

AUTOMATED CONTROL SYSTEM OF THE TECHNOLOGICAL PROCESS OF GYPSUM PRODUCTION IN ROTARY KILNS FOR INDUSTRY

Abidov K.Z.

Candidate of technical science, associate professor, Bukhara Engineering-
Technological Institute, Bukhara city, Uzbekistan.

Aminova M.B.

M7-21 TJBAKT graduate student, Bukhara Engineering-Technological Institute,
Bukhara city, Uzbekistan.

ABSTRACT

Currently, the tasks of developing the economic sector in our Republic and increasing the production of various products that meet world standards, including gypsum for the industrial and construction sectors, with the rational use of available resources, have been set. Gypsum is a widely used building material and has the potential to be used for various purposes, and it is important to automate existing technological processes in the production of this product and manage them based on modern information and communication technologies. Currently, in Uzbekistan, construction gypsum is widely used in plastering walls and ceilings, in the production of plaster walls, in the production of plasterboards, as well as in the production of frames.

Key words: *gypsum extraction, pressure, microprocessors, enterprise power, energy, metallurgy, mechanical engineering.*

INTRODUCTION

Gypsum is one of the oldest building materials. The structure of gypsum makes it a natural "conditioner". This happens due to the absorption of excess moisture in the room and its re-release. Gypsum materials used in rooms during construction have the ability to pass air. Gypsum is an environmentally friendly material, it is non-toxic, odorless and has a pH of 5.5 (corresponding to the acidity of human skin) [1]. It should be noted that in previous years, the production technology of water-saturated plasters was produced in chamber, shaft and rotary furnaces, as well as boiling cauldrons, and did not fully respond to the prospects aimed at increasing the strength of plaster. Therefore, in recent years, attention has been paid to the introduction of modern and relatively new technologies for the production of high-quality and high-quality gypsum.

As a result of scientific research and experiments, two new ideas in principle appeared in the following years: gypsum processing using steam under excessive pressure and obtaining water-saturated gypsum by boiling in a liquid medium. Obtaining high-proof gypsum as a result of vaporization of gypsum particles has made scientists more interested in its recovery in a liquid medium. Therefore, a number of new studies were conducted on the method of obtaining gypsum based on excess pressure [2]. The results of such studies were tested in production conditions and they were recommended for introduction into production. As a result, it was found that compared to the usual 55-70% water solubility of gypsum, when it is dissolved in 35-40% water, the ability to maintain its lithic properties increases significantly [3]. Today, as a result of the automation of technological processes of gypsum production, it is possible to obtain high-quality types of gypsum. Functional capabilities of modern microprocessor control systems form the basis of the automated control system of technological processes of gypsum production. Factors such as the use of integration principles, distributed control and software complexes play a leading role in the creation of such control systems. In the automation of the construction sector of the industry, as an object of automation, it is not a separate technological process or aggregate, but technological complexes in complex relationship with subsystems. Modern systems of construction industry automation based on microprocessor tools have wide functional capabilities, increase the reliability of automated control systems based on improved technical characteristics, and ensure quick organization of management.

Our research is aimed at developing a functional scheme for automating the technological process of gypsum production, selecting control and measurement devices for automating this process, and defining the appropriate microcontroller to control the process and developing a control program. It is also aimed at setting up the adjustment contour and conducting its research, developing a structural scheme of the control system. The analysis of the literature shows that, although there are various and many binders available today, some of them are used in construction. Construction refers to mineral binders, powder-like materials that form a mass when mixed with water and slowly harden into stone.

Ensuring the implementation of the program for the construction of individual houses according to model projects developed in the country in recent years, as well as the construction of energy, metallurgy, mechanical engineering, chemical industry facilities, railways and highways, and the unique role of the construction materials industry in creating their infrastructure. there is After all, it is considered one of the important sectors of our economy, and the achievements made in this front are a

worthy contribution to the development of our country and the improvement of the lifestyle of our people. Also, wastes containing gypsum residues are mainly used for addition to asphalt concrete in the construction industry and in the asphaltting of highways, after a special environmental inspection.



