Biomass Gasification Systems 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

Biomass Gasification Systems Training Course is designed to develop expertise in renewable energy technologies, clean energy transition, carbon reduction strategies, and advanced biomass conversion systems. With the global shift toward net-zero emissions, sustainable energy solutions, circular economy practices, and decentralized power generation, biomass gasification has emerged as a strategic technology for converting agricultural residues, forestry waste, and organic resources into valuable producer gas, heat, electricity, biochar, and renewable fuels. This course provides practical knowledge of biomass feedstock assessment, gasifier design, system integration, operational optimization, emission control, and energy recovery technologies.

The training combines industry best practices, engineering principles, real-world case studies, and emerging market trends to prepare participants for implementing efficient biomass gasification projects. Participants will gain insights into advanced gasification technologies, waste-to-energy solutions, rural electrification models, industrial heat applications, smart energy management, and sustainable bioenergy development. The course supports professionals seeking to contribute to the growing green energy economy, climate resilience initiatives, and low-carbon industrial transformation.

Programme Curriculum

Biomass Gasification Systems Training Course

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Course Duration

5 days

Course Objectives

1. Understand the fundamentals of biomass energy conversion and advanced gasification technologies.
2. Develop expertise in biomass feedstock characterization, availability assessment, and supply chain optimization.
3. Learn the design principles of fixed-bed, fluidized-bed, and advanced biomass gasification systems.
4. Analyze gasifier performance, thermal efficiency, energy yield, and operational reliability.
5. Gain practical knowledge of producer gas cleaning, conditioning, and emission reduction technologies.
6. Explore integration of biomass gasification with renewable power generation and hybrid energy systems.
7. Understand biochar production, carbon sequestration, and circular economy applications.
8. Learn strategies for biomass project development, feasibility studies, and financial evaluation.
9. Develop skills in operation, maintenance, troubleshooting, and performance monitoring.
10. Evaluate environmental impacts, carbon footprint reduction, and sustainability indicators.
11. Understand regulatory frameworks related to clean energy, waste management, and renewable energy policies.
12. Examine global trends in distributed generation, industrial decarbonization, and energy transition.
13. Apply knowledge through industry case studies and practical biomass gasification project scenarios.

Target Audience

1. Renewable energy engineers and energy consultants
2. Biomass project developers and entrepreneurs
3. Mechanical, chemical, and environmental engineers
4. Power plant operators and maintenance professionals
5. Waste management and sustainability specialists
6. Government energy planners and policymakers
7. Researchers, academics, and technical trainers
8. Industrial professionals seeking clean energy solutions

Course Modules

Module 1: Fundamentals of Biomass Gasification and Renewable Energy Transition

- Introduction to biomass energy systems and sustainable energy pathways
- Principles of thermochemical conversion and gasification reactions

- Types of biomass resources including agricultural, forestry, and municipal residues
- Role of biomass gasification in net-zero and carbon-neutral strategies
- Overview of global biomass gasification market trends
- Case Study: India rural biomass gasification projects demonstrating decentralized electricity generation using agricultural residues.

Module 2: Biomass Feedstock Assessment and Resource Management

- Biomass characteristics-moisture content, calorific value, ash, and composition
- Feedstock collection, processing, storage, and logistics management
- Sustainable biomass supply chain development
- Waste-to-energy opportunities using industrial and agricultural residues
- Feedstock quality improvement techniques
- **Case Study: Sugarcane bagasse gasification systems** used for industrial heat and power generation.

Module 3: Biomass Gasifier Technologies and System Design

- Fixed-bed gasifiers-downdraft, updraft, and cross-draft systems
- Fluidized-bed and advanced gasification technologies
- Gasifier sizing, design parameters, and performance calculations
- Reactor operation and process optimization
- Integration of gasifiers with engines, turbines, and boilers
- **Case Study: European biomass CHP plants** using advanced gasification technology for combined heat and power.

Module 4: Gas Cleaning, Conditioning, and Emission Control

- Producer gas composition and quality requirements
- Tar removal and gas purification technologies
- Filtration, cooling, and conditioning systems
- Emission monitoring and environmental compliance
- Advanced pollution control strategies
- **Case Study: Industrial biomass gasification plants** implementing advanced tar reduction systems.

Module 5: Biomass Gasification Power Generation and Industrial Applications

- Electricity generation using gas engines and turbines
- Industrial process heat applications
- Hybrid renewable energy systems with solar and storage
- Rural electrification and microgrid applications
- Smart energy management and efficiency improvement
- **Case Study: Community biomass microgrids** providing clean electricity in remote regions.

Module 6: Biochar, Carbon Management, and Circular Economy

- Biochar production through biomass gasification systems
- Carbon capture potential and climate benefits
- Circular economy approaches for biomass utilization
- Agricultural soil improvement applications
- Carbon credit opportunities and sustainability reporting
- **Case Study: Biochar-based carbon farming projects** supporting carbon sequestration initiatives.

Module 7: Biomass Gasification Project Development and Economics

- Feasibility studies and technical assessment methods
- Project financing and investment evaluation
- Life-cycle assessment and carbon accounting
- Operation and maintenance planning
- Risk management and business models
- **Case Study: Commercial biomass energy projects** using waste residues for industrial energy supply.

Module 8: Future Trends, Digitalization, and Advanced Biomass Systems

- Artificial intelligence and IoT-based biomass system monitoring
- Digital twins for energy optimization
- Advanced hybrid renewable energy integration
- Green hydrogen and syngas applications
- Future opportunities in global bioenergy markets
- **Case Study: Next-generation biomass gasification facilities** integrating digital monitoring and renewable fuel production.

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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