

The Use of Process Integration and Plate Heat Exchangers for Energy Saving in Buildings

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In many countries buildings account for about 40% of the total energy demand and 36% of the total greenhouse gas emissions, and are hence considered both consumers and producers of energy. Buildings can be categorised as industrial, residential, or commercial/public, with a further category for building complexes. One of the main people needs it is the comfort conditions and proper services in leaving premises, offices, workshops etc., which are mostly situated in buildings of various types.

Basically to maintain favourable conditions for process of people leaving the heat utilities should be used, hot when it is requires to heat cold air stream in the room to comfort conditions, and cold utilities, when temperatures become too high. The task is very similar to that in process industry, and there are different cold and hot streams inside the building and in its neighbourhood, close and distant. To minimize the consumption and cost of utilities we should choose their proper nature and energy levels and to maximize energy recuperation between all streams. It is exactly the task where pinch technology and process integration can help, counting for the good records in process industries. Off course like at e.g. refinery, first we must ensure the minimal economically viable losses to ambient surroundings, choosing optimal thermal insulation and best process equipment design. After that all methodology of process integration can be employed.

The prospects of application of the process integration methodology for energy systems of buildings and buildings complexes are discussed. A description of the Total Site Analysis (TSA) method is provided, with specific reference to its application to District Energy (DE) systems and integration procedures. Recently studied practical examples of the implementation of this type of system are also presented and analysed. The experience of pinch analysis and process integration application for District Heating system in Ukraine was reported by Smith et al. (2000). Coupled with the use for better heat recuperation of enhanced heat transfer equipment it presents big potential for improvement of energy efficiency in buildings, especially when renovating District Heating networks in Eastern European countries. The examples of practical implementation of these technologies in District Heating systems of Ukraine are presented.

References

Smith R., Klemeš J., Tovazhnyansky L.L., Kapustenko P.A., Uliev L.M. (2000), Foundations of Heat Processes Integration (Osnovy Intergatsii Teplovykh Processov) , (in Russian), NTU KhPI, Kharkiv, pp. 456.

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