

When ecological requirements meet economic interests

Glassmakers face numerous challenges today with ecology and the environment probably the most prominent. Anne-Sophie Lelievre* explains solutions to successfully take up these challenges.

Ecology-related events often make the news headlines and this looks set to continue.

In December 2015, 196 countries adopted the Paris Agreement, aiming at limiting the increase of the global average temperature to 1.5°C. As a consequence, all categories of society need to take measures taking into account this objective: private people, companies, governments... and of course, industries! The glass sector is no exception.

Glass, an opportunity for the future

Glass is considered as a robust and sustainable material and is taking advantage of the bad reputation currently experienced by single-use plastic. Although glass faces a promising future as it can be reused and recycled, the glass industry has to find a way to make its production process cleaner and to

drastically reduce its carbon footprint. Now is a good time for glassmakers to consider this.

Glassmakers are not alone to find the best solutions to face this challenge. Vertech', as a software provider to the glass industry, accompanies them by offering modern and innovative solutions.

Investing in the renovation of premises or in new machines could be one solution; but this costly measure wouldn't be enough. The whole process must be daily controlled, in terms of energy consumption for example, to provide glassmakers with all the keys to make suitable decisions.

High stakes on raw materials

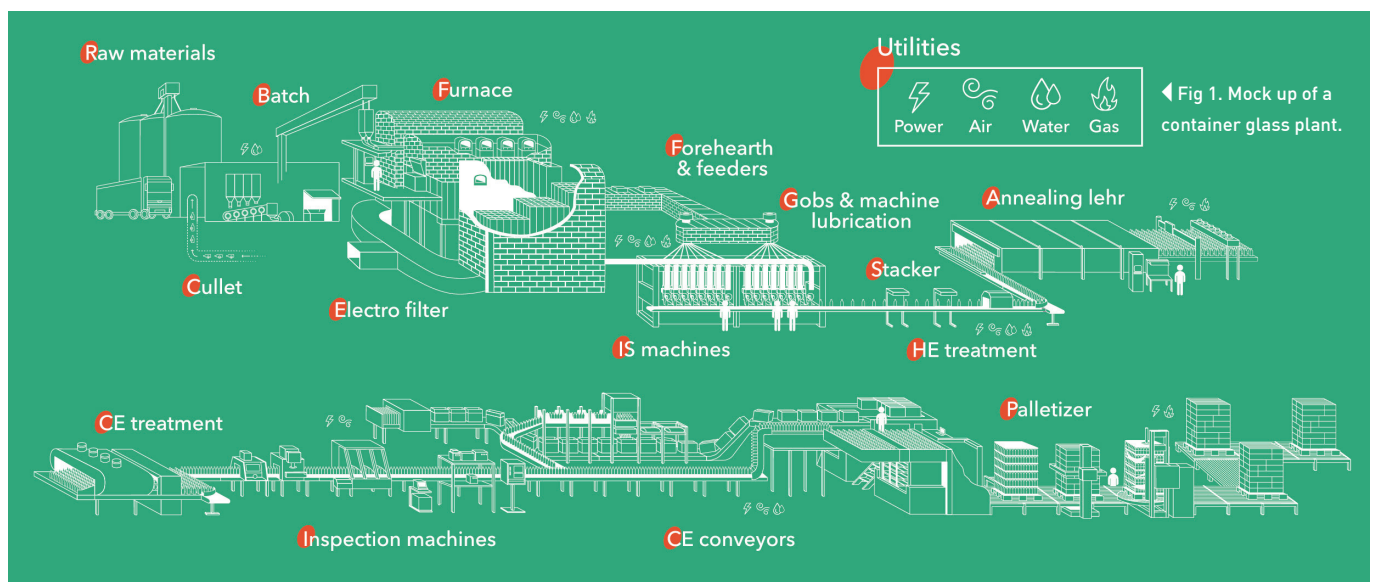
Optimising cullet is of big interest from both ecological and economic points of view. Using cullet to produce new articles implies a much smaller use of raw materials, particularly sand. For

glassmakers, sand constitutes a real problem, economically and ecologically. Raw materials need to be paid for and transported to the plant. But most importantly, like any other resource on Earth, sand is not unlimited and is becoming rare. Several types of sand are not suitable for glass production; for example, sand from deserts is deemed too regular. Therefore sand must be extracted implying heavy ecological consequences: destruction of ecosystems, shore erosion, or even sometimes desalination.

