Case study factsheet

Tain, United Kingdom

Last update on 2024-10-11

Project ULTIMATE

Tain , **United Kingdom (Great Britain)**

Description

For this case study, the symbiosis first interlinks the Glenmorangie whisky distillery and the company Aquabio which provides circular economy (CE) enabling treatment and reuse solutions. This first started in 2017, with the design and installation by Aquabio of a system for the treatment of the wastewater from the distillery. An anaerobic membrane bioreactor (AnMBR) was installed to treat the wastewater generated in the distillery during the whisky making processes and allows to discharge the treated effluent in the local estuary, the Dornoch Firth. However, the Glenmorangie whisky distillery which belongs to the Louis Vuitton Malletier Holdings (LVMH) has a strategy engrained in sustainability and the symbiosis can then also be extended to the local farmers and the local community and environment. Indeed, the Glenmorangie distillery is part of the Dornoch Environmental Enhancement Project which aims to restore Native European oysters and enhance biodiversity in the Dornoch Firth for the benefit of the local environment and community.
As part of Ultimate, Aquabio and Cranfield University (partners in the project) will collaborate with the Glenmorangie distillery and Alpheus, the current operator of the treatment site, (both stakeholders but not beneficiaries) to evaluate options to expand the CE approach at the site. The AnMBR effluent provides opportunities for heat recovery, nutrient recovery and finally with further advanced treatment for water recycling within the distillery.

Outcome of assessments

Total cost of ownership (TCO)

The TCO assessment for nutrient recovery from distillery wastewater at the Tain case study focuses on two processes, (1) struvite precipitation and (2) ammonia stripping. Over a 30-year period, the TCO for the struvite unit and the stripping unit was estimated at 26.9 million EUR and 17.5 million EUR, respectively. Major cost drivers include business operation costs, particularly the consumption of energy and chemicals. Revenue from selling the recovered struvite and ammonium sulphate as fertilizers could reduce costs, but only to a limited extent due to the low market prices of these products. A sensitivity analysis indicated that the profitability of the systems is significantly influenced by the selling price of ammonium sulphate, with a price of around 250 EUR/m^3 required for the stripping unit to break even. Furthermore, reducing chemical usage by utilising excess biogas-generated heat to raise water temperature could lower the TCO by around 4.5 million EUR, making the stripping unit potentially profitable at a lower selling price.

Legislation and policy recommendations

Clarifying responsibilities and developing consistent guidelines for water reuse licensing and service provision across the EU are essential to ensure effective practices. The strategic agenda proposes comprehensive coverage of all water reuse types, emphasizing safety, environmental impact assessment, and the integration of reclaimed water into local water balances based on regional circumstances. Future regulations should establish minimum standards for non-agricultural uses, enhance risk assessment, and promote research on innovative water reuse technologies and practices. (see also D1.10)

Assess the opportunity of eco-labels and certification schemes for circular by-products. This may be an opportunity to foster material recovery purposes in Europe through the promotion of best practices to the consumers. Additionally, a potential mandatory share of recovered fertilisers in conventional fertilisers can stimulate a market pull.

Applied technologies

- **Ammonium sulphate production (air stripping & scrubbing)**
- **Anaerobic Membrane Bioreactor (AnMBR) with degassing unit**
- **Low grade heat recovery from wastewater**
- **Reverse Osmosis**
- **Struvite production**

Publications and references

- Kleyböcker, A., Bruni, C., Gonzalez Camejo, J., Naves Arnaldos, A., D1.10 Lessons learned from synergy workshops, Project report, 2024
- Naves Arnaldos, A., van den Broeke, J., Guleria, T., Bruni, C., Fantone, F., Touloupi, M., Iossifidis, D., Giménez Lorang, A., Sabbah, I., Farah, K., Baransi-Karkaby, K., Pidou, M., Reguer, A., Kleyböcker, A., Jährig, J., Vredenbregt, L., Thisgaard, P., D1.9 Start-up and intermediate results of plant operation from all case studies, Project report, *ULTIMATE,* 2023
- R. Radcliff and A. Zarnadze, Application of Membrane Technology to the Production of Drinking Water, Scientific article, 2004

Scale

Operational scale of this case study related to the application of tools and technologyies

- Local scale

Related tags

air stripping | ammonia | fertiliser | heat | Circular Economy

Contact data

Contact person

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Involved organisations

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