



The role of AnMBR LE™ Anaerobic MBR in environmental improvements at the Glenmorangie Distillery

- Aquabio and Freudenberg Group
- The Glenmorangie AnMBR Project - Why do it?
- Technology Selection – Why AnMBR?
- Scope of Supply and Layout
- Key Features of the AnMBR LE™
- Summary

Aquabio and the Freudenberg Group



Freudenberg is a family-owned group of companies

- Founded in 1849
- Sales of over €7.5 Billion, over 40,000 employees in 60 countries
- Foundation of sustained success based on strength of core values, innovation, prudent entrepreneurship and the ability to adapt to change.

Aquabio

- 100% Part of the Freudenberg Group
- Over 18 years of advice, process and engineering design, complete equipment supply and project management for water and wastewater treatment and reuse systems.
- Expertise in the Food and Drinks sector
- Unrivalled references, particularly in water reuse



The Glenmorangie Project – Why do it?



Corporate Responsibility

- Glenmorangie is owned by Louis Vuitton Moët Hennessy (LVMH), internal focus on corporate Social and Environmental responsibility identified a relatively high COD load discharge into the local receiving water.
- The wastewater from the Glenmorangie distillery constitutes over 90% of the LVMH COD load but only makes up about 1% of the LVMH revenues.
- Reason: Glenmorangie are a 'cradle to grave' producer so the management of the process by-products lies solely with them.

Dornoch Environmental Enhancement Project (DEEP)

- Glenmorangie is part of **DEEP** with Heriot Watt University, the Marine Conservation Society, National Museums of Scotland and other technical partners. Focus of environmental improvements to the local environment the Dornoch Firth area in North East Scotland.

Key Decision-making Criteria



- ✓ **Corporate Compliance**
 - Meet LVMH targets for Corporate Social and Environmental Responsibility.
- ✓ **Legal, Regulatory, and Health and Safety Compliance**
 - Meet Statutory and Local Regulations and Discharge Criteria
- ✓ **Assurance of Supply**
 - Technology Supplier must have extensive experience of industrial wastewater treatment processes, notably in Food and Drinks
 - Must have proven track record and history of Customer Satisfaction
- ✓ **Quality and Service**
 - Must have reliable, robust supply chain of suppliers and subcontractors
 - Essential for ongoing process management and aftersales support
 - Process security - Must be a high quality, robust solution

Key Decision-making Criteria



✓ Total Cost of Ownership

- Solution should be designed to reduce, optimise whole life cost
- Low energy operation and energy efficient equipment selection

