How to define performance parameters for verification including parameters relevant for energy efficiency of a wastewater treatment plant

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Intended application of the technology

The intended application of the technology specified in terms of matrix, purpose and technical conditions.

MATRIX	**The type of material that the technology is intended for. Matrices could include, drinking water, ground water, municipal wastewater, industrial wastewater etc.**
PURPOSE	The measurable property that is affected by the technology and how it is affected. It is possible to define more than one purpose. The matrix and purpose will translate into performance parameters as described below. Examples include a given reduction of nitrate concentration in wastewater, separation of volatile organic compounds, reduction of energy use (MW/kg) etc.
TECHNOLOGIES	The practical application of the technical or scientific principles in the environmental area to achieve the purpose. The term 'technology' covers a variety of products, processes, systems and services. Examples include a membrane technology , activated sludge technology, membrane bioreactor, anaerobic digestion, etc.
TECHNICAL CONDITIONS	All other information related to the technical conditions of operation or test of the technology for the given matrices and purposes described above. The technical conditions will translate into operational parameters, environmental parameters and additional parameters .

Definition of veryfication parameteres

Definition of the verification parameters shall be carried out by the Verification Body in co-operation with the proposer, building on the initial performance claim and using the template given for the parameter definition table (Table 6) in Appendix 6 of GVP. All categories of parameters as mentioned in the parameter definition table shall be considered.

The list of verification parameters and their expected values shall ensure that the technology is tested for parameters and in ranges that are relevant for the purchasers and users of the technology considering regulatory requirements, intended applications, key environmental factors and state of the art performance of technologies performing similar functions or used in similar situations.

Verification parameters and their values should:

- describe the functioning or performance of the technology in the intended application
- highlight the advantages and innovative features of the technology, in terms of the environmental added value as well as other advantages relevant for users of the technology;
- reflect direct environmental impacts of the technology in the intended application and, to the extent possible, relevant indirect impacts on the environment from a life cycle perspective
- be quantifiable and verifiable through tests

GVP, Table 6: Parameter definition table

Parameter	Value	Existing legal requirements and/or BAT values	Test method(s)	Test/available data (+ performer of tests)
Performance parameters (technical or functional performance)		e.g. Required in France, legal reference	e..g. ISO…	available data + sample (laboratory)
Operational parameters e.g. temperature	e.g. maks. 80°C			e.g. monitored for 2 months (subcontractor)
Environmental parameters Resource use during production of the product or equipment Resource use during use phase Water Electricity Raw materials Consumables Use of hazardous substances Waste generated Emissions (air, water) Reusability, recyclability (fully or in part) End of life decommissioning and disposal	600 m3/year		e.g. flow meter type…	

Parameter	Value	Existing legal requirements and/or BAT values	Test method(s)	Test/available data (+ performer of tests)
Additional parameters Man-power needed operation maintenance Space needed operation maintenance Service life Robustness/vulnerability to changing conditions of use				

Types of parameters

Performance parameters related to the performance of the technology in fulfilling its purpose (also referred to as technical or functional performance);

e.g. COD removal at least 99%, the content of the following pollutants in treated wastewater: BOD5 <10 gO_2 / m^3, suspended solids <10 g / m^3 Ammonia <1 gN-NH_4 / m^3 Total nitrogen <10 gN/ m^3

Operational parameters related to the technical conditions of the intended application. The operational parameters shall be used in particular to determine the testing conditions. Examples of operational parameters include ambient temperature, concentrations of non-target compounds in matrix, OLR, HRT, sludge concentration, transmembrane pressure, e.t.c.

Environmental parameters related to potentially significant impacts on the environment, directly and indirectly, along the life cycle (e.g. raw materials, production, use, recycling, end-of-life disposal). These may include for example energy consumption or emission of pollutants to air or water. The definition of environmental parameters should normally build on the assessment of the environmental added value in the proposal. Environmental parameters directly linked to the purpose of the technology should be considered as performance parameters;

Terms	Natural resources (raw materials, energy) extraction and transformation phase	Manufacturing phase	Use phase	End of life phase
Greenhouse gas emissions	+	+	0	+
Emission of pollutants to air:	0	0	0	0
Emission of pollutants to water:	0	0	0	0
Emission of pollutants to soil:	0	0	0	0
Consumption of natural resources:	+	+	0	NI
Energy consumption: *(including use of non-renewable or renewable energy)*	+	ND	+	+
Water consumption	0	+	0	0
Production of non-hazardous waste:	0	ND	0	+
Production of hazardous waste	0	0	0	0
Production efficiency – productivity	ND	ND	+	NI
Production efficiency – final quality	ND	0	+	+

Additional parameters related to information about the technology that is useful for users but that may not necessarily be measurable through tests and therefore not included in the list of verification parameters above. Examples of possible additional parameters include the expected service time during which the claimed performance is respected, overall service life, health and safety issues, installation and maintenance requirements and operating costs. In the statement of verification, the additional parameters are to be listed under "Additional Information".

