

AERATED CONCRETE BLOCKS: MAIN TYPES AND EQUIPMENT

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Abstract

This article provides information about the building material aerated concrete, the main types of aerated concrete products, as well as the technological process of manufacturing aerated concrete and the equipment used.

Keywords: aerated concrete, aerated concrete products, aerated concrete blocks, Portland cement, lime, sand, aluminum powder, gypsum, slag, wood chips, conveyor lines; stationary lines; mini-lines; mobile installations.

Introduction

The construction industry, even in times of various crises, always shows a certain growth, so the production of building materials as an idea for business development will always be successful. The most attractive is the production of materials that show an ever-growing demand, and these include aerated concrete, which is consistently popular, especially among private developers.

In order to manufacture aerated concrete for commercial purposes, special equipment, production facilities, suppliers of raw materials, workers are needed (if we are talking about a small enterprise, you can even do it on your own plus 1-2 assistants). The size of future production should be determined by the following criteria: financial investments that a businessman is ready to invest at the initial stage, the capacity of the market for which the production of this product is oriented. In some cases, it is justified to purchase equipment for the production of aerated concrete for a specific object: in this case, you can significantly reduce the total construction costs, and after completion of work, the equipment can be sold, leased or set up a small commercial production of this material [1].

Aerated concrete (building material) is a popular material in the construction industry, durable but light enough. Industrial capacities were required for its manufacture, but today technologies are changing. There is an upgraded equipment for the production of aerated concrete, which allows it to be produced within the framework of small productions, and some models – at home.

Any business should be started after a carefully and thoroughly developed business plan.

Aerated concrete products can be produced in various ways, and, therefore, different equipment will be needed, and the needs of the enterprise in production and storage areas may also differ. Aerated concrete can be produced in two ways: autoclave and non-autoclave. In the first case, the products have greater strength, give a lower percentage of shrinkage, and are recommended



for the construction of load-bearing walls and partitions. Products obtained by the usual method of hardening exhibit the best thermal insulation characteristics [2].

Aerated concrete blocks can have a standard rectangular shape (more precisely, a parallelepiped) or a special U-shaped one, which are used to install jumpers in window and door openings. The dimensions of the product are determined by the dimensions of the molds for pouring, but it is desirable that they correspond to standard or standard values equal in length – 625 mm, in height – 250 mm, and with the possibility of producing blocks of different thicknesses, from 100 to 400 mm. For U-shaped products, the standards are as follows: length 600 mm, height 250 mm, and width or thickness can be 200, 300 or 400 mm. The advantage will be the possibility of using equipment for the manufacture of blocks according to individual orders [3].

Since most of the cost of production is made up of raw materials, the choice of suppliers should be approached very responsibly. The main criterion is the quality of the raw materials and low transportation costs. In addition, in order to provide a certain raw material reserve, warehouse space will be needed, the size of which must also be taken into account when choosing a site for rent.

For the production of aerated concrete, you will need: Portland cement, it is recommended to use the 400 grade, which guarantees the necessary strength characteristics of the finished product; lime; sand (quartz is often used for this); aluminum powder or paste. It is also allowed to use additional components: plasticizers that improve the characteristics of aerated concrete and hardening accelerators that shorten the production cycle, but do not worsen the quality of products. There must also be a source of water, the quality of which must meet certain technological requirements. If you plan to produce products with additional properties or qualities, you may need stocks of gypsum, slag, wood chips and some other components used as fillers [1,4].

If commercial production is planned, then it is impossible to do without drawing up Technical Specifications for their production. This is primarily necessary to obtain a Quality Certificate for manufactured products. You can do the development yourself, if you have a specialized education, or you can order this work to specialists or buy ready-made technical specifications. After that, you need to go through the registration procedure. In some cases, the purchase of technical specifications is carried out together with the purchase of equipment, many manufacturers offer this option as a bonus or at a discounted price with a big discount. The technical specifications for the production of products must contain the following information and data: on the parameters of the product, its properties and characteristics; a description of the technological process of manufacturing and product quality control; on the necessary conditions for storing finished products and rules for its transportation; on the requirements for the quality of raw materials; on the rules of compliance with safety at work; on the standards for compliance environmental protection [5].

When choosing equipment, its capabilities for the production of blocks of different densities, including minimum and maximum values for this parameter, should be taken into account. Regardless of the configuration, the equipment for the manufacture of blocks consists of the following elements and production units: a mixer for a slurry solution; an activator mixer;



molds for products; a mechanism for cutting aerated concrete; dispensers for water and raw materials, a vibrating screen, a special autoclave furnace (only for the production of autoclave aerated concrete). Hydraulic trolleys will also be needed to transport finished products to the warehouse.

The capacity of the equipment can be 10 m³, 60 m³, 120 m³ or more per day. The price will depend on this parameter, as well as on the degree of automation of the process. For equipment for the production of aerated concrete blocks, the minimum price for about 15 m³ per day will be about 100,000 rubles. It should also be noted that the cost of equipment for the production of autoclaved aerated concrete is much higher, therefore its use for mini-factories is very rare, since the profitability of such production is very low, and accordingly, the payback period will be very long. On average, the payback time for equipment and initial capital invested in production ranges from six months to two years [6].

