A new methodology for considering energy saving in area layout design stage

B. Li\textsuperscript{1}, Y. Wang\textsuperscript{*2}, X. Feng\textsuperscript{3}, G. Jiang\textsuperscript{4}

\textsuperscript{1}China University of Petroleum, Beijing, China
\textsuperscript{2}China University of Petroleum, China
\textsuperscript{3}Xi’an Jiaotong University, China
\textsuperscript{4}China University of Petroleum-Beijing, China

Abstract

With the scale of refineries becoming larger and larger, industrial area layout design plays an important role in capital cost and energy consumption. To maximize the economic benefits of a refinery, a lot of factors should be considered, such as safety, transportation, piping etc. However, in the conventional rules of thumb, energy saving is not considered at this stage, resulting in the bottleneck of energy recovery. Up to now, most of published work on inter-plant heat integration concentrate on indirect heat integration through steam system. Limited by the distance, inter-plant heat integration carries out usually by the intermediate medium rather than the direct heat exchange of process streams, but the twice heat transfer nature for indirect heat integration limits energy saving potential. In this paper, a new approach is proposed to consider heat recovery at industrial area layout design stage. First, plants are matched through an optimal matching algorithm. The plants are integrated by direct heat integration to increase heat recovery potential and the optimal match between plants is determined. Then the number of connections between plants is calculated through Pinch Approach and the layout of each plant is optimized by a random algorithm to come up with the optimal layout with the shortest length of pipelines. Finally an optimal layout design is obtained considering both heat recovery and pipeline capital cost. A case study illustrates the significant energy-saving and pipeline shorten effect of this approach.