



Glass and Ceramic Products

Medium Risk Sector



The processing of sand and minerals into glass, ceramic and other non-metallic mineral products.
For processing limestone into cement, refer to the related 'Cement and Concrete' sector.

Related Sectors:

- Cement and Concrete
- Mining and Quarrying



Production Processes

The main steps in the glass production process are: Mixing, melting, forming, cooling and finishing.

The **mixing** process (either wet mixing or batch agglomeration) prevents dusting, ensures homogeneity and increases melting efficiency. After the mixing process, glass is **melted** in furnaces. The main **raw material** for glass salt production is milled silica sand, which is melted together with soda (sodium carbonate) or potash to reduce the melting temperature. The molten substance has to be homogenized and gas bubbles have to be removed through the addition of gas building substances. The **forming step** depends on the final glass product. Some are mouth-blown, but typically the forming process is performed with machines. Once formed, the hot substance is cooled rapidly, not allowing enough time for a regular crystal structure to form. The **finishing** processes may be mechanical or chemical. Mechanical processes include cutting, drilling, grinding and polishing. Chemical treatments may enhance the strength and durability of the glass product.

The industrial process of **ceramics production** is very similar to glass. Ceramics are originally made from clay and other non-metallic materials. Today, some high-tech ceramics use alumina, silicon carbide and other synthetic raw materials. As in the glass process, ceramics tend to be formed from melts. Ceramic materials are used as pottery, from crude earthenware to the finest porcelain. Ceramics are also used for electric equipment (e.g. insulators) and engineering products.

Sustainability Issues

H	Energy
M	Water Use
M	Emissions to Water
M	Waste
M	Emissions to Air
L	Ecosystems
H	Workplace Health & Safety
M	Disaster Risk
L	Site Contamination

Sector Rating

- H High risk issue
- M Medium risk issue
- L Low risk issue

Risks & Opportunities

- **The production of glass and ceramics is very energy-intensive.**
Energy is used primarily to melt and refine raw materials. In addition, further downstream processing to form and finish glass or ceramics also requires a significant amount of energy.
- **High temperatures, toxic dust, moving machines and falls from heights are the main health and safety issues.**
Heavy machinery is involved in glass and ceramic manufacturing. Production processes expose workers to high temperatures and solvents. Risks to the health and lives of workers may be mitigated by training, protective equipment and technical measures.
- **Large amounts of water are used for cooling and production purposes.**
Water is used to cool the molten raw material and the tools used in the glass product manufacturing process.
- **The gaseous emissions from kilns and furnaces may contain toxic substances.**
Emissions to air depend on the choice of fuel used for the kilns and furnaces. Emissions normally include substances as NOx, SOx, CO, hydrocarbons and fluorides. Fluorides, in particular, can pose a risk to human health.
- **Wastewater may be contaminated with heavy metals.**
There are several wastewater sources stemming from glass finishing processes. Dangerous wastewaters are released from coloring, in particular.