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The Way of the Waste Sulphitation Gas Use

Environmental security issues have always been urgent at sugar factories of Ukraine, and they have significantly increased today. Evidence of this fact is a number of the environmental statutes and regulations that create such conditions under which the environmental pollution is economically unprofitable. Thus, economic activity of the sugar plants should be aimed at the reduction of the payments which will enable to reduce the prime cost of sugar, and it is possible to do with the introduction of advanced technologies both in primary production and purification.

The analysis of the work of the sulphitation station showed the possibility of reducing the emissions of sulphur dioxide and heat that are present in the vapour-gas mixture in the atmospheric air from the ink-jet sulphitation apparatuses.

The work of the ink-jet sulphitation apparatuses is accompanied by the constant emission of the vapour-gas mixture ($138,4 \text{ m}^3/\text{h}$). It contains sulphur dioxide (0.16%) and evaporated moisture (48 kg/h) and can be emitted in the air [1]. In addition, the heat of the vapour-gas mixture (the temperature of the process of hot sulphitation is $70\text{-}85^\circ \text{C}$ [2]) and sulphur dioxide (MPC in the ambient air: a maximum single dose is $0.5 \text{ mg}/\text{m}^3$, an average daily dose is $0,05 \text{ mg}/\text{m}^3$) contained in this mixture are emitted in the environment.

The reuse of the steam-gas mixture is offered in order to reduce the impact of sulphur anhydride, which is in the vapour-gas mixture, on the environment and the use of heat of low potential as a secondary energy resource offers. It can be done by directing it to the pre-processing of sugar-beet chips that are delivered to the diffuser. There is a well-known way of the reuse of the steam-gas mixture with sulphitation apparatuses by directing it to the heating of the water pulp press station [1]. When using this method it is possible to heat water up to $50\text{-}60^\circ \text{C}$. There is also a well-known way of the pre-processing of the beet chips by sulphur anhydride, which comes directly from the sulphur burning furnaces [3]. The use of this method of treatment has shown positive results in the process of sugar extraction from the chips, but it is accompanied by an extra sulphur burning furnace that leads to the increase of costs for sulphur while conducting the process (the rate of the sulphur consumption in the process of sulphitation 0,01-0,015% to the weight of the sugar beet is about 25-40 kg per 100 tons of sugar beet [2]), as well as the emissions of sulphur dioxide in the atmosphere. Unlike the described methods above in the proposed version there are:

- repeated use of the heat of the vapour-gas mixture to heat the beet chips;

- pre-treatment of the chip with sulphur anhydride, which is present in the vapour-gas mixture.

Beet chips that are in the diffusion apparatus have a low temperature (about 10°C [2]), which is not optimal from the point of view of sugar extraction in the extract the sulphitation liquid and processed compressive water. Therefore, to enhance the sugar extraction the preliminary scalding of the chips is conducted by the hot diffusion juice, or saturated steam. In this variant it is offered to replace saturated steam by the steam-gas mixture. As a result the vapour-gas mixture radiates is heat of vaporization by heating up the chips condensing on the cold chips and they get together in the main extraction step in the diffusion apparatus. During the treatment of the chips with the steam-gas mixture after sulphitation apparatus on its surface the process of acid formation undergoes that will lead to the intensive denaturation of its cells. With processed in such a way chips the process of sugar extraction improves due to the increase of its elasticity.

After the processing of the chips waste steam-gas mixture from the sulphitation apparatuses and as a result of the contact heat exchange the temperature of the mixture is almost equal to the temperature of the chip, and SO₂ concentrations significantly reduces, it decreases the air pollution by sulphur gas.

Conclusion

Thus, the cold beet chips processing with sulphitation gas enables to heat chips, denaturate some of its cells and simultaneously increase the elasticity of the chips when pH decreases.

In addition it, using the heat of low-potential sulphitation gas and reduced air pollution with sulphur dioxide which is located in the gas-vapour mixture reduces as well as the conditions for the sugar extraction, improves resulting in the reduction of its losses from pulp.

LITERATURE

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