IMPROVEMENT OF SOLVENT RECOVERY TECHNOLOGY IN OIL EXTRACTION PRODUCTION

[1]Suvanova F.U., Qobilova.N.X., [2]Tuxtamishova G.Q.
[1]Karshi Engineering and Economic Institute, [2]Gulistan State University
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Abstract. *This article discusses the causes of irretrievable losses in the oil extraction industry and the conditions for the proper organization of the technological process. In particular, a solvent regeneration technology has been developed, according to which the condensate formed in the reflux condenser is used to purify the steam-gasoline mixture coming from the evaporator to the meal traps, and which are stable water-gasoline emulsions with meal particles . Thus, the system reduces the consumption of hot water, solvent, the duration of the solvent regeneration process, due to this, the cost of the finished product is reduced.*

Keywords: *extraction, organic solvent, gasoline, regeneration, condenser, distillation, air-steam mixture, dephlegmator, meal trap.*

Introduction

At oil and fat enterprises of our republic, vegetable oils are obtained by pressing-extraction of various raw materials: cotton seeds, sunflower seeds, soybeans, safflower. The extraction solvent evaporated from the miscella and meal is reused after condensation to extract the oil.

The efficiency of solvent use depends on its complete regeneration. However, in practice this cannot be achieved, some of it is lost irretrievably. These losses depend on the type of raw materials being processed, the purity of the solvent, the technology for extracting the oil by extraction, the equipment used in the extraction process and the recovery of the solvent. Irreversible loss of the solvent is up to 1.0% by weight of the extracted material [1, p.319].

The solvent vapors formed in the distillers are sent for condensation. Part of the vapors that have not turned into a liquid state in the condensers evaporates in various containers and reservoirs, auxiliary apparatus, forming air-vapour mixtures. Usually such mixtures consist of a large amount of air and a small amount of solvent.

Cooling condensers are used in extraction shops to condense solvent vapors in mixtures. Subsequently, the condensate is separated into its constituent components - gasoline and water by settling in special devices - water separators. In addition, during the production process, part of the solvent is mixed with water, fats, proteins, phosphatides, carbohydrates, and other substances contained in the processed raw materials, forming stable emulsions (sludges). The isolation of the solvent from them is a rather laborious and difficult process.

As a result of the correct organization of the technological process in the production of vegetable oil by the extraction method, it is possible to reduce the solvent consumption, which not only affects the cost of the finished product, but also improves the environmental, fire and explosive situation at the enterprise.

Sources of irretrievable solvent losses at oil extraction plants can be different. These are water discharged into the sewer from water separators, meal leaving various types of evaporators after steaming, air leaving dephlegmators, gasoline vapors penetrating into the room ¬through leaks in the apparatus and communications of the extraction shop, and then emitted by the exhaust

system into the air and etc. Solvent losses ¬with the meal are especially high in case of violation of the equipment operation mode [2, p.228].

To trap gasoline vapors from the air-vapor mixture, a surface cooling dephlegmator is used, which is a vertical shell-and-tube heat exchanger. The air-steam mixture is fed from above into the annular space . The resulting condensate, consisting of solvent, water, solid particles and emulsions, is discharged to the water separator, air to the atmosphere.

The separation of the condensed solvent and water vapors is carried out by settling and is based on the difference in their densities. To do this, the mixture enters the preliminary water separator , which is filled with fresh water before start-up, then the final water separator. To maintain a constant water level, circulating water is supplied to them. The level of the water-gasoline mixture is controlled using a gauge glass [3, C .153, 4, C .420] .

From the water separator , the upper layer - the solvent is sent to the solvent tank. The emulsion layer is discharged to the sludge evaporator, and the lower layer is formed by water with an admixture of the solvent. Sludge settles at the very bottom.

The formation of emulsions, sludge , as well as mixtures of water with a solvent leads to irretrievable losses of the solvent, which increases the cost of the finished product and worsens working conditions. Losses of gasoline with sludge water in water separators are due to some solubility of gasoline in water. It is known that the solubility of gasoline in water is low, but it increases with increasing temperature, which also contributes to an increase in solvent losses. The water leaving the water separator contains up to 0.3% of dissolved and emulsified gasoline.

Offer and results

During the processing of the meal in order to distill the solvent, along with the vapors of gasoline and water, a large number of particles of the meal are carried away , which are deposited on the cooling surface of the condensers, reducing the heat transfer coefficient. This leads to a deterioration in the operation of capacitors, the formation of stable emulsions of water and gasoline.

