Making our world more productive

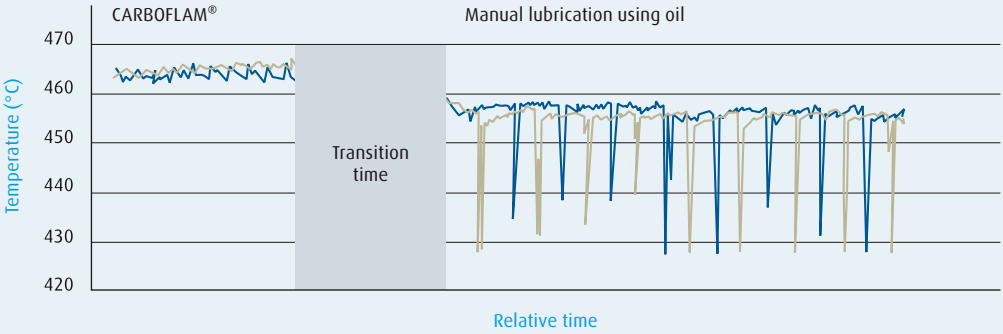
CARBOFLAM® Surface Coating for Glass Molds

Oil-free, automated mold lubrication for quality and productivity gains

Overcoming the Challenges of Manual Lubrication in Glass Forming

Under growing pressure to increase process efficiency and productivity, leading glass manufacturers worldwide are looking for ways to automate manual lubrication processes. Manual lubrication presents a number of challenges, making it difficult to achieve repeatable lubrication results in continuous mode. This results in either production losses or high reject rates due to surface quality defects. Many customers are keen to overcome these downsides, and also reduce the major effort required to clean machines and components of oil-based lubricants. In addition, manual swabbing ties up valuable resources as it is a time-intensive and highly repetitive task. At the same time, growing awareness about the health and safety of employees and the need to minimize workplace pollution is increasingly being reflected in stricter safety legislation.

Temperature profile of the blank mold surface during glass forming



The blue and gray lines represent two measurement points on the surface of the blank mold. CARBOFLAM® ensures a stable temperature profile on container, art and tableware molds as it overcomes the uneven cooling effect that results from the application of lubrication oil, which can lead to surface defects.

CARBOFLAM®: How it Works

To overcome these issues and capitalize on the latest advances in industrial automation, glass industry players are looking to transition to automated solutions. This applies to both the art and tableware sector as well as the container glass segment, which typically relies on production lines with individual section (IS) machines.

Existing automation solutions are generally based on mobile swabbing robots or fixed installations at every section of the production line. Although these solutions provide superior lubrication repeatability relative to manual processes, they still have one significant downside, namely the use of lubrication oil, which has an uneven cooling effect on the blank mold.

Linde developed its CARBOFLAM technology to overcome the shortcomings of manual lubrication processes and the problems associated with oil-based automated lubrication systems. A flame-based carbon coating solution, CARBOFLAM combusts acetylene under precise and reproducible conditions and thus separates it into hydrogen and carbon. Nearly 100% of the carbon created is then deposited as a thin layer on the blank mold surface. This process is totally oil-free.

The acetylene is combusted with a post-mixing burner based on an under-stoichiometric acetylene/oxygen flame mixture. The gas stream is automatically ignited by a pilot flame or an electric ignition solution – both integrated into the CARBOFLAM burner head. The carbon coating process for a blank mold takes just 0.1 seconds.

CARBOFLAM Results at a Glance

Quality gains

Because CARBOFLAM is totally free of oil, it keeps the temperature of the blank mold surface more stable and homogeneous during glass forming. A more stable temperature profile leads to a more homogeneous – and thus higher-quality – glass surface. Compared with oil-based lubrication processes, it also minimizes the reject rate attributable to variations in the mold temperature profile.

Productivity gains

The highly automated, fully integrated design of CARBOFLAM results in reproducible coating results. Coating process parameters, such as the gas pressure, can be precisely adjusted and the CARBOFLAM nozzles can be adapted to the IS machine to ensure an optimal carbon coating layer on the mold surface. An automated process flow also frees up staff to focus on other strategic, value-adding tasks. New and advanced features such as the CARBOFLAM touch panel with an integrated database of all parameter settings contribute further to overall productivity.

Increased workplace safety

CARBOFLAM relieves operators of the repetitive task of manual lubrication. Not only does this free up staff, it also reduces the likelihood of operators sustaining strain-related injuries. In addition, automation reduces operator interaction with running machines and thus mitigates the risk of crushing and other hazards.

Reduced workplace pollution

Experience has clearly shown that the carbon formed through the combustion of acetylene is reduced to inorganic carbon dioxide (with the exception of the required carbon layer in the glass mold as determined by the process settings). As there is no oil involved in this automated process, operators do not have to contend with oil condensation at or near the carousel in art and tableware production or near IS machines in glass container plants for instance.

Reduced maintenance and cleaning effort

Optimized process parameters and the oil-free design combine to increase the lifetime of container, art and tableware molds while also reducing the cleaning effort involved.

Proven technology with growing reach

CARBOFLAM is a proven technology in the industry, deployed by an ever-growing number of leading container, art and tableware players worldwide. The flexible design of CARBOFLAM means it can support nearly all glass forming needs across the entire industry, regardless of glass product, production speed, machine type and process type.

Partner of Choice for All Your Glass Treatment Needs

Experience counts

We have many years of experience in flame-based glass coating. We channel these insights into the ongoing evolution of our innovative CARBOFLAM offering, adding next-generation features such as a touch panel with integrated settings database, improved ignition control, a quick hose connector as well as proportional valves, flame monitoring, pressure monitoring and alarms for enhanced process control.

Having successfully deployed CARBOFLAM to more than 70 production lines around the world, our experts are ideally equipped to offer process consulting and optimization advice.

Deep process know-how

Looking beyond coating, our team of experts has proven experience across the full glass treatment application spectrum. Covering the entire solution lifecycle, from design and build to install and support, we also deliver the accompanying control system and gas supply concept. And our support does not cease on successful installation of your system – our experts are always on hand if you run into operational issues or have optimization questions.

Supply and suppor services

Depending on your volume requirements, we can supply your gases in cylinders or in bulk, always ensuring the highest reliability and safety standards. For added efficiency, we offer ACCURA® and SECCURA® gas management services such as automated tank level monitoring or Internet-based tank and cylinder tracking so you are free to concentrate on your core business.

Visit www.linde-gas.com/glass for more information.

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