

# **Integrated Water & Wastewater Network Design using OpenFlows WorkSuite**

## **Course Objectives**

- To provide comprehensive knowledge of Bentley OpenFlows applications for water distribution, surge analysis, and sewer network design.
- To develop practical skills in creating, analyzing, and optimizing hydraulic models using WaterCAD, HAMMER, SewerCAD, and SewerGEMS.
- To enable participants to design efficient water supply and wastewater systems based on engineering standards.
- To build competency in interpreting simulation results, troubleshooting network issues, and preparing technical reports.
- To familiarize learners with integrated workflows involving CAD, GIS, and infrastructure data management.

## **Course Outcomes**

- Participants will be able to develop complete water distribution and sewer network models using OpenFlows software.
- Learners will perform hydraulic, transient, and capacity analyses for real-world utility systems.
- Participants will optimize pumps, pipelines, valves, and sewer networks for improved operational performance.
- Learners will generate professional engineering reports, profiles, and design documentation.
- Participants will gain confidence to apply OpenFlows tools in municipal, industrial, and infrastructure projects.

## **Target Audience**

- Civil Engineers involved in water supply, wastewater, and utility infrastructure projects.
- Mechanical and Process Engineers working on pumping systems and hydraulic networks.
- Design Engineers, Drafting Professionals, and BIM Modelers in infrastructure sectors.
- Municipal engineers, consultants, and planners handling urban utility development projects.
- Students and fresh graduates seeking specialized skills in hydraulic and sewer network modeling.

## Course Outline

The course comprises **40-hours** of theory and labs and is divided into **9** different Modules. Each chapter will be followed by hands-on lab exercises to reinforce learning and gauge understanding of the topics covered.

### Table of Contents: -

#### **Module 1: Introduction to OpenFlows Applications**

- 1.1 Overview of Water Supply and Sewer Network Modeling
- 1.2 Introduction to OpenFlows Product Suite
- 1.3 Differences between Water, WaterCAD, HAMMER, SewerGEMS & SewerCAD
- 1.4 Industry Applications and Workflow Integration
- 1.5 Software Interface and Navigation Basics

#### **Module 2: Fundamentals of Hydraulic Modeling**

- 2.1 Basic Hydraulic Principles
- 2.2 Flow, Pressure, Headloss, Velocity Concepts
- 2.3 Demand Patterns and Load Estimation
- 2.4 Gravity vs Pressurized Systems
- 2.5 Modeling Standards and Best Practices

#### **Module 3: OpenFlows Water / WaterCAD – Water Distribution Modeling**

- 3.1 Creating a New Water Network Project
- 3.2 Nodes, Pipes, Tanks, Reservoirs and Pumps
- 3.3 Demand Allocation Methods
- 3.4 Running Steady-State Simulations
- 3.5 Pressure Zone Analysis
- 3.6 Fire Flow Analysis
- 3.7 Extended Period Simulation

#### **Module 4: Advanced WaterCAD Applications**

- 4.1 Pump Selection and Pump Curves
- 4.2 Valve Modeling and Control Strategies
- 4.3 Energy Cost Analysis
- 4.4 Scenario Management
- 4.5 Calibration Techniques
- 4.6 Design Optimization

#### **Module 5: OpenFlows HAMMER – Surge & Transient Analysis**

- 5.1 Introduction to Water Hammer Concepts
- 5.2 Causes of Pressure Surges in Pipelines

- 5.3 Building a HAMMER Model from WaterCAD
- 5.4 Pump Trip and Valve Closure Simulations
- 5.5 Surge Protection Devices
- 5.6 Air Valves, Surge Tanks, Relief Valves
- 5.7 Interpreting Transient Results

### **Module 6: OpenFlows SewerCAD – Sanitary Sewer Design**

- 6.1 Introduction to Gravity Sewer Systems
- 6.2 Creating Sewer Networks
- 6.3 Manholes, Pipes and Lift Stations
- 6.4 Load Generation and Population Data
- 6.5 Hydraulic Grade Line Analysis
- 6.6 Sewer Capacity Checks
- 6.7 Pump Station Modeling

### **Module 7: OpenFlows SewerGEMS – Advanced Sewer Modeling**

- 7.1 Dynamic Sewer Simulation Concepts
- 7.2 Wet Weather Flow Modeling
- 7.3 Infiltration/Inflow Analysis
- 7.4 Scenario Alternatives and What-if Studies
- 7.5 Flooding and Surge Analysis
- 7.6 System Rehabilitation Planning

### **Module 8: GIS, CAD & Data Integration**

- 8.1 Importing CAD Drawings and GIS Data
- 8.2 Background Layers and Terrain Models
- 8.3 Database Connectivity
- 8.4 Model Validation and Cleanup
- 8.5 Exporting Reports and Drawings

### **Module 9: Design Reports & Deliverables**

- 9.1 Creating Profiles and Thematic Maps
- 9.2 Quantity Estimation and BOQ Support
- 9.3 Hydraulic Reports and Summaries