

Why

broiler houses on the farm itself can be treated and reused. This should be done in a sustainable, economical and practically feasible way. By valorizing this water stream as an alternative source, the goal is to help poultry farmers to:

- reduce their water consumption,
- become less dependent on groundwater or tap water,
- and better prepare for future regulations and increasing permitting requirements for water use

Problem Statement:

Poultry farms use large amounts of water to clean their houses, leading to significant pressure on their water consumption. At the same time, they will face stricter regulations around groundwater abstraction and re-licensing in the future, making access to traditional water sources (including groundwater) uncertain. Although the cleaning water used contains relatively low concentrations of nitrogen and phosphorus, it is still legally classified as manure. As a result, there are requirements for storage and the runoff regulations apply.

This combination of increasing water pressure, limited access to groundwater and strict regulations surrounding cleaning water is prompting poultry farmers to consider alternative solutions. The challenge, then, is: **In what way can poultry farms treat and reuse their cleaning water on their own farms in a technically and economically feasible way that reduces their dependence on scarce water resources while meeting applicable environmental regulations?**

What

To purify the cleaning water, a plant has been installed at the Poultry Industry Pilot Farm next to the broiler house. The water treatment plant is housed entirely in a 20-ft container and includes four functional compartments:

Compartment:	Functionality:
Bio-compartment	Aerobic biological purification via nitrification
Anoxic compartment	Anaerobic denitrification of nitrate to nitrogen gas
Sludge Buffer	Storage of excess biosludge and recovery of water
Technical room	Process control, aeration pumps and measuring equipment

In addition, (underground) storage is provided to store the untreated (influent) and treated cleaning water (effluent) from at least 1 cleaning operation.

A schematic overview of the process (Diagram 2 and Figure 3) shows the sequence of compartments and the direction of water flows, from collection to reuse.

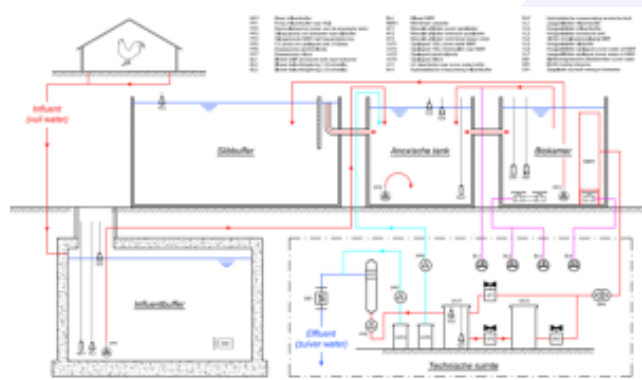


Diagram 2: Schematic overview of the structure of the water treatment system.



Figure 3: Overview of the different compartments in the purification container.

Cost

To get an idea of the cost of purifying the cleaning water, a business case was specifically developed (example in Chart 6). The costs are divided into the 2 parts:

- Installation costs (Capex – Capital Expenditures).
- Costs related to the operation and maintenance of the plant (Opex – Operating Expenditures).

In addition to these 2 cost items, the following parameters are also taken into account:

- Installation costs are depreciated over a period of 10 years. Afterwards, only operating costs are charged.

In addition, the business case includes a number of other variables that depend on the specific business situation:

- Number of m³ of cleaning water to be treated per year.
- Destination of treated cleaning water: reuse or discharge
- Actual cost of original reuse or disposal of untreated cleaning water

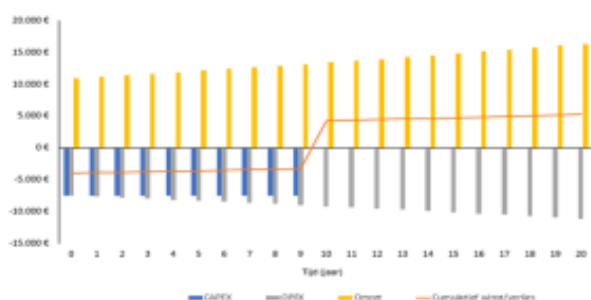


Chart 6: Example of an economic calculation of a treatment plant based on CAPEX, OPEX and

Benefits

As the cleaning water is catalogued as manure, the specific spreading regulation applies in Flanders. This means that this cleaning water cannot legally be spread during the restriction period (± 5 months). By reusing the purified cleaning water for cleaning the stables, only a storage capacity is needed for the amount of water for 1 production round instead of 3 to 4 rounds.

This also significantly reduces the use of groundwater or tap water at the farm level. $\pm 75\%$ of the water needed for a barn cleaning can be recaptured in the influent wells and then treated.

With this treatment system, other water streams on the farm can also be purified such as condensate water from a heat exchanger, cleaning water from an air scrubber and even farmyard runoff and silage effluent

The tables below list some examples of water flows originating from agricultural activities. The water flows are divided into two groups (= "low" and "high" load) based on the load level of a number of parameters (Table 7).

Water flow from 'agriculture'	Dimensions	
	Low load	High load
Parameter influent		
BOD (mg/l)	564	1581
COD (mg/l)	1600	4900
Suspended matter (mg/l)	130	798
Total nitrogen (mg/l)	82	284
Total phosphorus (mg/l)	22	53

Table 7: Summary of nutrient loading of water streams from agricultural activities (BOD = Biological Oxygen Demand, COD = Chemical Oxygen Demand).

Based on the load level, the flow rate to be treated (m³/day) and the effluent target values (Table 8), the volume of the buffer tank and

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Treatment and reuse of cleaning water from poultry

company-specific variables.

filtration in the container can be determined.

Effluent parameter	Target value
BOD (mg/l)	<25
COD (mg/l)	<125
Suspended matter (mg/l)	<35
Total nitrogen (mg/l)	<15
Total phosphorus (mg/l)	<2
Pathogens	absent

Table 8: Target value of different effluent parameters.

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