PAUL WURTH
SMS group

We are looking for you!

DEM: Material decalibration

Internship / Master thesis (6 months)

A blast furnace is a continuously operating shaft furnace based on counter flow principle. On top, coke and burden (sinter, pellets, lump ore...) are charged in different layers. The grain size distribution of those layers has a large influence on the permeability of the charge and hence on the gas flow distribution. It is therefore a major parameter for the Blast furnace process. This grain size distribution as well as the behaviour of the charging stream (falling curve, mass flow...) can be simulated using a method called **Discrete Element Method** (DEM).

Since more than 8 years, Paul Wurth is successfully performing particle simulation using a commercial DEM software (EDEM). Those DEM simulations are currently done in order to solve problems such as

- evaluation of falling curves;
- treatment of segregation issues;
- determination of a hopper emptying time
- determination of a mass flow...

However, those simulations still face two recurrent problems:

- the calculation time is very long (ranging between 2 hours and more than 1 week)
- the amount of data stored is very large (for every timestep, almost all the data for each particle, such as positon, velocity etc. have to be stored).

When Paul Wurth started to perform DEM simulations, the most currently used materials have been calibrated. The target of this first calibration was to define the material parameters (grain size distribution, friction factors, shape of particle...) in order to reproduce standard tests. This adaptation of parameters has not been optimised to reduce calculation time but the focus was set on realistic results. Nowadays, optimisation software have been developed which can deal with numerous parameters and make the calibration process more efficient.

Your challenge:

Redo the calibration of the particles using the optimization tool (Optislang) in order to reduce calculation time and if possible the amount of data without losing the accuracy of the results.

What are the different steps of your internship program?

1. Introduction to the Discrete Element Method
2. Introduction to the optimisation software (Optislang)
3. Define the material parameters that have to be varied
4. Find a parameter set that will allow to have the same results but with less calculation timep calculation

What do we expect?

- Master studies in mechanical engineering
- Fluent in English, and either French or German, Luxembourgish is considered as an asset
- Basic knowledge in a 3D solid modelling software
- High degree of initiative and responsibility and willingness to fully invest yourself in the assigned projects

If you are you a teamplayer with good communication and critical thinking skills, if you can perform passionately while working independently, this could be the place for you!

Paul Wurth group is an international engineering company driven by innovation. Our experience is based on a tradition of 150 years and the professional know-how of 1600 employees, located in around 20 countries worldwide. As global leader in ironmaking technologies, we constantly face new challenges that force us to manage an on-going cycle of innovation. We thus take an active role in shaping the industry of tomorrow.

Join us in conquering new challenges and be part of our Paul Wurth team!

Please apply online:
https://careers.paulwurth.com