For Earth, For Life
Kubota

Water Reuse at breweries and wineries employing KUBOTA Membrane Bioreactor (MBR) process

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1. Introduction

How much water is needed to produce our food and how much do we waste?

In September 2015, the UK committed itself to the 2030 UN Sustainable Development goals. There are seventeen goals, with the sixth being to ensure availability and sustainable management of water and sanitation for all. Drilling down within this goal further, two targets are especially interesting and pertinent for the UK water markets. These are:

Goal 6.3

"By 2030, improve water quality by **reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally**."

Goal 6.4

"By 2030, **substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity** and substantially reduce the number of people suffering from water scarcity."

Water volume required to produce a 250 ml glass of wine and beer is 109 and 74 litres, respectively, according to the Institute of Mechanical Engineers (IME). These volumes are not significant as compared to the water volume needed to produce some food products, such as beef, however, it is reasonable to think about overall water use efficiency and possible water saving and reuse. The Enhanced Capital Allowance (ECA) scheme in UK lets businesses write off 100 per cent of the cost against taxable profits in the year of purchase of water efficient plant and machinery – Kubota MBR system is eligible for the ECA.

Typical values for the volume of water required to produce common foodstuffs		
Foodstuff	Quantity	Water consumption, litres
Chocolate	1 kg	17,196
Beef	1 kg	15,415
Lamb&Mutton	1 kg	10,412
Wine	1 x 250ml glass	109
Beer	1 x 250ml glass	74

Table 1. Typical water volume required to produce food, source IME (2013)

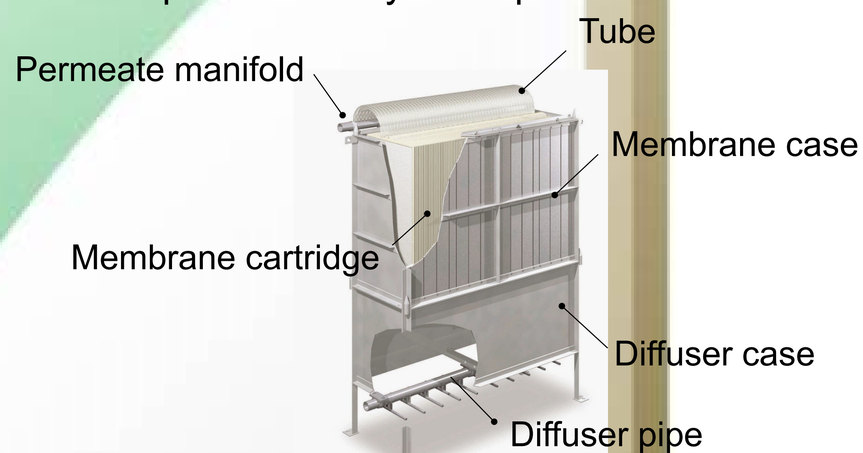

Figure 1. Kubota Submerged Membrane Unit structure

2. Kubota MBR wastewater treatment references at Breweries and Wineries

Up to date, there are over 600 Kubota MBR references in Europe, out of which 60% by number is industrial. 45% of European industrial MBR references account for food and beverage and there are 34 winery references, being one of the largest industrial references. Drivers for MBR technology in winery applications are NOT discharge quality: scarce available space, capacity enlargement of conventional treatment plants, minimisation of visual and odour impact, need for reduced civil engineering, treated effluent reuse for on-site cleaning or irrigation, etc.

3. MBR technology

Conventional activated sludge process with sedimentation allows the suspended solid escape into the effluent as well as nutrients such as hydrocarbons and nitrogen. When combined with membrane filtration, footprint for the wastewater treatment plant is reduced down to 1/3 to 1/4 whilst the process is stabilised and the effluent quality is typically BOD < 5 mg/l and SS < 2 mg/l. Bacteria is eliminated ca. log 4-6 and the MBR acts as disinfection, enabling water reuse without further post-treatment. Common water reuse purpose of winery and brewery wastewater is irrigation and washing. Figure 2a and 2b show typical MBR plant configurations. Table 2 shows Brewery St. Jozef's data observed in 2016.

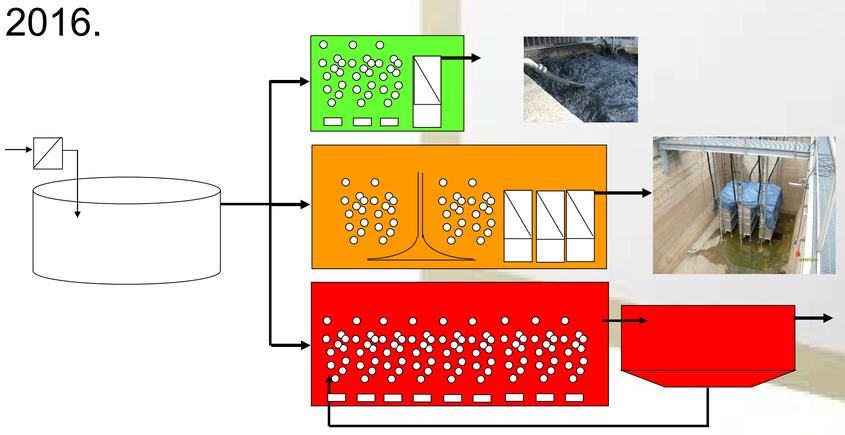

Figure 2a. RETROFIT Hybrid MBR plant (40 – 140 m^3/day)

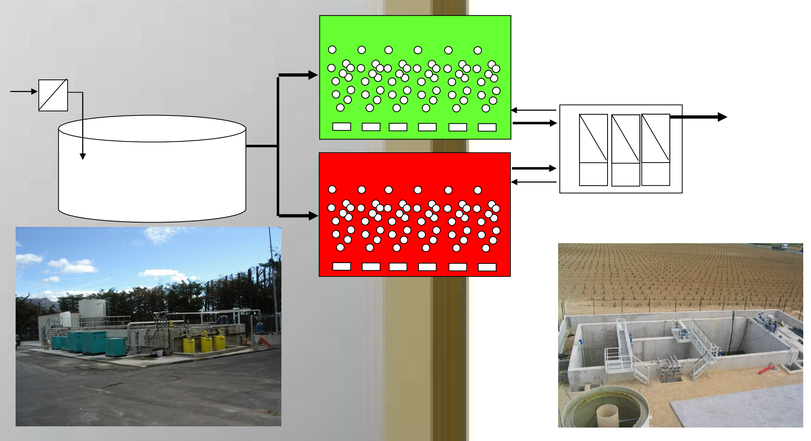

Figure 2b. NEW BUILD Modular MBR plant (70 - 224 m^3/day)

	Influent	Effluent	Effluent consent
COD (mg/L)	2184	8	125
NH_4-N (mg/L)	/	±0	Not required
Total P (mg/L)	5.2	0.2	1,0
pH	9.82	7.84	6.5-9

Table 2. Brewery St. Jozef influent and effluent characteristics

4. Conclusions

Lack of nutrient caused viscous bulking as a result of sudden increases of the organic load, however, controlling nitrogen and phosphorous dosing resulted in stable MBR process. Experience shows MBR as a reliable solution for the wine industry. Easy retrofit to existing plants, flexibility against seasonality, process stability, high effluent quality and possibility to reuse the treated effluent were demonstrated.