The 8th European Congress on Computational Methods in Applied Sciences and Engineering
ECCOMAS Congress 2022
5-9 June 2022, Oslo, Norway

# HEAT AND MASS TRANSFER BETWEEN XDEM & OPENFOAM USING PRECICE COUPLING LIBRARY

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**Keywords**: *Multiphysics, Coupled Simulations, Discrete Element Methods, Heat & Mass Transfer, Particle laden flow*

This work demonstrates the rapid development of a simulation environment to achieve Heat and Mass Transfer (HMT) between Discrete Element Methods (DEM) and Computational Fluid Dynamics (CFD). The HMT coupling can be employed to simulate processes such as drying, pyrolysis, combustion, melting, solid-fluid reactions etc and have industrial applications such as biomass furnaces, boilers, heat exchangers, and flow through packed beds. This shows that diverse CFD features and solvers need to be coupled with DEM in order to achieve various applications mentioned above.

The proposed DEM-CFD Eulerian-Lagrangian coupling for heat and mass transfer is achieved by employing the preCICE coupling library[1] on volumetric meshes. In our prototype, we use the eXtended Discrete Element Method (XDEM)[2] for handling DEM calculations and OpenFOAM for the CFD. The XDEM solver receives various CFD data fields such as fluid properties, and flow conditions exchanged through preCICE, which are used to set boundary conditions for particles. Various heat transfer and mass transfer laws have been implemented in XDEM to steer HMT source term computations. The heat and mass source terms computed by XDEM are transferred to CFD solver and added as source. These source terms represent particles in CFD.

The generic coupling interface of preCICE, XDEM and its adapter allows to tackle a diverse range of applications. We demonstrate the heat, mass & momentum coupling capabilities through various test cases and then compared with our legacy XDEM-OpenFOAM coupling and experimental results.

## REFERENCES

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