Process modeling with SUMO© 21

April 5th, 7th, 9th, and 12th, 2021 Online training

This is an advanced modeling and design applications course for wastewater process engineers who have some prior knowledge on how to utilize process models. Here you will learn using Sumo21 the following topics. This 16-hour course aims at introducing process modeling using hands-on simulations. *There will be 5-10 mins breaks every hour.*

Prerequisite - Introduction to modeling in Sumo19

https://www.youtube.com/watch?v=V13ujVWPJ6U&t=5009s&ab_channel=DynamitaSumo

	Monday	**Wednesday**	**Friday**	**Monday**
	April 5th	**April 7th**	**April 9th**	**April 12th**
	Tanush/Imre	**Helene/Dani/Peter**	**Dani/Feri/Tanush**	**Dwight/Helene/Tanush (with Csaba/Imre)**
10:00 am - 10:30 am	Personal introduction, program overview, and introduction to good modeling practice	Chemical P - Iron and Alum	Controllers introduction, setup, and application	Greenhouse gas model - fundamentals and application
10:30 am - 11:00 am	Sumo21 - New process units and features			
11:00 am - 11:30 pm		Aeration modeling - Diffuser versus mechanical, using aeration tool, alpha modeling	Introduction to energy and cost center	Modeling aerobic facultative lagoon (predict sludge buildup and dredging)
11:30 am - 12:00 pm	Wastewater characterization - data collection, reconciliation, and fractionation		Pump and blower curve examples, sizing a blower	Biofilm modeling - fundamentals and advanced setup
12:00 am - 12:30 am				
12:30 am - 1:00 pm	Dynamic and steady state simulations using a BOD removal/Nitrification/BNR plant (Activated sludge system with and without Carbon addition)	Biological Phosphorus removal - model, application, and constraints	Complete energy and cost calculation - upgrade evaluation, self sufficiency	Sidestream - P recovery, Post aerobic digestion and deammonification
1:00 pm - 1:30 pm			Conventional versus Advanced digestion (Thermal hydrolysis and UASB), precipitation, dewatering	Digital Twin - introduction to the concept, identifying need of application and instrumentation, software-in-the loop demo
1:30 pm - 2:00 pm	Clarifier modeling			

April 5th - Session 1

10:00 – 10:30 Personal introduction, program overview, and introduction to good modeling practice

- Housekeeping
- Introduction to process modeling
- Good modeling practice fundamentals

10:30 – 11:30 Sumo21 – New process units and features

- Configurational setup
- Model option selection and tab review
- Reviewing new process units features

11:30 – 12:30 Wastewater characterization - data collection, reconciliation, and fractionation

- Introduction to wastewater fractionation
- Wastewater data collection and reconciliation
- Dynamic data and fractionation – Diurnal versus long term
- Fractionating wastewater for model input (Primary effluent, and Other recycle streams)
- Industrial wastewater fractionation
- Oxygen uptake rate test for rbCOD and OHO estimation

12:30 – 1:30 Dynamic and steady state simulations using a BOD removal/Nitrification/BNR plant (Activated sludge system with and without Carbon addition)

- Introduction to model options and capability
- Reactor type set up – CSTR, PFR, SBR (Activated sludge)
- Metal, Chemical (Caustic) and Carbon dosing
- Model calibration parameters

1:30 – 2:00 Clarifier modeling

- Types of solids separation units (primary, secondary, thickener, dewatering)
- Model types and options
- Comparing simple and advanced models

April 7th - Session 2

10:00 – 11:00 Chemical P - Iron and Alum

- Modeling iron and alum dosing – model structure and setup
- HFO/HAO formation
- Calibration and multipoint dosage

11:00 – 12:30 Aeration modeling - Diffuser versus mechanical, using aeration tool, alpha modelingSumo21 – New process units and features

- Oxygen transfer model and inputs – mechanical and diffused aeration
- Introduction to oxygen transfer model and inputs – mechanical and diffused aeration
- Setting number of diffusers and calibrating alpha/SSOTE
- Using aeration tool
- Predictive Alpha modeling

12:30 – 2:00 Biological Phosphorus removal - model, application, and constraints

- Introduction to EBPR model
- Advantage of one versus multiple biomass model
- Modeling guidelines for EBPR (including case studies)
- P release test – release and uptake, understanding Bio-P sludge

April 9th - Session 3

10:00 – 11:00 Controllers introduction, setup, and application

- Controller basics background
- Controller setup – cascade controller
- ABAC, SRT, AvN, and NRCY control

11:00 – 11:30 Introduction to energy and cost center

- Introducing the unit options
- Model selection and approach
- Modeling exercise

11:30 – 12:30 Pump and blower curve examples, sizing a blower

- Pump curve tool evaluation
- Blower curve tool evaluation

12:30 – 1:00 Complete energy and cost calculation - upgrade evaluation, self sufficiency

- Impact of process configuration on energy recovery – primary, A-stage
- Co-digestion and sidestream for improving self sufficiency

1:00 – 2:00 Conventional versus Advanced digestion (Thermal hydrolysis and UASB), precipitation, dewatering

- Introduction to digestion model – conventional and advanced
- Sludge feed characterization and impact of influent particulates
- Thermal hydrolysis model application

April 12th - Session 4

10:00 – 11:00 Greenhouse gas model - fundamentals and application

- Introduction to model structure
- Application – shortcut N removal mainstream versus sidestream
- Data collection and calibration

11:00 – 11:30 Modeling aerobic facultative lagoon (predict sludge buildup and dredging)

- Steady state simulation of TSS, BOD, Ammonia and TP removal
- Desludging of multiple lagoons in series on a 10-yr vs 15 or 20-yr frequency
- Seasonal nitrification, TP removal and contribution of ferric/alum chemical sludge on sludge blanket build up and treatment capacity

11:30 – 12:30 Biofilm modeling - fundamentals and advanced setup

- Biofilm model structure and important parameters
- MBBR and IFAS modeling
- Granular SBR
- MABR – predictive oxygen transfer modeling

12:30 – 1:00 Sidestream - P recovery, Post aerobic digestion and deammonification

- Configuration setup and model capability
- Struvite, Pyrite, and Vivianite formation
- Sulfur modeling – identifying H2S in digesters

1:00 – 2:00 Digital Twin - introduction to the concept, identifying need of application and instrumentation, software-in-the loop demo

- Digital twin tool fundamentals
- Software-in-the-loop example