

عنوان مقاله:

Environmental sustainability enhancement of a petroleum refinery through heat exchanger network retrofitting and renewable energy

محل انتشار:

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نویسندگان:

Behrouz Raei - *Department of Chemical Engineering, Mahshahr Branch, Islamic Azad University, Mahshahr, Iran*

Ali Ghannadzadeh - *Department of Chemical Engineering, Hamedan University of Technology, Hamedan, Iran*

خلاصه مقاله:

This paper presents a case study on the enhancement of environmental sustainability in a petroleum refining process based on an exergetic diagnostic approach. The Life Cycle Assessment (LCA) pinpointed crude oil production and electricity generating systems as the main sources of environmental unsustainability. The existing hot utility demand of the process is 78.4 MW with a temperature difference of 40°C, where the area efficiency of the existing design is 0.7254. The targeting stage sets the minimum approach temperature at 18.96 °C, thereby establishing the scope for potential energy savings. The suggested design option with a total energy demand of 109,048 kW, the same as the existing one but 72,699 kW higher than the target, needs a 17,873 m² area in 38 exchangers. Notably, this requires 2,914 m² less surface area, suggesting the practicality of the project with a limited number of modifications such as the repiping of the existing exchanger units. Moreover, to enhance further the sustainability of the petroleum refining process, the possible solutions such as the renewables were evaluated through various scenarios; thus, resulting in a reduction in the environmental impacts from 2.34E-06 to 2.27E-06 according to ReCiPe, and thus paving the way towards a sustainable petroleum refining process.

کلمات کلیدی:

Environmental sustainability, Energy integration, LCA, Exergy, Petroleum refinery

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