Figure 1. Gypsum production plant rotary kiln view
(enterprise capacity 50-400 tons per day)

Today, more than 6,000 enterprises producing construction materials are operating in our republic. 10 million per year. "Kvarts" JSC, producing square meters of glass, "Bukhorogips" joint enterprise, producing 60,000 tons of dry construction mixes, 20 mln. sq. m. "Knauf Gypsum Bukhara" JV, which has the capacity to produce plasterboard, 3.5 mln. sq. Among them are "Moderna Ceramic Industries Fergana" JV, which produces ceramic tiles, and "Grand Art Ceramics" JV, which has the capacity to produce 75,000 pieces of sanitary ware. The water-saturated plaster prepared by this method is separated from the liquid medium by centrifugal force and then dried at 110° C in the first stage and at 70-80° C in the next stage. After going through the drying process, the gypsum is ground into powder form, leaving 5-10% residue. The water requirement of high-strength gypsum is 30-35%. In general, the production process of gypsum binding products consists of the following technological operations: storage of gypsum stone, crushing, burning of gypsum stone, grinding.

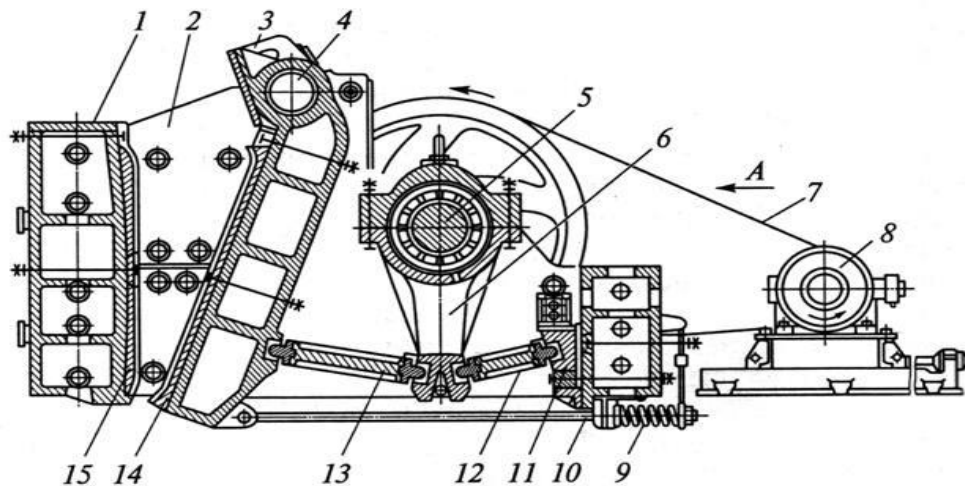


Figure 2. Gypsum crushing scheme in a jaw crusher

1 — body walls, 2 — side cheek, 3 — sliding cheek, 4 — axis, 5 — shaft, 6 — connecting rod, 7 — belt transmission, 8 — electric motor, 9 — spring, 10 — tire, 11 — rod, 12, 13 — rasp plate, 14, 15 — grinding plates

In the production of construction plasters by burning pieces of material, crushing of pieces is carried out on the basis of a one- or two-stage scheme in jaws (Fig. 2) and another crusher, depending on the size of the material, and is sent to the furnace for casting. In this case, a hammer crusher is used to re-grind the gypsum stone (Fig. 3).

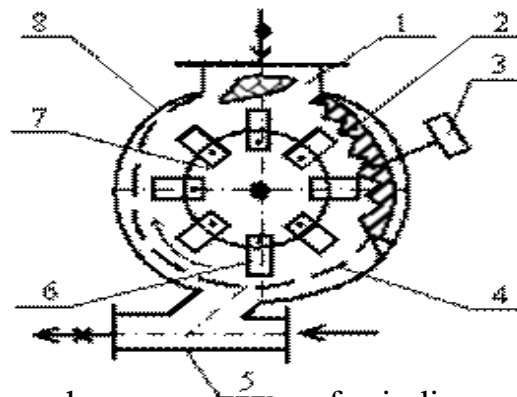


Figure 3. The scheme of grinding gypsum in a jaw crusher

1-receiver-consumer device; 2-bronze plate; 3-correction device; 4th sieve; 5th output device; 6-hammer; disc 7; 8th Corps.

