Biogas Plant Design and Operations Training Course

Professional Development Training Course Outline

Category	Renewable Energy	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Biogas Plant Design and Operations Training Course is designed to build advanced expertise in renewable energy systems, anaerobic digestion technology, waste-to-energy solutions, circular economy practices, and sustainable resource management. With the growing global demand for clean energy transition, carbon reduction, energy security, and climate-smart technologies, biogas has emerged as a strategic solution for converting organic waste into renewable methane, bio-CNG, green electricity, organic fertilizers, and valuable bio-products. This training provides practical knowledge on biogas project development, plant engineering, process optimization, operational excellence, safety management, and digital monitoring systems for modern biogas facilities.

The course integrates engineering principles, operational best practices, real-world case studies, and emerging industry trends to prepare professionals for successful biogas plant planning, construction, commissioning, troubleshooting, and performance improvement. Participants will gain insights into feedstock management, digester design, gas purification, digestate utilization, financial feasibility, regulatory compliance, and smart biogas technologies. The program supports industries, governments, entrepreneurs, and sustainability professionals in achieving net-zero goals, renewable energy targets, waste management transformation, and sustainable development objectives.

Programme Curriculum

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Course Duration

5 days

Course Objectives

1. Understand advanced biogas technology principles and anaerobic digestion processes.
2. Develop expertise in biogas plant design, engineering calculations, and system integration.
3. Learn feedstock assessment, biomass characterization, and waste-to-energy strategies.
4. Master anaerobic digester selection, sizing, and process optimization techniques.
5. Apply renewable energy project development and feasibility assessment methodologies.
6. Understand biogas upgrading technologies and bio-CNG production systems.
7. Improve knowledge of plant operations, preventive maintenance, and performance monitoring.
8. Learn digital transformation tools, automation, and smart biogas management systems.
9. Develop skills in biogas safety management, risk assessment, and regulatory compliance.
10. Explore carbon credits, ESG strategies, and sustainable finance opportunities.
11. Understand digestate management, biofertilizer production, and circular economy applications.
12. Analyze real-world biogas plant challenges through industrial case studies.
13. Build professional capability for successful biogas project implementation and operational excellence.

Target Audience

1. Renewable energy engineers and consultants
2. Biogas plant owners, operators, and managers
3. Environmental and sustainability professionals
4. Waste management specialists
5. Agricultural and livestock industry professionals
6. EPC contractors and project developers
7. Government energy and environmental officials
8. Researchers, entrepreneurs, and clean technology investors

Course Modules

Module 1: Fundamentals of Biogas Technology and Renewable Energy Transition

- Introduction to biogas production systems and anaerobic digestion fundamentals
- Global trends in renewable energy, decarbonization, and waste-to-energy solutions

- Types of biogas plants-agricultural, industrial, municipal, and wastewater applications
- Biochemical process stages-hydrolysis, acidogenesis, acetogenesis, and methanogenesis
- Role of biogas in achieving net-zero emissions and circular economy goals
- Case Study: Successful agricultural biogas transformation project converting livestock waste into renewable energy and organic fertilizer.

Module 2: Biogas Plant Design and Engineering Principles

- Site selection, feasibility analysis, and project planning
- Biogas plant layout design and engineering considerations
- Anaerobic digester types-CSTR, plug flow, covered lagoon, and batch systems
- Hydraulic retention time, organic loading rate, and process calculations
- Equipment selection and plant integration strategies
- **Case Study:** Design optimization of a commercial-scale biogas facility improving methane production efficiency.

Module 3: Feedstock Management and Biomass Optimization

- Feedstock identification and characterization methods
- Agricultural residues, food waste, sewage sludge, and industrial organic waste
- Co-digestion strategies for improved biogas yield
- Feedstock preparation, mixing, and storage systems
- Sustainable biomass supply chain management
- **Case Study:** Food waste co-digestion project achieving higher methane output through optimized feedstock blending.

Module 4: Biogas Plant Operations and Process Control

- Daily operation procedures and performance monitoring
- Process parameters-pH, temperature, VFA, alkalinity, and gas composition
- Troubleshooting digestion problems and operational failures
- Preventive maintenance and asset management strategies
- Digital monitoring, automation, and SCADA-based plant control
- **Case Study:** Industrial biogas plant recovery project using advanced process monitoring and operational improvements.

Module 5: Biogas Upgrading, Purification, and Energy Utilization

- Biogas cleaning technologies and gas conditioning systems
- Hydrogen sulfide removal and moisture management
- Biomethane production and bio-CNG applications
- Combined heat and power (CHP) generation systems
- Renewable natural gas integration and grid injection
- **Case Study:** Municipal biogas upgrading facility producing vehicle-grade biomethane.

Module 6: Digestate Management and Circular Economy Applications

- Digestate treatment and nutrient recovery technologies
- Production of organic fertilizers and soil conditioners
- Circular economy models for waste valorization
- Environmental benefits of digestate recycling

- Sustainable agriculture integration strategies
- **Case Study:** Farm-based biogas project generating renewable energy and commercial biofertilizer products.

Module 7: Biogas Plant Safety, Compliance, and Sustainability Management

- Biogas safety principles and hazard identification
- Gas storage safety and explosion prevention practices
- Environmental regulations and compliance frameworks
- Occupational health and safety management systems
- ESG reporting and sustainability performance indicators
- **Case Study:** Large-scale biogas operation implementing safety improvements and environmental compliance programs.

Module 8: Biogas Project Economics and Future Industry Trends

- Feasibility studies and investment analysis
- CAPEX, OPEX, ROI, and financial modelling approaches
- Carbon credits and renewable energy incentives
- Emerging technologies-AI monitoring, IoT sensors, and digital twins
- Future opportunities in global biogas and biomethane markets
- **Case Study:** Commercial biogas investment project evaluated using financial modeling and carbon reduction benefits.

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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