By using more cullet, all these problems can be reduced. Likewise, using some materials such as soda and lime reduces the fusion temperature, which is of high interest regarding energy consumption.

All in all, controlling composition and raw materials is extremely important. SIL provides all the KPIs to do so.

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◀ Fig 2. A manager can view what the energy consumption or the GES emissions are for the whole group.

the result in percentage on a specific timeframe (one hour, one shift, one day etc.). OEE is the product of the following three factors: machine performance, machine availability and product quality level.

Deep analysis

SIL also includes indicators related to statistical process control, such as the Gaussian curve. At a glance, glassmakers can see deviations from a standard value allowing them to anticipate on measures to be taken for continuous improvement of the production process.

To go into further details, data can be extracted and handled as glassmakers wish. In the form of pivot grids, datasheets, grouped, timeline or stock charts... Everything is possible with SIL! All these possibilities are key tools for managers to debrief on past actions and make appropriate decisions.

Energy consumption awareness

With all these KPIs, glassmakers will have an overview of their energy consumption. By knowing exactly the quantity of greenhouse gases they reject, glassmakers will be able to control their consumption by making decisions to reduce their carbon footprint and following the evolution. They will also have consistent KPIs to take part in a decarbonisation programme in order to compensate for their GES emissions.

A beginning...

Faced with these ecological challenges, glassmakers need to consider technologies and Industry 4.0 as excellent opportunities.

Monitoring Key Performance Indicators has become absolutely essential for glassmakers: first of all, so that they are aware of their energy consumption; secondly so that they have consistent data for analysis and decision-making. Vertech' aims to go further and is currently working on finding correlations in order to predict the future.

Innovation has no limits and is the key to success for glassmakers. ■

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Energy consumption

In a glass plant, different kinds of utilities are used: electricity, gas, water and air. First of all, glass is warmed at a high temperature in the furnace; once the article is produced, glass is warmed one more time before being progressively cooled. As a consequence, a substantial amount of greenhouse gas is ejected, particularly through fumes, which makes glass production a polluting activity. On the path to reduce the footprint of glassmakers, the first step consists in measuring, thus controlling, energy consumption. This step is absolutely essential to carry out an effective energy policy. Vertech' developed SIL4.0 to this end, to meet glassmakers' needs.

What's SIL4.0?

Collecting data and displaying real-time KPIs is one of the properties of SIL4.0. The concept is quite simple: SIL is able to get information at any place where sensors can be connected.

SIL communicates with machines and sensors through any communication protocol available on the market such as Webservices, Profibus and OPC-UA to help glassmakers develop their own protocol.

As a software company, Vertech' develops new protocols or functionalities whenever it is necessary. Regarding energy consumption, SIL4.0 is connected to key spots in the plant such as the furnace, where it can get real-time temperature; to the electro-filter, where it can get real-time green-house gas emissions;

to the annealing lehr, where it can get real-time temperature curve throughout the lehr. All the places on the production line where SIL4.0 is able to be connected are reported on (Fig 1).

SIL collects data; glassmakers choose what KPIs they wish to display, in order to help them take concrete actions.

KPIs can be consulted on totally customisable dashboards: information can be selected and sorted according to each user's needs.

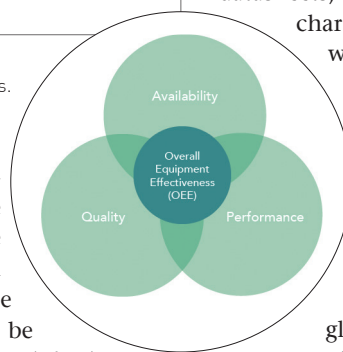
For top managers, a multi-plants dashboard may be configured, giving them the opportunity to have the same information for each plant on one single screen, which makes comparisons, benchmarking and analyses much easier and faster. In a few seconds, a top manager can view what the energy consumption or the GES emissions are for the whole group (Fig 2).

Advanced KPI – Overall Equipment Effectiveness

A great quantity of KPIs is available in SIL; among them, there is the Overall Equipment Effectiveness (OEE) (Fig 3).

It is extremely important for quantifying and analysing losses and outputs. The less losses glassmakers have, the more energy-efficient they are; the more outputs they have, the better the productivity is.

SIL gets the necessary data and makes the calculation, before displaying



▶ Fig 3. (Right) Overall Equipment Effectiveness.