✓ Innovation

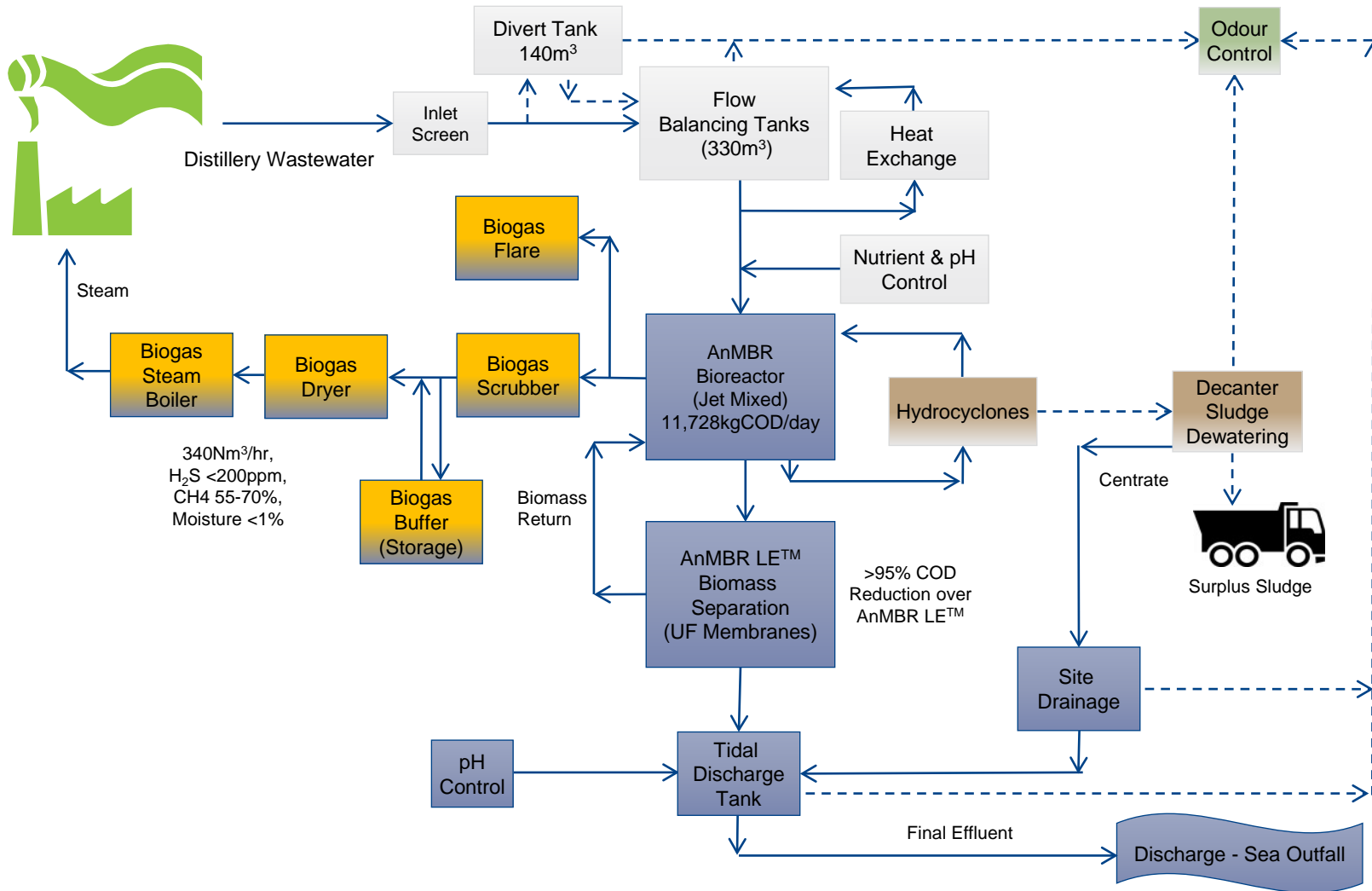
- Must demonstrate monitoring and performance to maximise energy efficiency
- Must have control and flexibility of the membrane biomass separation stage & energy efficient solution, with ability to automatically optimise membrane performance as plant flows vary
- Long history of successfully delivering state of the art wastewater treatment plants
- Continual improvement philosophy to learn, innovate, develop and lead

Technology Selection – Why AnMBR LE™?



- **High Strength Distillery Wastewater**
 - High strength and low flow
 - Sludge Bed AD technologies less suitable
 - Concern about media, or packed bed, technologies
- **Compared to Typical Industrial AD processes**
 - Uncouples the Hydraulic and Solids Retention Times - Complete Solids Retention and Control of a Long Sludge Age
 - Greater Tolerance of TSS (and Fats, Oil & Grease but not at Glenmorangie)
 - Higher %COD reduction and Biogas Quality & Yield (Nm³/kgCOD)
 - Higher quality final effluent & TSS free = Simplified tertiary treatment, eg.g. Nutrient Removal, Reuse
 - Low energy biomass separation, with NO Flocculants/Coagulants required (process issues and cost)
 - Simpler pre-treatment
- **Health & Safety**
 - Completely Enclosed Pumped Sidestream - the External Recirculation UF Membrane Loop is NOT exposed to the Atmosphere/Air
 - No Gas (e.g. Methane, Nitrogen) Scouring is Required on the Membranes
 - CIP 'In Loop' Cleaning
 - External to Bioreactor Servicing and Maintenance

