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# Air Transport Plan of Grinded Straw

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**Abstract:** This paper describes the design solution of technological milling — grinding, transport and production of briquettes from straw. The project is designed and implemented for "Victoria Group" in Zrenjanin. The paper contains a description of technological scheme of process, specification of mechanical and technological equipment, energy needs and measures of safety at work, pictures of machines and equipment and so on.

**Key words:** briquette, air transport, grinded straw

## 1. Introduction

"Victoria Group" in Zrenjanin has built a production plant — briquetted biomass. Biomass that is specifically used in this case is a plant residue wheat "straw". Fig. 1 shows the technological scheme of production of biomass briquettes from straw. Lower calorific value of straw is about 12 MJ/kg. It can be seen that there are two hammers, one for coarse grinding of straw, and the other for fine grinding of straw and two machines pellet mills for the production of the final product — pellet biomass. On the basis of performed measurements during operation of the plant, was established technical capacity of 2000 kg/h. Given that technical capacity is not achieved, it was performed reconstruction of grinding line and air transport straw [1, 2]. Fig. 1 shows technological scheme of the reconstructed line.

Each project of the production process — the system, has its own peculiarities. Depending on the type of installations and facilities, projects in some of its parts may have some similarities. This applies to general and technical requirements, which must be an integral part of every major technological and mechanical design [1].

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In the framework of this paper is given some basic elements of the project such as: description of technological process, the scheme of technological process, support safety at work, pictures of machines and equipment and so on.

## 2. Description of Technological Process

Straw bales throw into box for straw. Belt conveyor put the straw in the hammer for rough grinding. Transport of straw to hammer for fine grinding is performed by pneumatic pipeline. The ground straw is further transported by means of pipelines, the cyclone 1 and 2, wherein the separation is carried out, i.e., extracted the straw from the air. From cyclone 1 and 2, by air stunts — rotary extractor, milled straw goes into the spiral conveyor 1 and 2, and then in the mixer and further it is transported to the briquetting machines, i.e., pellet press 1 and 2 [2]. Aspiration system is performed by using a bag filter for dust and fan 2. Pneumatic conveying line is suctorial type and transport is performed using two centrifugal fans 1 and 2. Briquettes are further transported by chain conveyor and elevator, to refrigerator and vibro sieve. After that briquetted mass is transported to a warehouse and in the boiler room for combustion [3]. Fig. 1 shows technological scheme of the process.

As part of this study, it is given a conceptual technology solution of system — plants for the production of briquettes from biomass. Biomass that is specifically used in this case is a plant residue wheat “straw”.

The project has two hammers, one for the coarse grinding of the straw and the other for the finer grinding and two pellet machines for producing the final product, the pellets of biomass [4]. The solution includes: Description of technological process, scheme of technological process, calculation of pneumatic transport of grinded straw, specification of mechanical and technological equipment.

