

# Master-Thesis

## **Numerical Investigation of clean-in-place procedures in closed processing systems**

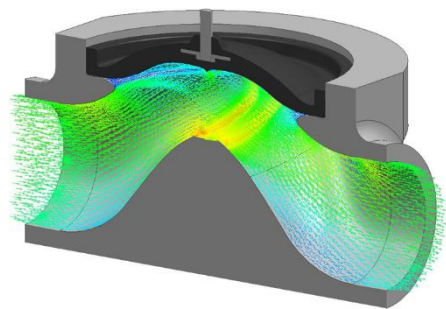
The University of Luxemburg within its multi-disciplinary and –cultural environment offers a grant for a Master-thesis in numerical simulation. The objective of this study is to investigate clean-in-place procedures in closed processing systems. The work is carried out in close cooperation with the industrial partner SISTO Armaturen S.A. ([www.sisto-aseptic.com](http://www.sisto-aseptic.com)).

The Grand Duchy of Luxembourg, in the heart of Europe, a multilingual country, and headquarters of many European institutions and businesses, offers a particularly interesting setting. The University of Luxemburg offers students the opportunity to pursue doctoral studies under the supervision of academic staff or in cooperation with other host institutions.

Outline of the thesis:

Effective cleaning of a closed processing system is particularly important in the pharmaceutical industry, where production lines are cleaned frequently to ensure the purity of drugs. The clean-in-place (CIP) process is to be examined with special attention to the hydrodynamic effects and the process parameters.

The simulation framework of the Extended Discrete Element Method (XDEM, [www.xdem.de](http://www.xdem.de)) is applied that complements favorably experimental data. The simulation platform allows hydrodynamic coupling between particles and a fluid-phase. Thus the trajectories of particles of different materials, sizes and shapes can be used to study the removal of biofilms in the piping system. A thorough analysis of predicted results reveals the underlying physics, and thus allows applying modifications for an improved cleaning process.



Profile of the successful candidate:

- MSc student in applied science or similar with focus on fluid dynamics
- Familiar with simulation environments
- Fluent in English and/or German
- Highly independent, motivated and with persistence in tackling and completing difficult tasks

Start and duration:

- Start date to be agreed with the successful candidate;
- Duration: 6 months;

Interested candidates are invited to send an application including CV and motivation letter electronically to:

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