Glenmorangie Treatment Schematic

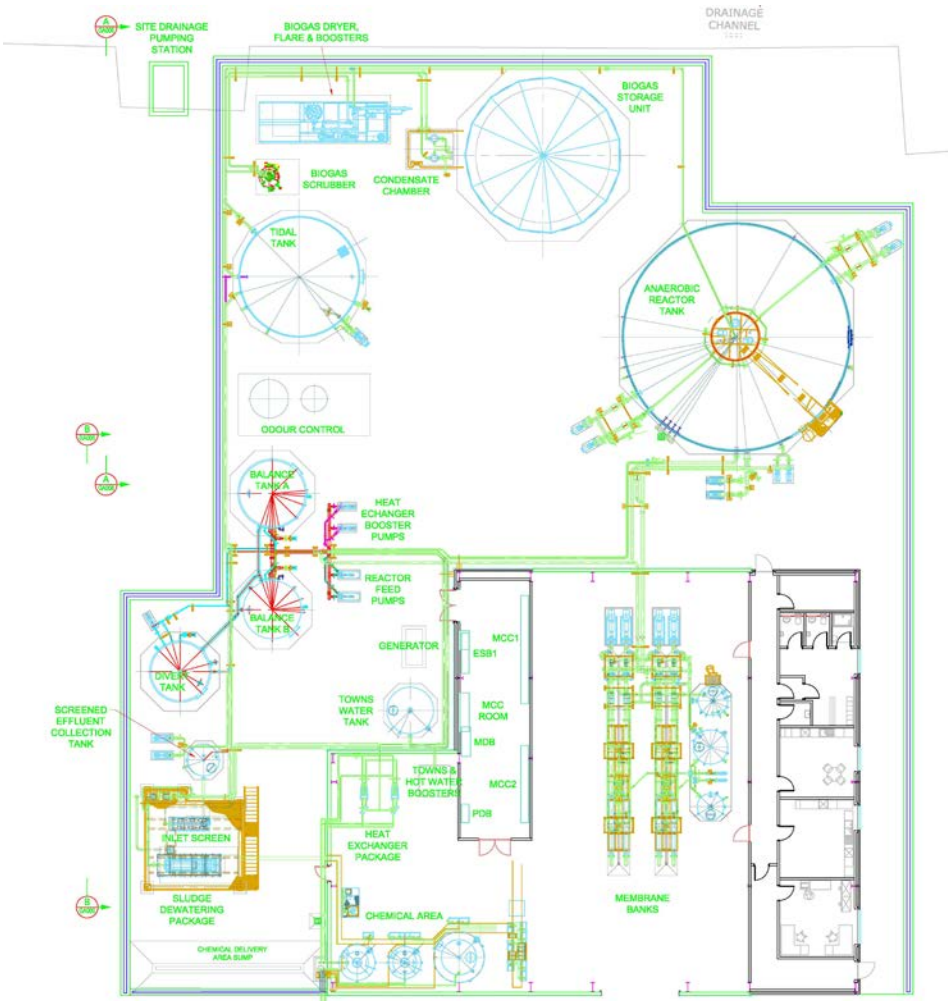


Scope of Supply

- Assistance with Planning permission drawings
- Technology package process design,
- HAZOP
- Mechanical and electrical design and installation
- Fully tested control and SCADA software & communications network
- Control systems integration
- Hydraulic and electrical testing of plant
- Plant commissioning and performance testing
- Supply of Operation and Maintenance Manuals
- Training of operational and management personnel
- Ongoing office based support via remote access to SCADA



Plant Layout



Site progress as at May 2016

Key Features of the AnMBR LE™ System



High quality effluent

- Complete barrier to suspended solids, TSS retention
- Ensuring high quality effluent
- Tertiary options for water re-use (Nutrients).