The production of aerated concrete is not particularly difficult, but requires precise adherence to the technological process. First, all the necessary raw material components are loaded into the concrete mixer in the proportions required and measured by the dispenser. After 10-15 minutes, a gas-forming component is introduced, for aerated concrete it is aluminum powder or suspension, which reacts with lime. Next, the finished solution is poured into molds or onto a special tray, on which, after a period of exposure, it is cut into blocks with a special knife.

The process of holding aerated concrete lasts 10-18 hours. After that, the blocks are laid out on pallets for further autoclaving under special conditions at a temperature of 180-190 °C and a pressure of 12 atm. Products produced by the non-autoclave method undergo a drying stage in natural conditions, which lasts 3-6 days. Further full maturation of aerated concrete lasts about a month and takes place in a warehouse. For the convenience of transporting the finished product, it should be placed on a wooden pallet and packed with shrink wrap.

All equipment for the production of aerated concrete blocks can be divided into 4 groups: conveyor lines; stationary lines; mini-lines; mobile installations. The main difference between them is performance. Production areas of different sizes are required to accommodate them [7]. Stationary lines are well automated, which allows you to significantly reduce the use of manual labor, as well as to obtain products of very high quality. The capacity is from 60 m³ per day or more. To ensure the smooth operation of the plant, only two people per shift are needed. To accommodate such a mini-plant together with warehouses for raw materials and finished products, about 500 m² of production and storage facilities will be required. Therefore, to start a business, quite large costs will be required at the initial stage, primarily for the purchase of equipment and rental of space. The cost of equipment alone will range from 300,000 to 1.5 million rubles or more, depending on its performance. It is possible to significantly reduce initial costs by giving preference to mini-lines, the capacity of which is about 15 m³ of products per day. Their main difference from stationary ones, except for the size and level of automation, lies in the principle of operation of the equipment [8].

In stationary complexes, the mixer is the fixed element, and in mini-lines, the molds for blocks, that is, in the first case, the molds themselves drive up to the mixer to fill them with the prepared solution, and in the second case, vice versa. Therefore, you can save money on renting space for production: to accommodate a mini-line with a capacity of 15 m³ per day, you will need



only 140-160 m². But the maintenance of this installation will also require at least 2 workers, since the automation level is much lower.



Mini-lines can be used for the production of aerated concrete directly on the construction site, only this will require an electric power source. On conveyor lines, it is possible to produce from 120-150 m³ per day, while it is possible to achieve maximum automation of the process, and reduce the number of employees. The equipment, located on an area of 600 m² or more, can serve only 8 people. Naturally, large investments will be required at the initial stage, but with good market conditions and well-established sales, the payback of such a line can occur in just a year, although equipment costs will range from 2-5 million rubles or more, depending on its performance [9].

It makes sense to buy mobile installations for the production of gas blocks in the case when it is necessary to build, for example, a country residential complex or a cottage. In this case, you can significantly reduce costs. On average, the cost of construction can be reduced by 30%. In order to achieve high-quality products, the mixer is additionally equipped with a compressor unit, which provides better production of the solution. As a rule, all mobile installations are designed to operate from a conventional 220 V power grid, instead of a three-phase 360 V connection for other types of equipment. To place it, you will not need a lot of space on the construction site, such equipment can even be placed under a canopy.

The production of material with low cost and high demand makes this type of business very attractive. But in order to get the maximum profit, you should take into account some nuances. First of all, the seasonality of demand should be taken into account, therefore, in order for the first year of operation not to be unprofitable, production should be started a month or two before the start of the construction season, having accumulated a certain stock of products in warehouses. It should also be borne in mind that the main category of clients are private developers, so it is necessary to constantly work on increasing sales by attracting the maximum number of new customers [10].

When choosing a rental space, several points should be followed: its area should be sufficient to accommodate a production line, a warehouse of raw materials and a warehouse of finished products. In addition, there must be an opportunity for vehicles to arrive. The room should be



sufficiently dry and warm, in addition, water supply and a three-phase power grid with a voltage of 360 V. Pricing and sales of products

When developing a business plan, special attention should be paid to the pricing section. In order for sales to grow, the price of products must be competitive, and the quality of products must be high. The calculation of the cost of production is performed for 1 m³ and includes: the cost of raw materials, including its transportation; utility and rental costs; wages for employees; business maintenance costs, including taxes; costs related to the promotion of products to the market (mailing lists, advertising, etc.); other expenses. After the cost of production of 1 m³ of aerated concrete is obtained, it should be compared with the average market price for this type of product. And depending on the result obtained, set an economically justified price for your products, without striving for the lowest possible price, which may simply scare off the buyer, since he will simply consider the product to be of poor quality, but also should not be set too high, since the consumer can always find high-quality products at an affordable price [2,6].

In order for business to flourish, it is necessary to regularly monitor the market and respond promptly to any fluctuations. In this case, it will be possible to achieve stable demand for their products, and, consequently, capital turnover will occur faster, which in turn will accelerate the payback of fixed assets spent at the initial stage on business organization.

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