Modelling across bioreactor scales: methods, challenges and limitations

Gernaey, Krist

Publication date:
2014

Document Version
Early version, also known as pre-print

Modelling across bioreactor scales: methods, challenges and limitations

Krist V. Gernaey

Department of Chemical and Biochemical Engineering, Building 229, Technical University of Denmark (DTU), DK-2800 Kgs. Lyngby, Denmark. kvg@kt.dtu.dk

Abstract: Scale-up and scale-down of bioreactors are very important in industrial biotechnology, especially with the currently available knowledge on the occurrence of gradients in industrial-scale bioreactors. Moreover, it becomes increasingly appealing to model such industrial scale systems, considering that it is challenging and expensive to acquire experimental data of good quality that can be used for characterizing gradients occurring inside a large industrial scale bioreactor. But which model building methods are available? And how can one ensure that the parameters in such a model are properly estimated? And what are the limitations of different types of models? This paper will provide examples of models that have been published in the literature for use across bioreactor scales, including computational fluid dynamics (CFD) and population balance models. Furthermore, the importance of good modeling practice will be highlighted as well.