Lower whole life costs

- High flux performance
- Optimised installed membrane area
- Long membrane life
- Low pressure and low energy operation

Ease of maintenance

- 'Out-of-tank' and low level installation of aeration and UF membrane equipment
- No moving parts immersed in the biomass
- Hygienic operation



Control Panels and Communications Network



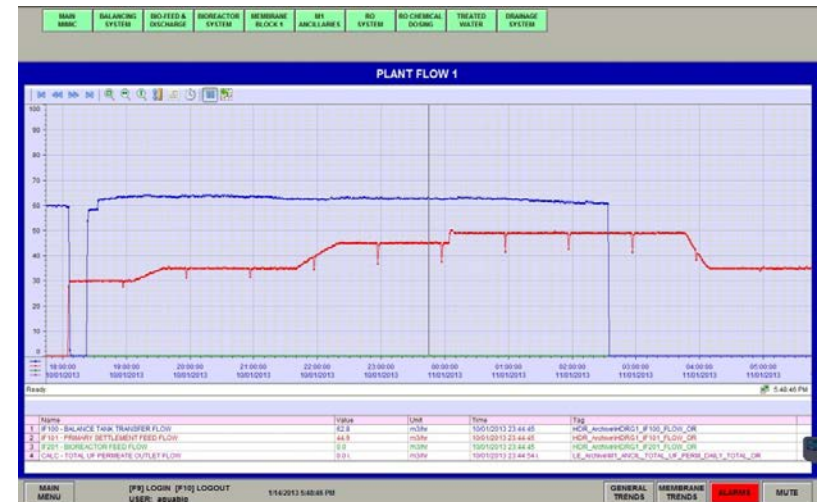
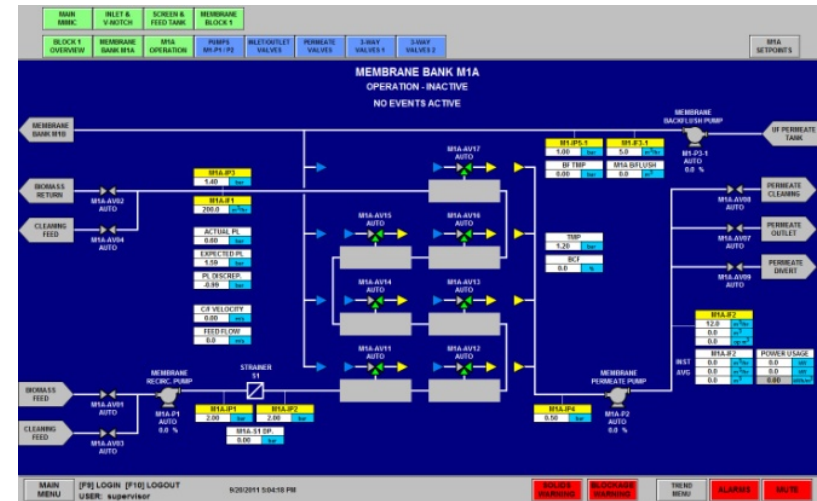
- In-house design and fabrication of control panels
- In-house design and configuration of communication networks
- Standardised approach to component selection
- Ethernet, Profibus DP and ASi networks
- Pneumatic actuation of valves via ASi solenoids
- Complete testing of control panel, communications networks, control software and SCADA prior to delivery
- Standardised approach includes electrical installation on site, reducing programme



Plant control and SCADA software



- In-house design and programming of control software and SCADA
- Bespoke header software supplemented with standard AMBR LE software
- Comprehensive SCADA package enabling operation, alarm handling and trending
- SCADA PC installed with dedicated UPS
- Remote access enables remote support of process and PLC and SCADA code
- Wi-Fi network installed on site to enable plant operation from tablet



- Seed Sludge Introduction August 2016
- Project on Programme
- Project on Budget – Deviation <1%
- Plant Operation by United Utilities
- Process Establishment Autumn 2016



Pure Confidence for our Customers

FREUDENBERG FILTRATION TECHNOLOGIES