FOAM GLASS PRODUCTS
PRODUCTION LINES FOR MANUFACTURING OF:

- GRAVEL
- GRANULES
- BLOCKS
FOAM GLASS PRODUCTS
DEFINITION OF FOAM GLASS AND MAIN PROPERTIES:

Foam glass in its viscous state is a glass swelled by gas formers and congealed to a solid foam by defined annealing, characterized by a high heat insulation factor.

Main properties of foam glass are:

- Extremely light-weight
- Good thermal insulation properties
- Non-inflammable
- High compressive strength
- Waterproof / Non-diffusible
- Vermin proof
- Chemically stable
- Dimensional stability
- Temperature-resistant
- Easy to work and machine
FOAM GLASS PRODUCTS

GENERAL PRODUCT DATA:

Gravel:
- Bulk density: 140 - 200 kg/m³
- Thermal conductivity: 0.06 … 0.08 W/mK
- Compressive strength: 270 - 275 kN/m²
- Grain size distribution: 10 - 60 mm

Gravel ribbon at foaming furnace outlet
Gravel as bulk outside
Gravel using as perimeter insulation in a building foundation
## Foam Glass Products

### General Product Data:

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blocks:</strong></td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>110 - 180 kg/m³</td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>0.05 - 0.06 W/m*K</td>
</tr>
<tr>
<td>Standard size,</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>600 mm</td>
</tr>
<tr>
<td>Width</td>
<td>600 mm</td>
</tr>
<tr>
<td>Height</td>
<td>160 mm</td>
</tr>
<tr>
<td>Thickness of plates</td>
<td>40/60/…… mm</td>
</tr>
<tr>
<td>Compressive strength</td>
<td>0.4 - 1 MPa</td>
</tr>
</tbody>
</table>

- **Foamed block in mould at foaming furnace outlet**
- **Foamed raw block**
- **Final product: Foam glass plates**
- **Final product: Shaped pieces for Pipe insulation**
- **Plates as wall perimeter insulation**
- **Plates as floor/roof insulation**

**Baunetz Wissen:**

**Foam Glass**
FOAM GLASS PRODUCTS
GENERAL PRODUCT DATA:

Granules:
Grain sizes:
- Size C-S: 0.2 – 0.5 mm
- Size C-M: 0.5 – 1.0 mm
- Size C-L: 1.0 – 2.0 mm
- Size C-XL: 2.0 – 4.0 mm

Bulk density Granules:
- Size C-S: 330 … 400 kg/m³
- Size C-M: 260 … 330 kg/m³
- Size C-L: 210 … 280 kg/m³
- Size C-XL: 190 … 250 kg/m³

Average bulk density: 230 kg/m³
Grain raw density: approx. 300 – 950 kg/m³
Thermal conductivity: approx. 0.07 W/mK
Average grain strength: 1.400 – 2.800 kN/m²

<table>
<thead>
<tr>
<th>Particle size</th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
</tr>
</thead>
<tbody>
<tr>
<td>bulk density</td>
<td>kg/dm³</td>
<td>0.35</td>
<td>0.3</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Granules used as aggregate in a noise protection plate
FOAM GLASS PRODUCTS
APPLICATIONS:

**Gravel:**
- Insulation fill in foundations of houses/buildings, parking decks, roofs of car park/perimeter insulation
- Substructure in road and railway constructions
- Insulation for long-distance heating pipe lines
- Insulation of underground storage tanks

**Granules:**
- Light filler for insulation concrete, Mortars
- Aggregate for acoustic boards, panels, fire protection facilities
- Insulation material for foundry industry
- Insulation fill
- Aggregate for paints, wallpapers

**Blocks:**
- Thermal insulation of walls, roofs, platforms
- Thermal insulation of cold storage houses
- Shipbuilding
- Manufacturing of shaped pieces for insulation of pipes
- Insulation for special applications (swimming pools, tunnels)
FOAM GLASS PRODUCTS

RAW MATERIAL REQUIREMENTS:

