Waste-to-Energy Technologies in Chemical Engineering Training Course

Professional Development Training Course Outline

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

Course Introduction

The global demand for sustainable energy solutions has never been more urgent. Waste-to-Energy (WtE) technologies represent a pivotal frontier in chemical engineering, transforming municipal, industrial, and agricultural waste into valuable energy resources. Waste-to-Energy Technologies in Chemical Engineering Training Course equips chemical engineers and industry professionals with advanced knowledge of cutting-edge WtE processes, including anaerobic digestion, pyrolysis, gasification, and incineration. Participants will gain hands-on insights into energy recovery systems, process optimization, environmental compliance, and economic feasibility assessments.

With the rise of circular economy initiatives and renewable energy mandates, mastering Waste-to-Energy technologies is essential for engineers seeking to drive innovation in sustainable waste management. This course emphasizes real-world applications, case studies, and process simulations, preparing participants to implement energy recovery projects efficiently while adhering to environmental, regulatory, and safety standards. By integrating chemical engineering principles with sustainable practices, participants will emerge as proficient professionals ready to tackle global energy challenges.

Programme Curriculum

Waste-to-Energy Technologies in Chemical Engineering Training Course

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Course Objectives

By the end of this course, participants will be able to:

1. Understand the fundamentals of Waste-to-Energy technologies and their chemical engineering principles.
2. Analyze waste composition and identify suitable conversion processes.
3. Design and optimize anaerobic digestion systems for biogas production.
4. Evaluate pyrolysis and gasification technologies for energy recovery.
5. Implement incineration processes with emission control strategies.
6. Integrate chemical engineering principles with circular economy initiatives.
7. Conduct economic feasibility studies for WtE projects.
8. Apply process simulation tools for energy and mass balance analysis.
9. Develop environmental compliance strategies for waste-to-energy plants.
10. Examine global case studies of successful WtE implementations.
11. Assess sustainability metrics and life cycle analysis of WtE systems.
12. Optimize WtE processes for maximum energy efficiency.
13. Explore emerging trends and innovations in renewable energy recovery from waste.

Target Audience

- Chemical Engineers
- Environmental Engineers
- Energy Sector Professionals
- Waste Management Specialists
- Renewable Energy Consultants
- Industrial Process Engineers
- Government and Regulatory Officials
- Research Scholars and Academics in Energy & Environment

Course Modules

Module 1: Introduction to Waste-to-Energy Technologies

- Overview of global waste generation and energy recovery potential
- Principles of thermochemical and biochemical conversion
- Environmental impact and sustainability considerations
- Regulatory frameworks and compliance standards

- Case Study: Municipal solid waste-to-energy plants in Europe

Module 2: Waste Characterization and Resource Assessment

- Classification of wastes-MSW, industrial, agricultural, and hazardous
- Chemical composition and calorific value analysis
- Moisture content and biodegradability assessment
- Resource potential mapping for energy recovery
- Case Study: Biomass feedstock assessment for anaerobic digestion in India

Module 3: Anaerobic Digestion and Biogas Production

- Fundamentals of anaerobic microbial digestion
- Reactor design and process optimization
- Biogas purification and utilization strategies
- Nutrient recovery and digestate management
- Case Study: Industrial-scale biogas plants in Germany

Module 4: Pyrolysis and Gasification Technologies

- Principles of thermal decomposition and syngas production
- Reactor types-fixed-bed, fluidized-bed, and rotary kiln
- Product characterization: bio-oil, syngas, and char
- Process integration with chemical and energy systems
- Case Study: Pyrolysis of plastic waste for fuel in South Korea

Module 5: Incineration and Energy Recovery

- High-temperature combustion principles
- Flue gas treatment and emission control technologies
- Heat recovery and cogeneration systems
- Safety and environmental monitoring
- Case Study: Waste-to-energy incineration plant in Japan

Module 6: Process Simulation and Optimization

- Process modeling using Aspen Plus / MATLAB
- Mass and energy balance calculations
- Sensitivity and scenario analysis
- Optimization techniques for energy efficiency
- Case Study: Simulation of a combined WtE plant

Module 7: Environmental and Economic Assessment

- Life cycle assessment (LCA) of WtE technologies
- Carbon footprint and sustainability metrics
- Economic feasibility and cost-benefit analysis
- Funding opportunities and policy incentives
- Case Study: Economic evaluation of biogas plants in the USA

Module 8: Emerging Trends and Innovations

- Integration with circular economy and smart grids

- Advanced catalysis and microbial engineering
- Hybrid systems combining multiple WtE technologies
- Digitalization and AI in process monitoring
- Case Study: Innovative WtE solutions in Singapore

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- 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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