lubrication, spraying and insulating with graphite suspensions, waxes, emulsions etc.), the application of carbon offers numerous advantages. Among these are a better glass quality, a higher process stability during the forming of the glass as well as less harmful vapours and mists at the workplace.

In order to make the advantages of surface coating with carbon available to the glass industry, Linde has upgraded the CARBOFLAM® process. CARBOFLAM® is a versatile process that can be applied for all types of glass. It is the most effective surface coating technique because it makes use of the material-specific release and insulating properties of pure carbon, such as an even temperature level during mechanical glass forming.

The surface coating of the moulding tools with CARBOFLAM® is done with a post-mixing burner and is based on an understoichiometric acetylene/oxygen flame. When combusted under precise conditions, pure acetylene separates into carbon and hydrogen. Depending on the chosen defaults of the CARBOFLAM® system, close to 100 percent of the carbon created by this process is then deposited as an even, µm-thin layer on the surface to be coated.

In order to do so, the corresponding magnetic valves in the gas supply piping of the CARBOFLAM® burner are opened and the set gas volumes stream out of the burner head. The acetylene stream is shielded by an oxygen stream. A pilot flame at the burner head automatically ignites the emanating gases. Each coating procedure takes between 0.1 and 1 second.

In general, CARBOFLAM® systems consist of a central pressure control panel, a gas supply module adapted to the corresponding application (for example when installed at IS or carousel machines), the burner fitting and the CARBOFLAM® burner. Thanks to its modular design and the large number of different nozzles, we can adapt the CARBOFLAM® system to the individual requirements of each project.
Due to its precisely defined, repeatable production conditions, CARBOFLAM® can’t be put on the same level with conventional “sooting” or “blackening”. Moreover, acetylene carbon particles are generally physiologically harmless. And thanks to the short coating times (e.g. 0.1 seconds) the concentration of harmful substances at the workplace is considerably lower than that created by injecting or combusting oils or suspensions. An additional, essential difference of using CARBOFLAM® is the temperature and process stability during the forming of the glass. With manual lubrication, the temperature profile at the surface of the forming tool is far less stable than the temperature profile with CARBOFLAM®. With the application of CARBOFLAM®, the temperature level is also higher than with manual lubrication and can be influenced through the coating frequency.

**Benefits**

→ Higher productivity due to improved process stability (default possibilities, automatic coating) and longer application time of the moulding tools
→ Higher glass quality through elimination/minimisation of structural marks of the moulding tools on the glass surfaces (cold waves)
→ New products due to improved glass distribution by higher mould temperatures
→ Lower maintenance costs through process optimisation
→ Substantial reduction of the workplace pollution compared to other applications (e.g. cracking applications)

**Features**

→ Post-mixing burner technology
→ Electrical/electropneumatic burner control units
→ Air or water-cooled burners and/or media-cooled burners
→ Standard burners and/or customised burners, non-standard and/or special burners
→ Materials: brass, stainless steel

**CARBOFLAM® burner design principles**

- One-flame burner
- Two-flame burner

**Burner principle**

- Acetylene C2H2
- Acetylene/oxygen
- Air or O2

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