The demand for complex therapeutic proteins and especially monoclonal antibodies for treatment of various diseases has increased continuously in the last decades, prompting the continuous development of new processes. For the development of these cell culture processes, equipment knowledge is essential, especially since a process typically is scaled up and transferred numerous times in large pharmaceutical companies. The need for a thorough equipment understanding has been also recognized by the FDA in their PAT-publication. To gain such an understanding at full production scale, Boehringer Ingelheim has put tremendous effort in fully characterizing our multiple bioreactors at different scale across multiple sites. Computational fluid dynamics (CFD) modeling is utilized which allows the evaluation of integral parameters including energy input, mixing time, shear forces and mass transfer coefficient (kLa). The knowledge gained through this tool has been instrumental in understanding the bioreactor characteristics and establish appropriate process scale up and transfer strategies within and across sites. In addition, we have constructed a 15000L acrylic bioreactor model which provides opportunities to validate simulation results with experimental data. For example, local behavior of the reactor regarding the bubble size distributions and dead zones for mixing and gassing can be visualized in the at-scale acrylic bioreactor. One study that was conducted is to understand mixing and mass transfer behavior with respect to agitation rate and superficial gas flow rate. The interactions of these parameters in large scale, however, were in some cases found to be counterintuitive where higher gassing and agitation did not consistently result in higher kLa and better mixing. Although simple modifications and standardization of systems can lead to more similar hydrodynamic conditions, it is difficult to make modification in existing GMP facility due to rigid regulations in the biopharmaceutical sector. Therefore, it is crucial to rely on engineering principles and CFD simulations for transfer between different sites with different bioreactor systems to give additional confidence to ensure successful transfer.