

ISO 31800:2020 (E)

Faecal sludge treatment units — Energy independent, prefabricated, community-scale, resource recovery units — Safety and performance requirements

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms and definitions
3.1	General
3.2	Input, energy balance, and resource recovery
3.3	Performance
3.4	Operability
3.5	Outputs
3.6	Abbreviated terms
4	General requirements
4.1	Industrial design and manufacture
4.2	Hazard and operability study and risk assessment
4.3	Ambient operation conditions
4.4	Expected technical lifetime
4.5	Treatment unit input
4.5.1	Input types
4.5.2	Specification of input parameters and ranges
4.6	Requirements for handling of faecal sludge as a fuel
4.6.1	Reception of faecal sludge
4.6.2	Storage of faecal sludge
4.6.3	Feeding system
4.6.4	Drying facilities
5	Energy balance and resource recovery
5.1	General
5.2	Energy balance
5.2.1	Energy independence
5.2.2	Energy positive
5.3	Resource recovery
6	Performance requirements
6.1	Technical process availability
6.1.1	Mean time between failure (MTBF)
6.1.2	Mean time to repair (MTTR)
6.1.3	Preventive maintenance time (Tpm)
6.2	Process reliability
6.2.1	Process stability
6.2.2	Start reliability and start time
6.2.3	Shut-off reliability and shut-off time
7	Safety and functional requirements
7.1	Applicability
7.2	Process control
7.2.1	General
7.2.2	Degree of automation

- 7.2.3 Intentional starting of operation
- 7.2.4 Intentional stopping of operation
- 7.2.5 Emergency stop
- 7.2.6 Continuous monitoring
- 7.2.7 Feedback of process failures
- 7.2.8 Safety-related functions of the control system
- 7.2.9 Input overload protection monitoring
- 7.2.10 Overpressure protection
- 7.2.11 Fire and overheating prevention
- 7.2.12 Explosion prevention
- 7.3 Process redundancy
- 7.4 Material fire resistance
- 7.5 Security of electrical energy supply
- 7.5.1 Safety and security
- 7.5.2 Security of external electrical energy supply
- 7.5.3 Security of internal electrical energy supply
- 7.6 Safety requirements for electrical energy supply
- 7.6.1 Separation and isolation
- 7.6.2 Electrical energy discharge
- 7.6.3 Overvoltage protection
- 7.7 Structures and supporting elements
- 7.7.1 Structural integrity
- 7.7.2 Integrity against external impacts
- 7.8 Sanitary requirements
- 7.8.1 Hygienic design
- 7.8.2 Materials
- 7.8.3 System tightness
- 7.8.4 Leakage protection
- 7.9 Mechanical requirements
- 7.9.1 Pressurized equipment
- 7.9.2 Pipes, hoses and fittings
- 7.9.2.1 Design and dimension
- 7.9.2.2 Positioning
- 7.9.3 Tanks and vessels
- 7.9.3.1 Flammable liquid tanks and vessels
- 7.9.4 Moving and rotating parts
- 7.9.5 Vibration
- 7.10 Radiation
- 7.10.1 High temperatures of parts and surfaces
- 7.10.2 Low temperatures of parts and surfaces
- 7.10.3 Electromagnetic compatibility
- 7.10.4 Other radiation emissions
- 7.11 Electronic and electrical components

8 Operability

- 8.1 Safe loading
- 8.2 Anthropometric design
- 8.2.1 General
- 8.2.2 Forces to be applied
- 8.2.3 Accesses and stairs
- 8.2.4 Aisles and platforms
- 8.3 Lighting
- 8.4 Operator system ergonomic design
- 8.5 Operator personal protection

9 Maintainability

- 9.1 Adjustability and maintainability
- 9.1.1 Identification of adjustment and maintenance needs
- 9.1.2 Ease of maintenance of devices, components and subassemblies
- 9.2 Access to adjustment, and maintenance points
- 9.3 Requirements for adjustment and maintenance activities
- 9.3.1 Discharge and cleaning, testability, adjustment, and maintenance on the running unit
- 9.3.2 Safe handling of electrical equipment
- 9.4 Spare parts

