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REFRACTORY PRODUCTION AT AGC BOR GLASS WORKS, JSC

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The AGC Bor Glass Works work on polished glass production is shown. Refractories for company needs and on order are produced. The manufacture of mullite bottom block has been perfected. An integrated quality-management system has been introduced. The company's articles are distinguished by their high quality.

Key words: polished glass, refractories, bottom block, mechanical working, product quality.

The company AGC is a world leader in the production of polished glass. At present 38 company plants operate worldwide. AGC Bor Glass Works has been part of AGC since 1998.

It should be noted that the production of fireclay refractories at the Bor plant started in 1931 — the year the plant was built. In 2002 specialists from the AGC group in the Belgian Research Center analyzed large-block fireclay articles for 10 European suppliers. The studies showed that the product from AGC Bor Glass Works is superior. The engineering department of the AGC group made the decision to use its own company's fireclay refractory product in AGC glassmaking furnaces. In 2005 the AGC Company invested 4.5×10^6 euros to upgrade the production of refractories. A new body was built and the latest equipment was purchased from well-known world and Russian producers: Wassmer, Avola, Demag, Toyota, Siemens, Kodia, Filtering system, Stromizmeritel', and Érga.

Over years of work specialists at AGC Bor Glass Works, JSC have accumulated enormous experience in the production of high-quality bottom blocks for the lining of a float-tank bottom as well as in the production of large-block fireclay refractories for the lining of a melt-tank bottom. Because of production upgrading and the efforts made by the group the product is in demand by many large plants producing polished glass in France, Russia, Japan, India, Philippines, USA, China, Czech Republic, and Indonesia. In Russia, at present, the bottom block for the lining of a float-tank bottom is produced only at the indicated plant.

In production, special attention is devoted to the raw material and its preparation. Rare types of clays from the Druzhkovskoe Mine Management of Ukrainian Deposits;

these clays have no analogs in Russia, which makes it possible to attain high product quality and absence of rejects, such as separation of a block, and thereby to increase service life. After the final preparation of all components of the raw material, the batch is mixed in a mixer. The ready batch enters the section of green formation in molds by means of compressed air rammers. The green product is dried and calcined in periodic action furnaces. The flexible drying and calcining regime makes it possible to obtain physical characteristics of articles with consistent quality. The calcined intermediate product is mechanically worked on grinding and drilling stands where it is given its final form with respect to the configuration and precise dimensional tolerances.

It is important to note that the company produces only mechanically worked articles; all surfaces are worked. The finished article moved to a storage area, where the orders are formed, the customer receives the articles, and the articles are packaged.

Strict monitoring of the technological regimes and quality indicators of the intermediate product is exercised at all stages.

AGC Bor Glass Works JSC produces an aluminosilicate bottom block for a melt tank (Fig. 1) and a ShSU-33 bottom block for the bottom of a melt tank, ShSU-40 burner and inspection blocks, 50 different sizes in all.

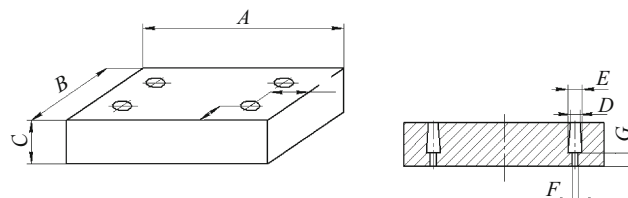


Fig. 1. Bottom block for a melt tank: size A) from 545 to 990 mm, tolerance $+0 \dots -1.5$; size B) from 642 to 608 mm, tolerance $+0 \dots -1.5$; size C) from 254 to 338 mm, tolerance $+0 \dots -1.5$.

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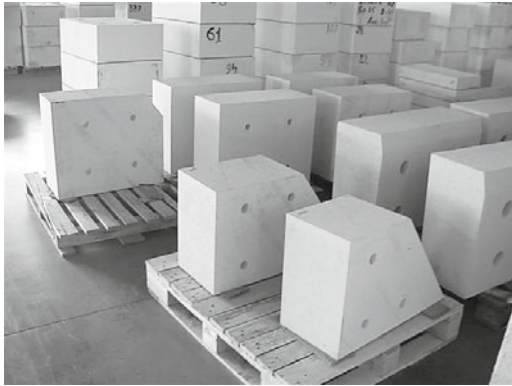


Fig. 2. Finished product in storage.

