

Modernisation of batch plant for efficient operations

The batch represents a very important element in the glass melting process. The quality of glass articles is significantly affected by non-homogeneous mixtures and inaccurate dosing systems. Batch plant specialist Vidromecânica advocates the modernisation of equipment in this area for higher quality and more efficient glass production.

A glass batch plant must have the capacity to fulfil the three main functions as follows: Raw material storage; batch preparation; and batch transport. Automation reduces operating personnel. If the equipment is quoted correctly and safely, a higher productivity level can be achieved.

The storage of raw materials and batch preparation takes place in the batch house. The transportation of the batch connects the batch plant house and the glass melting furnace. The selection of the kind of transportation for the many silos is determined by the materials themselves and by the various systems associated to the materials. Depending on the quantity, the raw materials can be supplied in bulk, sacks or drums. The silos are fed pneumatically or mechanically. Decentralised dust filters are installed on the individual raw material silos.

Selecting equipment

There is a large variety of products in the glass industry, which is why the area of batch preparation must be conceived in accordance with the specifications. Screw and vibratory conveyors are generally used.

Scales can be electronic or hybrid. In both systems, loading cells measure the weight of the raw material. Electronic scales are simple to construct and very popular. However, hybrid scales must be used when there are high lead loads to enable weighing accuracy.

Batch mixing

When all raw materials are in the mixer, dry mixing begins and the filling of the mixer stops. After dry mixing, water can be added and wet mixing begins.

The method of adding the cullet to the batch depends on industry requirements. Usually, cullet is added on the top of the batch after mixing. The quantity of the cullet to be added can be continuously or discontinuously measured.

Streamlining operations

The aim of Vidromecânica's engineering department during the conception phase is to minimise the number of equipments and obtain the simplest material flow. In this way, it is possible to achieve high operational reliability and low maintenance costs.



▲ An automatic serial batch plant.



▲ Batch transportation connects the batch plant with the glass melting furnace.

The company applies the same philosophy to the in-house cullet recycling systems and recycled cullet treatment plants widely installed in the container glass industry. When it is necessary to separate ceramic particles, metals and even colours, Vidromecânica offers solutions in partnership with the most advanced machines in the world.

Accurate weighing and reproducibility of all sequences for high-level productivity is very important. The controls are decentralised, therefore the batch plant continues to work if a control component fails. The system monitor informs the operator of the batch plant status at every moment.

continued >>

Batch plant

Cullet recycling development

Cullet is divided into two different types, depending on its origin. One type comes from an external source and the other comprises rejected material from the production lines inside the glass plant.

In response to industry demands and based on its experience, Vidromecânica has designed and produced a cullet recovery system for automatic manufacture with a capacity of up to 450 tons/day.

The system incorporates belt conveyors that remove rejected bottles and transport them away from production lines. It also features rotary falls for hot glass (drops and bottles from the IS machines), a scraping conveyor to process hot glass, a belt conveyor for humid or dry cullet, a cullet crusher, a metal elimination device, silos for cullet storage, dust removal filters, an electric panel and PLC/PC administration and control.

Cullet recovery process

Rejected cold glass from cold end lines is guided into recovery by belt conveyors. These conveyors were included in the design to ensure total fluidity of production and also avoid dust emissions.

Transfer between conveyors is via hoppers that feature small dust-removing filters. Once collected, the hot glass is guided by rotary falling chutes into the scraping conveyor, where it is cooled and processed by rollers and racks that crush the glass to the correct size.

These hot gob falling chutes are constructed with pipes that have a special hard coating on the major abrasion zones to keep wear and tear to a minimum.

Scraper conveyor

The scraper conveyor is a chain conveyor with dragging rods. It contains a water flow with a strictly controlled temperature that promotes efficient heat transfer between the glass and water, to cool it and reduce it to small particles. Belt displacement speed and water flow are adjusted depending on the amount of glass being introduced into the scraper conveyor.

The bottom of the scraper conveyor is covered with special melted basalt; a material that is highly abrasion resistant. The chains and rods have been specifically designed to cope with the difficult working conditions they are subjected to. A bottle breaker for floating

bottles or a mangle roller for flattening hot gobs can also be incorporated into the equipment to increase the heat transfer area between glass and water.

The mixture of hot and humid cullet with cold and dry cullet has a great advantage, because the humid glass avoids dust emission and the dry glass reduces the humidity grade of the humid glass. This also reduces the tendency for the glass to stick to the conveying equipment and storage silos.

The glass mixture is then conveyed to a cullet crusher where it is reduced to consistent sized grains. During transport the cullet passes by an electromagnetic device to remove any metallic particles.

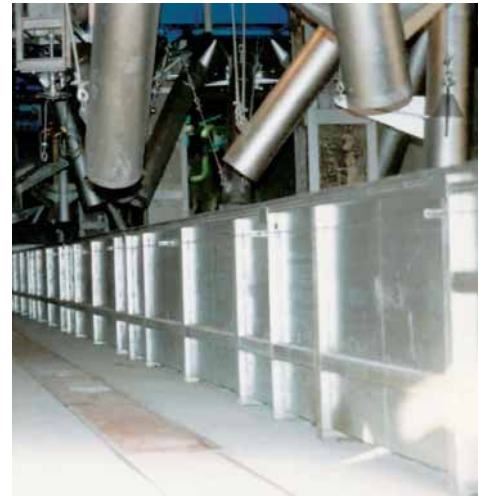
Hammer crusher

The next stage of the cullet crushing process uses a hammer crusher that has a capacity of up to 30 tons/hour. The equipment is completely covered with an abrasion resistant material to extend its lifetime.

The hammers are made with a shock and abrasion resistant material that suits the difficult working conditions. The impact bar can regulate grain size and all of the elements susceptible to wearing are easy to replace.

As this part of the process produces a certain amount of dust, a filter was installed to keep pollutants to a minimum. The filters selected are counter-flow sleeve-type with feature compressed air cleaning. Additional filtering units have also been incorporated to further reducedust levels.

The storage silo has a capacity of 150 tons and features a vibrated gutter to assist with material flow. Level probes



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control the maximum and minimum levels of glass in the silo.

System control

This system is PLC/PC administered with simple dialogue control. Each part of the equipment has specific controls, for easy diagnosis of faults. All events can be saved to file for reference and fault diagnosis, they can also be printed out if necessary. Operators can view recent events via a range of programme menus or pages that can be installed on a PC.

This programme was developed with maintenance protocols, to register and give alarms for routines or maintenance tasks.

Vidromecânica provides technical assistance and information via the internet, allowing operators to make any set-up changes to the working mode in real time. All machine operators have been trained by Vidromecânica technicians on theoretical and practical training procedures. ■

▼ A cullet crusher.



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