Anaerobic Digestion and Biogas Plants Course: Digester Design, Operation and Gas Upgrading

19 – 23 April 2027
Amsterdam - Zuidas business district hotel



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Introduction:

Anaerobic digestion and biogas plants, covering digester design, operation and gas upgrading, are the subject of this 1-week course for process engineers, digester operators and environmental project staff, ending with a Digester Process Design and Operating Plan. Sludge, food waste and farm residue digesters lose methane output, sour or foam when feedstock blends, loading rates, mixing and gas treatment are set by rule of thumb rather than measured data. Nominees already operate or specify digestion units, and teaching is by case study on plant logs, laboratory results and gas analyses. CoreConcept Training Center delivers this anaerobic digestion and biogas plants course.

Course Objectives:

- Characterise sewage sludge, food waste and agricultural residues by solids, volatile solids, COD and methane potential, and design co-digestion blends
- Select a digester configuration and size it from organic loading rate, hydraulic retention time and heat balance
- Run daily digester control using VFA to alkalinity ratio, ammonia and sulphide readings to keep methanogenesis stable
- Specify mixing, foam and grit control routines and digestate separation and land application routes
- Choose hydrogen sulphide, siloxane and moisture removal and an upgrading technology to produce biomethane or feed a CHP engine safely
- Prepare a Digester Process Design and Operating Plan for a case organisation

Target Audience:

- Process engineers responsible for designing or expanding digestion units at wastewater, food and agricultural sites
- Digester operators and shift leads who feed, heat, mix and monitor anaerobic reactors
- Environmental engineers in utilities and food processing who manage organic residue and sludge outlets
- Gas handling technicians responsible for biogas cleaning, upgrading skids, CHP engines and flares
- Project engineers who commission new biogas plants and hand them over to operations

Course Outline:

Day 1: Anaerobic Digestion Fundamentals and Feedstock Characterisation

- Four-Stage Biochemistry From Hydrolysis to Methanogenesis Explained
- Feedstock Profiling of Sewage Sludge, Food Waste and Manure
- Total Solids, Volatile Solids and COD Laboratory Analysis
- Biochemical Methane Potential Testing and Yield Interpretation
- Co-Digestion Blend Design Using Carbon-to-Nitrogen Balance

Day 2: Digester Configurations and Process Design Basis

- CSTR, Plug Flow and UASB Reactor Selection Criteria
- Dry Batch Tunnel Digesters for High-Solids Organic Residues
- Organic Loading Rate and Hydraulic Retention Time Sizing
- Mesophilic Versus Thermophilic Operation and Heat Balance Calculation
- Pre-Treatment Options Including Depackaging, Maceration and Pasteurisation

Day 3: Digester Operation, Mixing and Process Stability Control

- VFA to Alkalinity Ratio Monitoring and Feeding Adjustment
- Free Ammonia and Sulphide Inhibition Diagnosis and Mitigation
- Mechanical, Gas and Pumped Recirculation Mixing System Performance
- Foaming, Grit Accumulation and Scum Layer Control Routines
- Digestate Separation, Nutrient Content and Land Application Routes

Day 4: Biogas Cleaning, Upgrading to Biomethane and CHP Integration

- Hydrogen Sulphide Removal by Biological and Iron-Based Methods
- Siloxane and Moisture Removal Ahead of Gas Engines
- Water Scrubbing, Pressure Swing Adsorption, Membrane and Amine Upgrading
- CHP Engine Integration With Digester Heat Recovery Loop
- Gas Holder, Flare and Explosive Atmosphere Safety Controls

Day 5: Case Study Work and the Digester Process Design and Operating Plan

- Case Feedstock Inventory and Methane Yield Estimate Review
- Case Digester Sizing and Configuration Decision Record
- Case Gas Cleaning and Upgrading Train Selection
- Start-Up Seeding, Monitoring Schedule and Upset Response Card
- Digester Process Design and Operating Plan Completion and Peer Review

Skills You Will Gain:

- Feedstock Methane Potential Assessment
- Co-Digestion Blend Design
- Digester Sizing
- Process Stability Monitoring
- Inhibition Diagnosis
- Biogas Treatment Train Selection
- Digestate Management Planning
- Gas Safety Control

Why Attend This Course:

- Deliver a Digester Process Design and Operating Plan to the plant manager and the engineering lead responsible for the biogas unit
- Decide which digester configuration, loading rate and upgrading route suit the residues the organisation actually holds
- Avoid soured digesters, foaming events, corroded engines and flared gas that cut methane output and revenue
- Brief operators, laboratory staff and maintenance colleagues on daily stability checks and gas safety controls

Conclusion:

Back at work, the participant hands the Digester Process Design and Operating Plan to the plant manager and the engineering lead, who use it to confirm feedstock blends, reactor sizing, the gas cleaning and upgrading train and the daily monitoring routine for an existing or planned biogas unit. Operations teams adopt its stability limits and upset response card, while project teams use its design basis in specifications. After the first months of operation, the unit should compare measured methane yield, VFA to alkalinity trends and gas quality with the plan and revise its limits.

Frequently Asked Questions FAQ:

What should participants know before an anaerobic digestion and biogas plants course?

Participants should already work with digesters, sludge, organic residues or gas handling and understand basic process chemistry. Bringing anonymised feedstock analyses, digester logs or gas quality records makes the case study work closer to their own plant.

How does an anaerobic digestion and biogas plants course differ from a general bioenergy or waste-to-energy course?

It concentrates on one technology: digester biochemistry, sizing, daily stability control, biogas cleaning, upgrading and digestate. General bioenergy courses compare many conversion routes for feasibility, and waste-to-energy courses address thermal treatment of residual waste.

Why do anaerobic digesters in biogas plants become unstable?

Instability usually follows overloading, sudden feedstock changes or inhibitors such as free ammonia and sulphide. Volatile fatty acids accumulate faster than methanogens consume them, alkalinity is used up and methane output falls, so the VFA to alkalinity trend gives early warning.

What do participants take back from the anaerobic digestion and biogas plants course?

Participants take back a Digester Process Design and Operating Plan with a feedstock inventory, methane yield estimate, sizing record, gas cleaning and upgrading selection, digestate route, monitoring schedule and upset response card for their own unit.