Main raw material:
- Glass powder, approx. 95% of total raw material demand
  Source: from Glass melting plant with defined glass properties (own melting plant)
  Source alternative: treated recycling glass (flat or container glass),
  Soda- Lime- Basis with consistent quality
- Grain size:
  for gravel \( d_{100} < 100 \, \mu m; d_{90} < 63 \, \mu m \)
  for granules \( d_{100} < 63 \, \mu m; d_{90} < 40 \, \mu m \)
  for blocks \( d_{100} < 63 \, \mu m; d_{90} < 40 \, \mu m \)
  for other available grain sizes (bigger) appropriate treatment equipment (milling plant) has to be considered

Additives:
- Further main raw materials as additives up to approx. 5,0 Mass-% of total raw material demand are Sodium Silicate, Glycerol, Limestone, Water and Kaolin, small components depending on the kind of foam glass, quality and analysis of the glass powder and special technological requirements
FOAM GLASS GRAVEL:

- **Production Line Type**: SGS 60T
- **Standard Capacity**: 60,000 m³/a; saleable gravel
  - Approx. 180 m³/d, as bulk
- **Raw materials demand**: 8,400 t/a Glass powder
  - 25.5 t/d Glass powder
  - 1.06 t/h Glass powder
  - for bulk density of Ø 140 kg/m³
- **Number of production days**: 330 d/a
- **Production period**: 24 h/d
- **Belt width, gross**: 2.200 mm
- **Belt width, effective utilisable**: 2.000 mm
- **Total length furnace**: 23,600 mm (without glass fleece handling)
- **Tunnel length**: 18,000 mm
- **Foaming temperature, max.**: 900°C
- **Heating agent**: Natural gas
- **Heating type**: direct heating
- **Heating type alternative**: indirect heating
FOAM GLASS GRAVEL:
General flow sheet

Schematic drawing of the foam glass manufacturing process
foam glass gravel
FOAM GLASS GRAVEL:
Main Equipment

- Milling plant Glass powder (optional)
- Silo for glass powder (scope of customer or optional)
- Silos/ storage facilities for Additives (scope of customer or optional)
- Raw material handling and transport
- Dosing and mixing station raw materials
- Batch feeding station with glass fleece handling facility
- Technological Steel structure(supports, platforms for mixing area and batch feeding station), scope of customer
- Foaming furnace (passed through type) with natural gas heating
  Standard type:  direct gas heating
  Advanced type: indirect gas heating
- Control system
- Belt conveyor to storage area (optional)
FOAM GLASS GRAVEL: General Layout

Space requirements:
- **Length:** approx. 40 meters
- **Width:** approx. 12 meters
- **Height:** min 6 meters (clear height under truss)
  (area for silos and mixing equipment to be clarified)
### Foam Glass Granules:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production Line Type</strong></td>
<td>SGG 3000</td>
</tr>
<tr>
<td><strong>Standard Capacity</strong></td>
<td>3,000 t/a; saleable granules</td>
</tr>
<tr>
<td><strong>Raw materials demand</strong></td>
<td>3,150 t/a Glass powder</td>
</tr>
<tr>
<td></td>
<td>9,55 t/d Glass powder</td>
</tr>
<tr>
<td></td>
<td>0.4 t/h Glass powder</td>
</tr>
<tr>
<td><strong>Number of production days</strong></td>
<td>330 d/a</td>
</tr>
<tr>
<td><strong>Production period</strong></td>
<td>24 h/d</td>
</tr>
<tr>
<td><strong>Rotary tube, length</strong></td>
<td>6,000 mm</td>
</tr>
<tr>
<td><strong>Rotary tube, diameter</strong></td>
<td>800 mm</td>
</tr>
<tr>
<td><strong>Cooling tube, length</strong></td>
<td>4,000 mm</td>
</tr>
<tr>
<td><strong>Cooling tube, diameter</strong></td>
<td>600 mm</td>
</tr>
<tr>
<td><strong>Total length of the unit</strong></td>
<td>10,000 (only rotary kiln)</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>approx. 2,500 mm</td>
</tr>
<tr>
<td><strong>Rotary speed</strong></td>
<td>0.5 – 5.0 rpm</td>
</tr>
<tr>
<td><strong>Inner temperature, max.</strong></td>
<td>1,000°C</td>
</tr>
<tr>
<td><strong>Heating agent</strong></td>
<td>Natural gas</td>
</tr>
</tbody>
</table>
FOAM GLASS GRANULES:
General flow sheet
FOAM GLASS PRODUCTION LINES