Nowadays, plaster casts are mainly made in rotary kilns. Currently, drums are used mainly for burning building gypsum in rotary kilns. Such drums are also used in the drying process of dispersed materials in other industries (Fig. 4).

The description of the technological process of water-saturated gypsum production in rotary kilns is presented in Fig. 4.

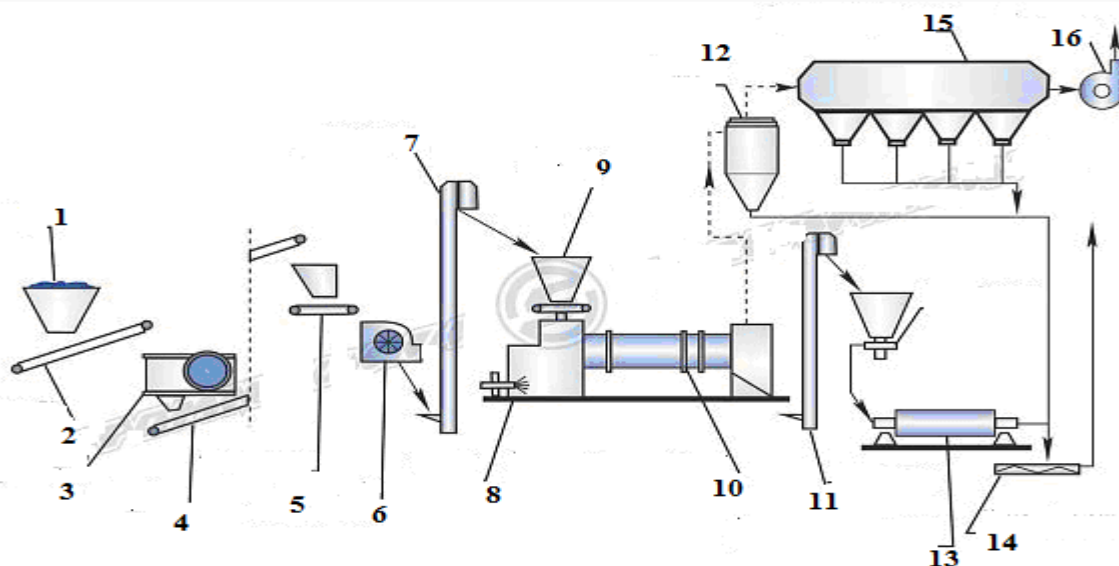


Figure 4. Technological scheme of construction gypsum production in rotary kilns

1- bunker, 2- feeder, 3- crusher, 4- conveyor, 5- feeder, 6- crusher, 7- elevator, 8- firehouse, 9- bunker, 10- drying drum, 11- elevator, 12- cyclone, 13- ball mill, 14- screw conveyor, 15- hand filter, 16- smoke extractor

The drying drum is a welded steel cylinder device that rotates on support rollers at a speed of 2-3 revolutions per minute. The drum is installed with a horizontal inclination of 3-5° and is rotated by an electric motor. Gypsum sheben is delivered to the warehouse of the enterprise by road transport and before that by rail transport. The autoloader picks up the plaster and transports it to the desired location. From there, a crane-hammer loads a portion of the loose gypsum material into a gypsum rock hopper. From there, the gypsum is transferred to grinding by belt conveyor. At the entrance to the drying drum, the gas temperature reaches 900 °C in direct flow. In the opposite flow, it is up to 600-700 °C. Before the product goes to the gas furnace, it is mixed with air to the required temperature. The gas leaves the drum at 160-180°C in direct flow, and at 100°C in counterflow. After drying, the material falls into the sheben hopper with the help of an elevator, and the dust falls into the dust settling chamber. From the bunker, the sheben drops into the ball mill.

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