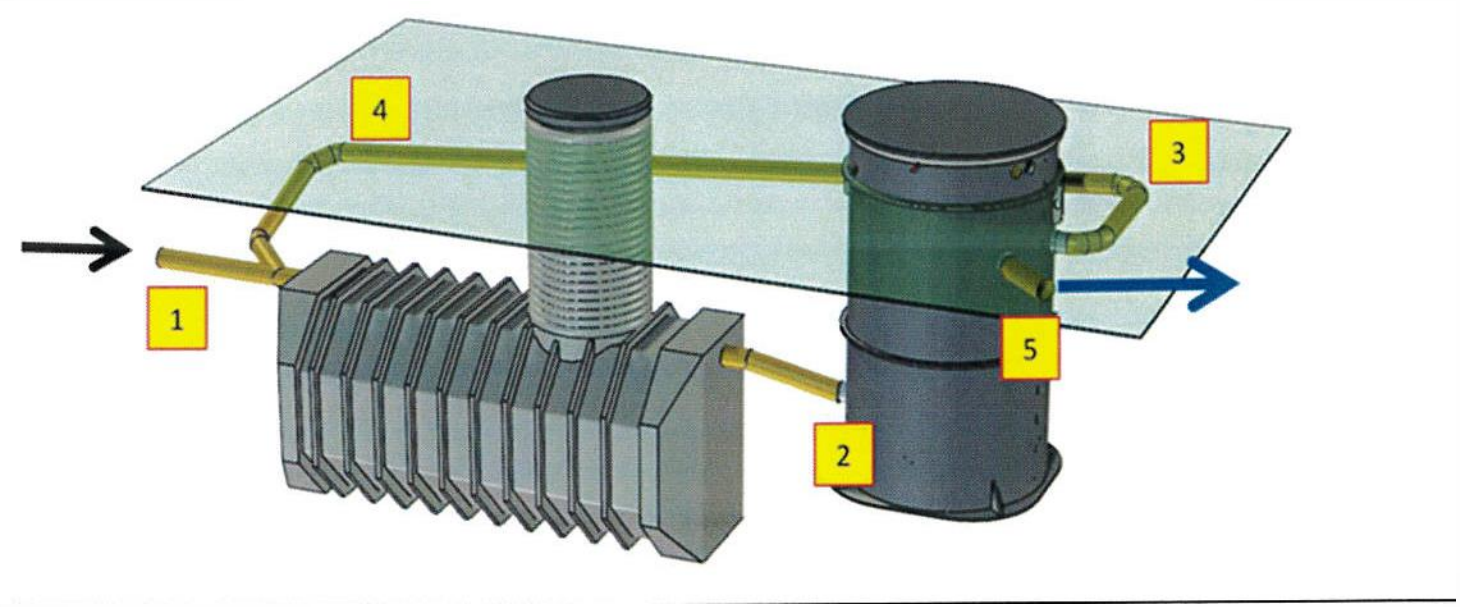
When elaborating the specific verification protocol, the Verification Body shall take into account:

- guidance documents and protocols recommended by the EU ETV Technical Working Groups for the related technology group;
- appropriate technical standards or reference documents for the related technology group;
- advice of the stakeholder forum where appropriate.

If a standard giving relevant verification parameters for the technology under verification and its intended application is available, reference to this standard can substitute the definition of the verification parameters in question. This should not prevent the possible inclusion of other relevant parameters.

The definition of verification parameters shall be done separately for each technology under verification in order to reflect the different requirements for different applications and technologies. However, if a specific verification protocol has been prepared under the EU ETV pilot programme for the same application and a comparable technology, the verification parameters of this protocol shall be considered for inclusion in the new protocol if relevant for the new technology.

BioKube A/S Summerhouses Wastewater System



For the verification, the claims regarding the Summerhouses Wastewater System were defined as follows.

The first claim is the treatment result for the following parameters. It is claimed that the ordinary treatment system (*i.e. ordinary Venus 1850) and the energy-saving treatment system (i.e. the BioKube Summerhouses Wastewater System) comply with the current Danish effluent quality standards3 immediately, on receiving incoming wastewater again, after a period (of up to 6 months) without influent wastewater:*

- Biochemical Oxygen Demand (BOD) < 10 mg/l,
- Chemical Oxygen Demand (COD) < 70 mg/l,
- Ammonium (NH4) < 5 mg/l,

and for systems having the P precipitation system installed (see section 2.2.3):

- Total phosphorous (P) < 1.5 mg/l.

The second claim is that the use of a flow-switch will enable the energy-saving treatment system to power down parts of the system during periods without influent wastewater (up to 6 months), reducing the electric power consumption for use at summer cottages by at least 50%, compared to the ordinary treatment system.

Test and analysis parameters overview

Wastewater parameters	Operational parameters
BOD COD NH_3-N NH4-N Total P	Flow of raw wastewater to the BioKube treatment systems at the WWTP
	Environmental parameters
	Power consumption

Energy consumption (kWh) by the energy-saving and ordinary treatment systems at Tappernøje WWTP during the dormant and active phases of the test period.

Treatment system	Dormant period (181 days)	Active period (13 days)
Energy-saving	0.76 kWh/d	1.79 kWh/d
Ordinary	1.83 kWh/d	1.70 kWh/d

Thank you for your participation and attention!