- 9.5 Tools and devices
- 10 Outputs
 - 10.1 General
 - 10.2 Solid
 - 10.2.1 Pathogens and indicator organisms
 - 10.2.2 Requirements for trace elements in solid outputs
 - 10.2.3 Alternative requirements for solids for disposal
 - 10.3 Effluent
 - 10.3.1 Pathogens and indicator organisms
 - 10.3.2 Environmental parameters
 - 10.3.3 Requirements for trace elements in effluent outputs
 - 10.4 Air emissions
 - 10.5 Odour
 - 10.6 Noise
- 11 Testing
 - 11.1 General
 - 11.2 Type tests
 - 11.3 Performance testing
 - 11.3.1 Test conditions
 - 11.3.2 Test duration
 - 11.4 Input characterisation and sampling
 - 11.5 Solid and effluent
 - 11.5.1 Pathogens and indicator organisms in solid outputs and effluent
 - 11.5.2 Trace elements in solid outputs
 - 11.5.3 Environmental parameters for effluent
 - 11.5.4 Trace elements in effluent outputs
 - 11.5.5 Sample planning
 - 11.5.6 Measurement principles
 - 11.5.7 Sampling location
 - 11.5.8 Output sampling type and frequency
 - 11.5.9 Sample size
 - 11.5.10 Sampling method
 - 11.5.11 Sample storage
 - 11.6 Air emissions
 - 11.6.1 Measurement planning
 - 11.6.2 Measurement principles
 - 11.6.3 Equipment specification
 - 11.6.4 Equipment calibration
 - 11.6.5 Sampling location
 - 11.6.6 Normalizing of measured pollutants
 - 11.6.7 Reference conditions
 - 11.7 Odour
 - 11.7.1 Test methods for odour output
 - 11.7.2 Measurement planning
 - 11.7.3 Measurement principles
 - 11.7.4 Sampling location requirements
 - 11.7.4.1 Point source emissions
 - 11.7.4.2 Surface and fugitive emissions
 - 11.7.5 Measurement process
 - 11.7.5.1 Sampling train
 - 11.7.5.2 Materials selection
 - 11.7.6 Additional equipment considerations
 - 11.7.7 Sample collection
 - 11.7.7.1 Sample collection on non-ventilated, odour-emitting solid or liquid area sources, and fugitive emissions
 - 11.7.7.2 Sample collection on a solid or liquid surface with very low discharge rates
 - 11.7.7.3 Sample collection on point sources, odour-emitting stacks, ducts, vents and alike
 - 11.7.8 Minimum requirements for reporting
 - 11.7.8.1 Treatment unit information
 - 11.7.8.2 Odour source information
 - 11.7.8.3 Flow conditions
 - 11.7.8.4 Odour measurement results

- 11.7.8.5 Quality assurance
- 11.7.9 Determination of the odour concentration in the laboratory
- 11.7.9.1 Selection of panellists
- 11.7.9.2 Dilution apparatus
- 11.7.9.3 Reference odourant
- 11.7.10 Dispersion modelling
- 11.7.10.1 Dispersion model
- 11.7.10.2 Lagrangian particle model
- 11.7.10.3 Computational grid
- 11.7.10.4 Physical and chemical data
- 11.7.10.5 Source data
- 11.7.10.6 Evaluation grid
- 11.7.11 Real measured values, treatment unit data and design data as input
- 11.7.11.1 Source data
- 11.7.11.2 Treatment unit data
- 11.7.11.3 Design data
- 11.7.11.3.1 Mean wind velocity
- 11.7.11.3.2 Surface roughness
- 11.8 Noise
- 11.8.1 Test methods
- 11.8.1.1 Noise output
- 11.8.2 Measurement planning
- 11.8.3 Requirements for the sampling location
- 11.8.4 Measurement methods and parameters
- 11.8.5 Measurement equipment
- 11.8.6 Calibration
- 11.8.7 Operation of treatment unit during test
- 11.8.8 Sound level meter setting
- 11.8.9 Microphone orientation
- 11.8.10 Correction for background noise and reflecting surfaces in test environment

12 Product literature

- 12.1 General
- 12.2 Input
- 12.3 Performance claims
- 12.4 Unit boundaries
- 12.5 Energy independence assessment
- 12.6 Environmental sustainability
- 12.6.1 Consumables
- 12.6.2 Greenhouse gas (GHG) emissions
- 12.6.3 Characteristics of resource recovered products
- 12.7 Maintenance and operator documentation
- 12.7.1 Language requirements
- 12.7.2 Provision of manual
- 12.7.3 Information to be provided
- 12.7.4 Recurring operation and maintenance
- 12.7.5 Complexity of configuration, adjustment, and maintenance activities
- 12.7.6 Labelling and marking

Annex A (informative) Input specification templates

- A.1 Thermal processes
- A.2 Biological processes
- A.3 Trace elements

Annex B (informative) Sustainability

- B.1 General
- B.2 Estimated cost of use calculations
- B.2.1 General
- B.2.2 CAPEX
- B.2.3 Recurring costs
- B.3 Financing
- B.3.1 General
- B.3.2 Financing in the context of the sanitation value chain
- B.4 Suitability
- B.5 Planning, stakeholder participation and integration of the treatment unit
- B.6 Environmental compliance monitoring and enforcement
- B.7 Acceptance and affordability