FOAM GLASS GRANULES:
Main Equipment

- Milling plant Glass powder (optional)
- Silo for glass powder (scope of customer or optional)
- Silos/ storage facilities for Additives (scope of customer or optional)
- Raw material handling and transport
- Dosing and mixing station raw materials
- Fluid- bed dryer, incl. cyclone for de- dusting
- Sieving plant for separation of grain out of defined range
- Silo for storing of raw granules
- Silo for storing of separation agent (Kaolin)
- Facility for dosing of raw granules and separation agent
- Rotary kiln, with indirect heating
- Air classifier for separation of separation agent
- Filter unit for separation agent
- Sieving unit for classifying of final products in 4 fractions
- Silo final products with filling system for BIG BAG (scope of customer)
- Technological Steel structure(supports, platforms for mixing area and batch feeding station), scope of customer
- Control system
Space requirements:
- Length: approx. 46 meters
- Width: approx. 18 meters
- Height: min 6 meters (clear height under truss)
  (area for silos and mixing equipment to be clarified)
FOAM GLASS BLOCKS:

- **Production Line Type**: SGB 40T
- **Standard Capacity**: 40,000 m³/a; saleable blocks
- **Factor gross-net capacity**: 1,25
- **Gross capacity**: 50,000 m³/a
- **Raw materials demand**
  - resp.: 8,000 t/a Glass powder
  - resp.: 24,3 t/d Glass powder
  - resp.: 1,0 t/h Glass powder
- **Number of production days**: 330 d/a
- **Production period**: 24 h/d
- **Total length foaming furnace**: approx. 47,000 mm
- **Foaming temperature**: max. 900°C
- **Total length annealing lehr**: approx. 87,000 mm
- **Max. temperature**: 600 °C
- **Heating agent**: Natural gas
FOAM GLASS BLOCKS:
General flow sheet; process with own glass melting plant
FOAM GLASS BLOCKS:
General flow sheet; Standard- Process with recycling glass cullet
FOAM GLASS BLOCKS:
Main Equipment

- Raw materials storage and batch house for glass melting (option for own glass melting)
- Glass Melting furnace (option for own glass melting)
- Glass frit and crushing facilities (option for own glass melting)
- Milling plant Glass powder (optional)
- Silo for glass powder (scope of customer or optional)
- Silos/ storage facilities for Additives (scope of customer or optional)
- Raw material handling and transport
- Dosing and mixing station raw materials
- Mould circulation, incl. mould Cleaning and impregnation
- Mould filling station
- Foaming and stabilising furnace
- Block removal and handling
- Annealing lehr
- Block cutting
- Quality control
- Packing
- Set of moulds, incl. spare (scope of customer or optional)
- Technological Steel structure (supports, platforms for mixing area and batch feeding station), scope of customer
- Control system
FOAM GLASS BLOCKS:
General Layout

Space requirements:
- Length: approx. 120 meters
- Width: approx. 30 meters
- Height: min 6 meters (clear height under truss)
  (area for silos and mixing equipment to be clarified)
FOAM GLASS PRODUCTS
SUMMERY AND BASIC PRINCIPLES:

Foam glass products are used as an high-end insulating material for a wide range of applications.

Production capacities and plant configuration are depending on the market and local conditions.

For a decision regarding these issues it is recommended, to make a technical study and investigations regarding efficiency of the project.

GLAMACO is at yours disposal to support you to all questions and procedures for the implementation of the plant.
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