For thorough cleaning of water and gasoline vapors from meal particles, wet meal traps or scrubbers are installed between the meal evaporator and condensers (Fig. 1). In them, washing of the gas-vapor mixture is carried out by spraying hot water at a temperature of 85 -9 0 0 C or a hot solvent. The purified juice vapors are sent for condensation. As a result of the improvement of the technological line, these vapors are sent to the distillers of the I and II stages. Wet screening with hot water is part of the sludge and emulsion water treatment system.

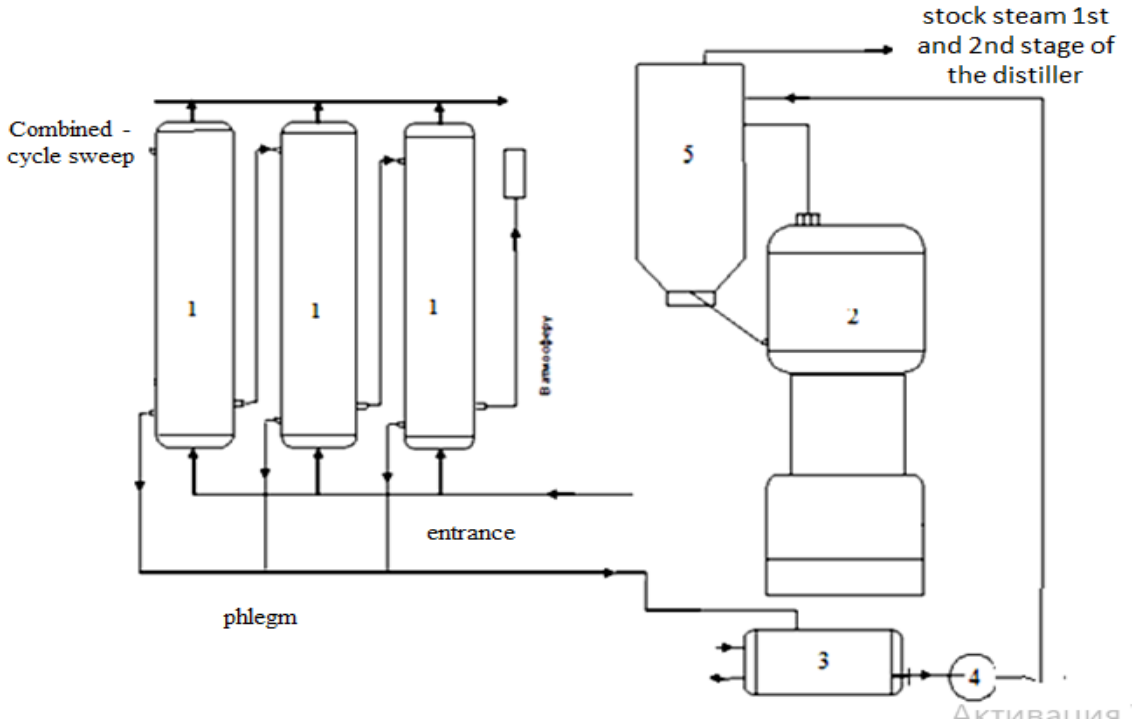
In order to minimize situations that lead to solvent losses, it is advisable to use the condensate formed in the reflux condenser (phlegm) in wet screen traps. This will require one pump and a tank with a volume of V = 3 m 3 , heated by deaf steam, for the continuous supply of the apparatus with hot condensate.

After the recuperation process in reflux plants, the released condensate containing the solvent and emulsions is collected in a container, heated with deaf steam to 85 -9 0 ° C in a heater and sent to a wet sieve trap to clean gasoline and water vapors coming out of the tank evaporator from particles of meal . The washed off sludge is collected in the lower part of the apparatus and sent to the first tank of the meal evaporator.

Thus, an increase in the efficiency of solvent recovery is a chieved.

Fig. 1.

Technological scheme of using reflux to clean the vapor-gas mixture formed in the meal evaporator:



1- dephlegmator; 2 – toaster (meal evaporator); 3-heat exchanger; 4-pump; 5-s to rubber (wet trap).

Conclusion

According to existing technology the condensate formed in the dephlegmator and consisting of water, solvent, emulsion and sludge passes through the preliminary and control water separators, where it is separated into several fractions by settling. In order to maintain a constant water level, wash water is supplied to them.

As aresult of the use of condensate coming out of the dephlegmator. wet screen traps reduced water consumption, solvent losses decreased by 4...5 %, the degree of solvent purification was 97%.

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