Analysis of technologies and potentials for heat pump-based process heat supply above 150°C - DTU Orbit (25/07/2019)

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The transition of the manufacturing industry towards carbon neutrality requires a reduction of the emissions from combustion for the supply of process heat. Heat pumps are an efficient alternative technology for supplying heat while improving the overall efficiency and shifting to potentially carbon neutral electricity. The state-of-the-art technology is limited to supply temperatures between 100 °C and 150 °C because of lower efficiency and component limitations. This paper has therefore analyzed two promising concepts for higher supply temperatures and found technically and economically feasible solutions for process heat supply of up to 280 °C. These solutions are using large-scale equipment from oil and gas industries for applications in energy-intensive industries. The suggested systems benefitted from the economy of scale and access to low electricity prices. The concepts outperformed a biogas-based solution, and they were competitive with biomass or natural gas systems with respect to economic performance. It was concluded that an electricity-based heat supply is possible for a wide range of industrial applications and accordingly represents an important contribution to fulfilling the objectives of lower climate impact of energy supply in industry.

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