

CPAC Summer Institute

July 21-23, 2015

The theme of the meeting will be the exploration of effective strategies for investigating, developing, and controlling intensified processes for the next generation of sustainable production including bioprocesses. It is clear that new processing concepts and techniques will be required to cost effectively develop the next generation of materials and insure their ability to compete in the market. The meeting will provide examples of how enhanced end to end process understanding enabled by PAT can positively impact implementation of the new intensified approaches to material transformations. It is expected that attendees will develop an understanding of how the utilization of next generation processing approaches will significantly improve the potential for true economic and environmental sustainability of their production processes.

Examples will demonstrate the role of PAT in speeding the development of next generation processes for converting principle components of biomass to valuable products. This includes continuous fermentation for higher yields with lower operating costs in the biobased conversions area and new thermal and catalytic routes for the direct conversion of biomass to fuels and chemical feedstocks. However it is becoming increasingly clear that to maintain a fully sustainable biomass conversion process will require the use of PAT to enable the use of molecule management concepts to extract maximum value from biomass processing. This technique highlights the need to understand the total composition of the feedstock and how to cost effectively convert all of it for maximum value in the marketplace. The meeting will also examine how to use PAT to improve process efficiencies in what is often the most expensive part of any raw material conversion process which is separations. This will be done by demonstrating the utility of PAT for the range of advanced liquid phase continuous separations techniques. The meeting will also explore new developments in PAT including instrumentation and advanced data analysis. It will be demonstrated how these advances facilitate the use of molecule management and how these new PAT technologies are also important for the development and optimization of processes as well as for maintaining high quality process performance during production.

In terms of handling the data generated by analyzers, the general concept of data fusion to more completely characterize a material is very powerful. It is particularly valuable when it is understood that it can provide better data faster and more accurately than many physical tests. It is valuable to have early involvement of control engineers since this data enables the use of feed forward control and the generation of predictive estimation tools.

Discussion topics will include:

- How can we achieve a better understanding of the data fusing process? For example, has the problem of fusing multivariate and uni-variate data been solved?
- Almost by definition, multiple instruments will go out of calibration at different rates and this will be a problem that must be understood and solved.

- It is important to understand what types of data can be modeled and also if we go to simpler instruments what are the requirements for making the change.

The three day schedule ends on Thursday evening with a BBQ dinner off-site event. The final afternoon will summarize the technical areas and meld the conclusions into a broader look at the future impact of Process Analytical Technology (PAT) for Process Optimization.

CPAC has an established track record in fostering academic/industrial/national laboratory interactions, which aims at bridging the gap between basic research and full-scale process/product development. CPAC's Summer Institute (SI) will provide continuing education opportunities in the areas of advances in measurement science linked to process control. The CPAC Summer Institutes are held in an informal format, with technical presentations, and time allotted for open discussion and brainstorming on topics that arise from this interaction. The informal environment has created a successful format for bringing together chemists, biologists, measurement scientists, and process engineers from industry, government, and academic institutions drawn from both CPAC and non-CPAC members. The program will be structured to include plenary talks on broad topics, such as challenges and needs. There will be talks that present advances in technologies that enable one to address these needs. These will include areas like sensors, fluidics, sampling, and control. Advances in continuous process unit operations such as reactions, separations and purification will also be presented and discussed.