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The Precise Definition of the Payload Tube Furnaces for Units of Primary Oil Refining

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The article considers the primary oil refining unit AVDU A12/2 in the mode without vacuum unit. The lack of information about process stream parameters for heat exchangers network complicates the Process Integration of the observed flowsheet. Targeting the minimization of energy consumption and the cost of the operation and investment, the step-by step analysis and optimal design based on the Pinch Analysis methodology is provided.
The present paper carried out the extraction of data on process flows and equipment, tabulated streaming data. The process data collection was carried out using portable and stationary thermometers and flow meters. To improve the information about the composition of the circulating flows and for calculating of heat balance and material balance of AVDU A12/2 in the mode without vacuum unit used the program Unisim Design. Modelling was done in this case is for the process of refining oil, after the desalting and dehydration of crude oil in electric dehydrators and heat exchangers in the network. Obtained data allowed obtain stream data properties for further thermal and energy integration of process primary oil refining.
Using the rules and methods of pinch analysis the targeted minimal temperature difference ΔT_{min}, was determined. Total power of hot utilities in the network is 19.4 MW and only 43 kW is transferred through the pinch. The power of cold utilities was reduced to a value of about 1.6 MW and that allows eliminating the majority of refrigerators. In the resulting heat transfer network uses 22 recuperative heat exchange communication. Assessment of the overall surface area of heat transfer – 31.052 m^2, but in the existing scheme already installed 12.658 m^2 of shell and tube heat exchangers, so the will be need only 18.394 m^2 surface. Using data was built the model reconstruction project AVDU A12/2. This will test the proposed project and confirm the appropriateness of its design and implementation in production.
Comparison of the energy performance of existing and proposed in the project of reconstruction of heat exchange network installation showed that the project will reduce the energy consumption of hot utilities by 56%, and the cold – by 95%. The proposed integration will reduce energy consumption by more than 2-fold compared with the level of consumption in the present.
Building a grid diagram of the reconstruction project has allowed making its simulation program Unisim Design, which confirmed the integrity of the project and the feasibility of its implementation. Accounting heat loss heat exchange equipment and pipes of 4 MW in the construction of Grand Composite Curve of the process provides more accurate values furnace payload and off-gas, and allows understanding the utilities interaction with the process.

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