At present the AGD Bor Glass Works is perfecting the manufacture of MLS-62 mullite bottom blocks for the bottom of the melting tank of a furnace and ShTU-1.3 aluminosilicate heat-insulating block. Thus, the company has the ability to propose to its clients the optimal solution with respect to the application of refractory materials for the masonry of the bottom and walls of the melting tank of a furnace. To implement this solution the company manufactures the articles ShTU-1.3, ShSU-33, and MLS-62 with large dimensions for straight articles — to $1200 \times 500 \times 300$ mm — as well as articles with different configuration and with different technological openings according to the client's drawings. All surfaces of the articles are mechanically worked (ground), which makes it possible attain minimum dimensional tolerance near 1.5 mm.

The physical-chemical characteristics of the articles for the bottom and wall masonry of a melting tank are presented in Table 2.

Studies of the product quality are performed regularly in the plant laboratory, which is equipped with the latest equipment, and when necessary studies are also performed in authoritative centers in Europe and America. The latest such studies of products are: an investigation of the float block of a melt tank for separation, a laboratory study initiated to study the separation process and making a comparison of the product made with other products on the market; investigation of MLC-62 and ShTU-1.3 articles for bottom and wall masonry of a melt tank of a furnace; a laboratory study was initiated to determine the nominal physical-chemical characteristics.

An integrated quality management system, an ecological management system, and professional health and safety management system have been developed, documented, adopted, and supported at AGC Bor Glass Works. The integrated quality management system was developed in accordance with the requirements of the standards ISO 9001, ISO 14001, and OHSAS 18001.

A flexible system of working with clients, which makes it possible to fulfill high-quality orders of an complexity in a short time has been developed at the AGC company. With its

TABLE 1. Physical-Chemical Characteristics of Aluminosilicate Bottom Blocks for a Melt Tank

Indicator	Maximum deviation
Top diameter of conical opening D , mm	– 0 ... + 6
Bottom diameter of conical opening E , mm	– 3 ... + 6
Diameter of cylindrical opening F , mm	– 0 ... + 2
Height of cylindrical opening G , mm	± 3
Distance from center of opening to edge of article H , mm	± 6
Apparent density, g/cm^3 , not less than	2.1
Open porosity, %, not more than	19
Compression strength, MPa	30 – 50
Gas permeability with respect to air, μm^2	0.05 – 0.2
Mass fraction for calcined matter:	
Al_2O_3 , %, not less than	33
Fe_2O_3 , %, not more than	1.3
sum $\text{Na}_2\text{O} + \text{K}_2\text{O}$, %, not more than	3
Calcination mass losses, %	Not normalized
Refractoriness, $^\circ\text{C}$, not less than	1410
Water absorption of fireclay, %, not more than	2
Channel porosity, %, not more than	7

TABLE 2. Physical-Chemical Characteristics of Articles for Bottom and Wall Masonry of the Melt Tank of a Furnace

Indicator	Properties of articles		
	ShTU-1.3	ShSU-33	MLS-62
Al_2O_3 mass fraction, %	≥ 28	≥ 33	≥ 62
Fe_2O_3 mass fraction, %		≤ 1.5	≤ 1.5
Apparent density, g/cm^3	≤ 1.3	≤ 2.1	≤ 2.45
Open porosity, %	≥ 50	≤ 19	≤ 24
Compression strength, MPa	≥ 8	≥ 30	≥ 40
Thermal conductivity, $\text{W}/(\text{m} \cdot \text{K})$ at temperature:			
650 $^\circ\text{C}$	0.7	1.3	1.73
1000 $^\circ\text{C}$		1.4	1.92

large production capacities the company is ready to propose its products to colleagues in production of different types.

The main advantages of the refractory production of AGC Bor Glass Works are:

- many years of experience producing aluminosilicate large-block articles;
- many years of experience in using the articles which it produces as well as articles produced in AGC plants around the world;
- consistently high level of production and product quality;
- possibility of producing in short periods of time mechanically worked articles with practically any complexity;
- accessible production site.