Institute for
Sustainable
Process Technology

Final Public Report

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Project Number ISPT(-TKI)	DR-20-14
Project Title + Acronym	PRocess INtegrated HEat pump Drying (PINcHED)
Coordinator	ISPT
Name Cluster Director	Peter de Jong, cluster Drying & Dewatering
Name project leader	Anton Wemmers (TNO)
PDEng's	Sanduni Pathiraja (TU/e)
Funding	TKI Toeslag 2018
Project start	1 April 2019
Project original end date	1 April 2021
Project final end date	1 April 2021

Partners

Final Public Report

Public summary

Drying processes account for approximately 15% of the Dutch industrial primary energy use and associated CO_2 emissions. Up to 70% of the energy needed in drying processes is emitted into the environment as latent heat in the exhaust air. The reason for these emissions is that the temperature of the latent heat is too low for re-use in the process. Heat pumps are identified as a promising technology to recover the latent heat in drying air and upgrade it to process heat with the aid of electricity. The use of electricity eliminates the scope 1 emissions and, since the amount of electricity is typically 1/3 to 1/5 is of the produced process heat, significantly reduces the energy need.

In order to fully utilize the potential of heat pumps, the correct integration with the drying process is necessary. The PINcHED project investigates the heat pump process integration for two typical drying processes: Convective drying (Huhtamaki use case) and Contact drying (Cosun/Rixona and AVEBE use cases). The project approach is to take an existing drying process, replace the utilities by a heat pump and determine the technical and economic feasibility (Brown Field situation). Subsequently, the properties of the heat pump are taken as the starting point and the necessary modifications of the process to arrive at the best feasible heat pump integration are determined (Green Field situation).

The Brown Field heat pump integration is not economically feasible for both contact drying and convective drying as a result of the large temperature difference of approximately 150K between the source heat and the process heat.

Airless drying in combination with improved heat transfer is identified as a way to reduce the temperature lift. The Green Field situation for contact drying is possible for the heat pump but very challenging for the drying process. Issues with product quality, technical and economic feasibility remain to be solved. The Green Field situation for convective drying is possible for the heat pump with technical and production capacity issues to resolve.

Communication and Dissemination

a. Activities

The project was kicked-off with all project consortium partners on 9th May 2019.

The report of the results of research executed by PDEng Sanduni Pathiraja (chemical engineer TU/e) at Cosun's potato factory Rixona and at the AVEBE factory in both Greenfield and Brownfield situation are available on the shared project intranet environment of the PINcHED project for all project partners.

All reports of TNO on the cases of AVEBE, Cosun/Rixona and Huhtamaki are available on the shared project intranet environment of the PINcHED project for all project partners.

b. Public references

A project page regarding the project and her partners is available on the ISPT website https://ispt.eu/projects/pinched/.

A project poster was presented with the project characteristics, scope, objective, motivation, results and next steps during ISPT Symposium 2019 and 2020. The poster is also available on the project page.

On the 4th of July 2019 a news item regarding the kick-off of the PINcHED project was published in the ISPT newsletter, and the content was also presented on the ISPT website with the title ‘Accelerating the implementation of high temperature heat pumps in industry’. See link https://ispt.eu/news/accelerating-the-implementation-of-high-temperature-heat-pumps-in-the-industry/.

A news item on the final results of the PINcHED project will be published in the ISPT newsletter, on the ISPT website. This action is due in June 2021.

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