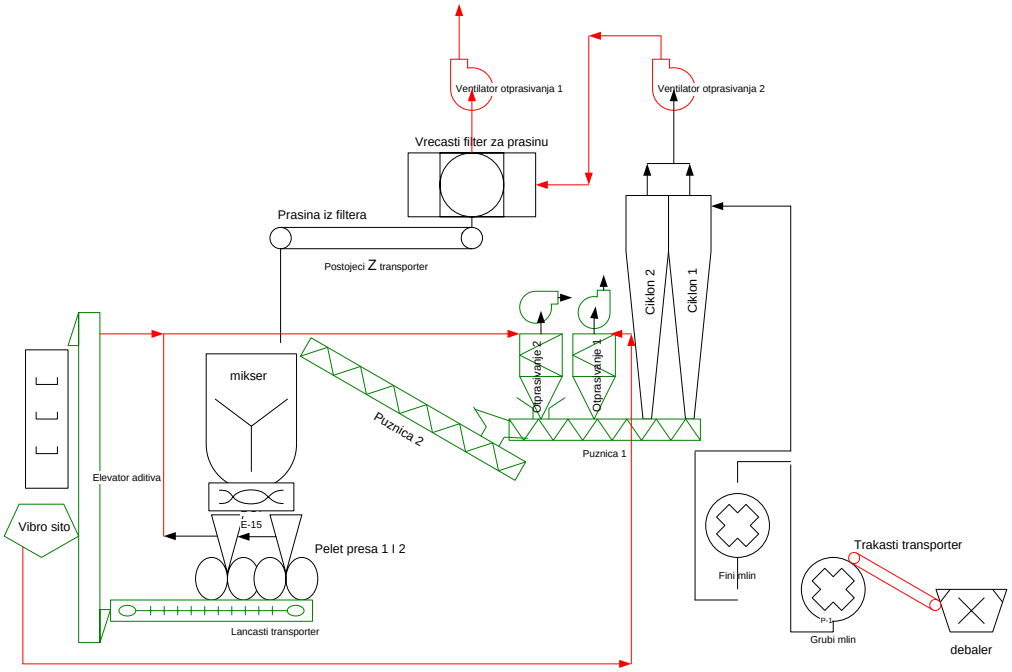


**Fig. 1 Technological Scheme of Production of Briquettes from Straw**

**Fig. 2 Hammer for Rough Grinding of Straw and Transport**

The total installed power is 423 kW. For operation of the production plant in two shifts which is 16 hours, if the coefficient of coincidence of work is 0.95, the power consumption is 423·16·0.95 = 6430 kWh. On that basis, the specific energy consumption for the production of pellets is 105.75 kWh/t, i.e., 0.105 kWh/kg of pellets [4].

**Fig. 3 Hammer for Fine Grinding of Straw and Transport**

**Fig. 4 Machines for Peletting of Grinded Straw**

## 3. Measures of Protection at Work

Work organization at protection in facility, first of all, should provide preventive care.

## 4. Previous Measures of Protection

All rotating parts (clips, pulleys, etc.) are protected with protective sheet metal. For the purpose of removal

of static electricity, machines and devices connect to each other and earthed.

All flange connections — flange of elevators, pipeline, etc. bridge with the copper tape.

All machinery and equipment must be enclosed and therefore is strictly prohibited opening the cover and other protective elements during work. In the event of an audit or similar action on the machines, it must be ensured that the worker will look after to avoid a sudden release of machines in operation [5, 6].

Machinery and equipment should be maintained as per the instruction of supplier of equipment. In case of necessity of welding and like this, it will be done only when the machines and devices out of operation with the previously performed preparation.

Employed staff at this facility must fully understand basic rules of safety, preventive measures to prevent fires, as well as handling of fire extinguishers [7].

Every employee must know the functions of certain machinery and equipment, and in a prominent place must be emphasized ban of using of faulty devices as warn of danger during the operation. Prior to the commissioning in operation of individual lines or machines, staff must warn by sound signal.

## 5. Conclusion

Plant for crushing — grinding and air transport of straw, capacity 4000 kg/h, built in company "Victoria Group" in Zrenjanin, allows the preparation of chopped straw for briquetting. Briquetting is performed on two machines for pelleting. After that, the pelleted mass is stored in a separate silo cell. The pellets are used for combustion in boilers for steam production. Lower calorific value of the briquettes is 16 to 18 MJ/kg.

Factory "Victoria Starch", in the process of wet processing in the most modern way, will produce syrup and starch from corn. Part of the capacity will be used for the storage of crop residues for the needs of the company "Victoria Group" in which structure "Victoria Starch" operates, and straw will be used for energy production. This method of operation is a good example to close the entire cycle of procurement of materials, processing of raw materials, production, and that it all performed in one facility to cut costs and particular to reduce the consumption of energy to be 2-3 times cheaper [8].

Company "Victoria Logistic" buys raw materials for all manufacturing capacities. Annually, it buys about 70000 tons of straw from barley, wheat and soya which are necessary to produce cheap energy in all manufacturer capacities. To produce steam in a future plant for processing of corn daily consumption based on 300 tons of crop residues.

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