

ELSE-related USN publications

Scientific articles, posters and presentations by USN

- Tokheim, L.A., Mathisen, A., Øi, L.E., Jayarathna, C., Eldrup, N.H., Gautestad, T.: "Combined calcination and CO₂ capture in cement clinker production by use of electrical energy", SINTEF Proceedings, 4, pp 101-109, 2019
 - [Paper](#)
 - [Poster](#)
- Samani, N.A., Jayarathna, C.J. and Tokheim, L.A.: "CPFD simulation of enhanced cement raw meal fluidization through mixing with coarse, inert particles", Linköping Electronic Conference Proceedings (Proceedings of the 61st SIMS, September 22nd - 24th, virtual conference), pp. 399-406, 2020
 - [Paper](#)
 - [Presentation](#)
- Samani, N.A., Jayarathna, C.J. and Tokheim, L.A.: "Fluidized bed calcination of cement raw meal: Laboratory experiments and CPFD simulations", Linköping Electronic Conference Proceedings (Proceedings of the 61st SIMS, September 22nd - 24th, virtual conference), pp. 407-413, 2020
 - [Paper](#)
 - [Presentation](#)
- Tokheim, L.A.: "Dynamic Modelling and Simulation of Raw Meal Calcination for Isothermal Boundary Conditions", Linköping Electronic Conference Proceedings (Proceedings of the 62nd SIMS, September 21st – 23rd, virtual conference), 2021
 - [Paper](#)
 - [Presentation](#)
- Jacob, R.M. and Tokheim, L.A.: "Electrification of an entrainment calciner in a cement kiln system – heat transfer modelling and simulations", Linköping Electronic Conference Proceedings (Proceedings of the 62nd SIMS, September 21st – 23rd, virtual conference), 2021
 - [Paper](#)
 - [Presentation](#)
- Usterud, M.H, Jacob, R.M. and Tokheim, L.A.: "Modeling and Simulation of an Electrified Drop-Tube Calciner", Linköping Electronic Conference Proceedings (Proceedings of the 62nd SIMS, September 21st – 23rd, virtual conference), 2021
 - [Paper](#)
 - [Presentation](#)
- Jacob, R.M., Moldestad, B.M.E. and Tokheim, L.A.: "Fluidization of fine calciner raw meal particles by mixing with coarser inert particles – Experiments and CPFD simulations", Linköping Electronic Conference Proceedings (Proceedings of the 62nd SIMS, September 21st – 23rd, virtual conference), 2021
 - [Paper](#)
 - [Presentation](#)

MSc theses by USN students

- Jacob, R.M.: “Gas-to-gas heat exchanger for heat utilization in hot CO₂ from an electrically heated calcination process”, [MSc thesis](#), USN, 2019
- Samani, N.A.: “Calcination in an electrically heated bubbling fluidized bed applied in calcium looping”, [MSc thesis](#), USN, 2020
- Usterud, M.H.: “Calcination in an electrified drop-tube calciner” , [MSc thesis](#), USN, 2021
- Khadka, D.: “Calcination applying H₂ combustion in O₂ in a CO₂ rich atmosphere”, [MSc thesis](#), USN, 2021

MSc project reports by USN students

- Edirisinghe, V., Høibjerg, F., Ytterbø, A.A. and Aavik, N.J., “Fluidization of cement raw meal using coarse particles”, [MSc group project report](#), USN, 2021

Newspaper or magazine articles about ELSE/USN

- 2018-05-15: Porsgrunns Dagblad – [Newspaper article](#): A greener Norcem
- 2018-12-18 Teknisk Ukeblad – [Magazine article](#): Cement production may obtain 70 % CO₂ reduction

Facts about ELSE

The project name is “Combined electrified calcination and CO₂ capture in the cement industry”. ELSE is used as a short name for the project (abbreviation of "ELEktrifisering av SEmentproduksjonen", which is Norwegian).

The project is funded by Climit-Demo and Norcem. Phase 2 started in August 2020 and has a duration of 3.5 years.

The objectives of the project are to:

1. specify in detail a technically feasible concept for combined calcination and CO₂ capture in existing cement kiln systems
2. verify key input data through laboratory experiments
3. make an outline of a pilot plant

USN, IFE, SINTEF Industry, Kanthal and Norcem are the five partners in the project.

USN's main personnel working on the ELSE project are:

- [Professor Lars-André Tokheim](#) (USN's project manager)
- [PhD student Ron M. Jacob](#)