

# ADVANCED MODELING AND CONTROL IN PROCESS DESIGN AND OPERATION

*Raleigh, NC*

Venue: Hazen and Sawyer, [4011 Westchase Boulevard, Suite 300; Raleigh, NC 27607](https://www.hazenandawyer.com/locations/raleigh)

*Date: June 21-22*

This course will start at 1 pm Thursday after the Nutrient Removal and Recovery WEF Conference and have four main segments over the two days:

1. Basics of Sumo or refresher for active users
2. Engineering aspects of models, influent fractions, nutrient removal, chemistry, aeration, digestion, etc.
3. New features in Sumo18 (steady-state, scenarios, controllers, new models)
4. Advanced control modeling (AvN, ABAC, cascade, etc.)

All topics will include a short introduction and slides helping to explain the key engineering issues. Most of the time will be dedicated to hands-on simulations for interactive learning.

## DAY 1

### 1 pm – 1:30 pm Introduction to modeling (Slides)

- Modelling fundamentals and key definitions
- Role and type of models
- ASM family
- Process simulation

### 1:30 pm – 2:30 pm Sumo refresher (Hands-on)

- General overview of Sumo as simulation environment
- What's new in Sumo18?
  - o High rate and sulfur models
  - o Steady-state
  - o Scenarios
  - o Controllers with new interface

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*2:30 pm. – 3 pm Coffee break*

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### 3 pm – 4 pm How to set up Sumo (Hands-on)

- How to use Sumo for steady-state and dynamic simulations
- Hands-on simulation: setting up a configuration

4 pm – 5 pm Influent fractions (Slides and hands-on)

- Wastewater constituents
- Wastewater and biomass fractions
- Role of different fractions in models
- Characterization protocols
- Fractionation example

5 pm – 6 pm Phase separation (Slides and hands-on)

- Settling – simplified and flux based
- Primary, secondary, thickening, dewatering

## DAY 2

8 am – 9 am Hands on exercise

- Build configuration provided at the training

9 am – 10:30 am Nutrient removal and recovery (Slides and hands-on simulations)

- Introduction to nitrification and denitrification
- Biological kinetics
- Factors influencing nitrification/denitrification
- Aeration
- Principle of biological phosphorus removal – new PAO/GAO model
- Factors influencing bio-P
- Chemical P removal

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*10:30 am – 11 am Coffee break*

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11 am – 12 pm Digestion and side-stream treatment (Slides and hands-on)

- Fermentation
- Anaerobic digestion and how to restart a pickled digester
- Precipitation basics
- Centrate treatment (Deammonification)

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*12 am – 1 pm Lunch*

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1 pm – 2 pm Biofilm technologies (Slides and hands-on)

- Biofilms – conceptualization
- MBBR, IFAS and Trickling filter configurations

2 pm – 3 pm Introduction to controllers (Slides and hands-on)

- Basics: Control and manipulated variables, (CV, MV), sensitivity
- Time based on-off, ratio, deadband and PID controller examples

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*3 pm – 3:30 pm Coffee break*

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3:30 pm – 5:30 pm Advanced control (Slides and hands-on)

- Cascade controller example
- Use of SumoSlang Plantwide file for complex control
- ABAC (Ammonia based aeration control) and AvN (ammonia versus nitrate) control

5:30 pm – 6 pm Questions-Answers. Wrap-up of the two days