

## The Project

Situated on the north shore of Tortola and nestled between two of the most pristine beaches in the British Virgin Islands (BVI) archipelago, the Long Bay Hotel & Resort has been a key destination for leisure & business travelers across the Caribbean for 75 years. In early September 2017, however, Hurricane Irma tore through the heart of the BVI and devastated the resort, including villas, spa & conference center and much of the utility infrastructure.

Fortunately, the following year, a group of international investors acquired the property with a vision to rebuild the hotel and resort to its former glory and updated to a new standard of excellence – beach-front villas, hospitality areas, recreation areas and a complete rebuild of the infrastructure. Over a period of several months in 2018, Enereau worked with the client to develop and refine a range of concepts for a wastewater treatment plant that would fit into the footprint of the previous facility, support the property redevelopment goals and produce a continuous and reliable supply of up to 25,000 USgpd (100 m<sup>3</sup>/d) of reuse-quality water for landscape applications.



*The devastation of Hurricane Irma took many of the resort's facilities offline, including the wastewater plant.*

Located less than 100 yards (100m) from the coast and amid an island-wide reconstruction effort, the Enereau team needed to incorporate a number of project-specific design requirements:

- Low Energy
  - o The BVI has some of the highest electricity rates in the world and experiences frequent power interruptions. With on-site back-up power from expensive diesel fuel generators, every kWh counts.
- Longevity
  - o With its close proximity to the coast, all major components such as structural framing and tankage had to be fabricated from non-metallic or corrosion-resistant materials.
- Modularity
  - o With a shortage of construction labor on the island, Enereau was tasked to supply a “plug ‘n play” system that could be installed by the hotel’s own maintenance team without need for specialized contractors or trades.

### **The Solution**

Following a site visit in late 2018, the team determined that the best solution for the application’s footprint and performance requirements would be the nrPUR Membrane Filtration Module in a Membrane BioReactor (MBR) configuration. The existing basins from the previous Rotating Biological Contactor (RBC) system would be repurposed as equalization tankage to reduce capital costs and combined with new BioReactors and a Membrane Filtration Module (MFM) to complete the MBR process train.

To save energy, vertical silo BioReactor tanks equipped with fine bubble aerators were selected to optimize the oxygen transfer in the system and minimize the aeration power requirements. The BioReactors and the MFM were prefabricated off-site to reduce on-site installation costs, with all piping inter-connections were completed by the hotel’s on-site maintenance team. To maximize longevity and minimize capital costs, a combination of Fiberglass Reinforced Plastic (FRP) and 316SS materials were used for all tankage and structural framing.

With such a compact and modular design, the entire system (BioReactors, Feed-forward tank, Membrane Filtration Module and all ancillary equipment) was shipped to site in two standard ISO containers and installed in less than two weeks. The new equipment was installed in a footprint of under 14’x40’ (4m x 12m) thereby allowing excess space in the originally designated area for future growth. A fully aerobic process

with in-tank jet aeration, the system creates minimal sound and no odour, allowing it to be installed at the entrance of the site and blended into the landscaping.



*Respecting the coastal location of the resort, only non-metallic and corrosion resistant (316SS) materials were used to ensure the longevity of the system.*



*Once on-site, the Prefabricated Membrane Filtration Module (316SS) & BioReactor Tanks (FRP) were plumbed together easily with pre-identified tie points.*



*The Enereau nrPUR™ MBR treats & returns 25,000 USgal (100 m<sup>3</sup>) of high-quality reuse water to the property every day for potential landscape irrigation applications.*

#### **The Enereau nrPUR™ Membrane BioReactor:**

##### Standardized & Modular Design

Developed around a series of standard, modular building blocks, the nrPUR™ family of systems offers unparalleled flexibility and reliability for wastewater treatment systems from less than 500 USgpd to over 100,000 USgpd (2-400 m<sup>3</sup>/d). Factory-assembled and tested prior to shipment, with integrated automation, permeate & CIP pumps, air scour and instrumentation, the use of proven process modules to configure the specific treatment system for each unique application ensures that each platform goes together seamlessly on site and starts up with no complications.

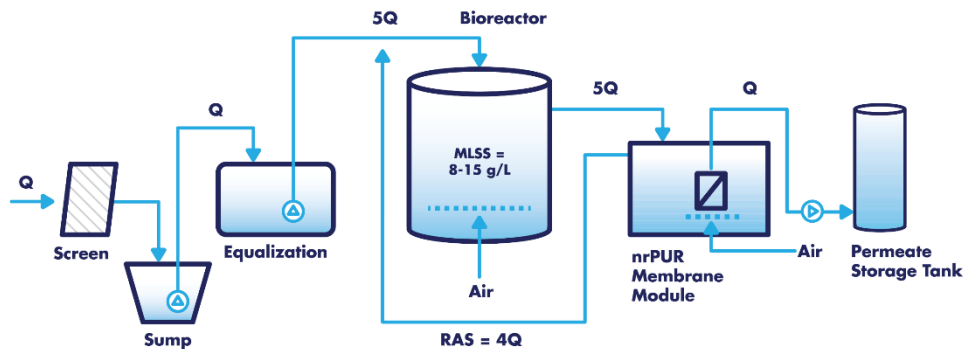
##### nrPUR™ Technology: Best-in-Class Membrane Technologies

- Ultrafiltration separation technology (less than 0.1 micron)
- High flux with low pressure
- Low-fouling hydrophilic membrane chemistry
- Self-cleaning (air scour with optional backpulse)

### Membrane BioReactor Process

Wastewater is centrally collected and pretreated to remove non-biodegradable solids and transferred to an Equalization (EQ) tank, where variations in flow and concentration are moderated. The balanced wastewater is transferred under level control to the system's BioReactor. Wastewater is recirculated between the BioReactor and the Membrane tank at a rate of 4-5 times average daily flow.

The BioReactor is a continuously-stirred, complete-mix reactor designed to ensure effective biological digestion of the organic materials in the secondary aeration step of the activated sludge process. The appropriate BioReactor volume is dictated by the Food to Micro-organism (F/M) Ratio and the mass loading of BOD per cubic volume of reactor.



### KEY :

RAS = Return Activated Sludge  
MLSS = Mixed Liquor Suspended Solids

The activated sludge process converts the soluble organic material present in the wastewater into  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and biological cell mass. An aeration system provides the oxygen required for this process. The mass of oxygen transferred is based upon the design daily influent BOD load.

The liquid phase of the mixed liquor is pulled through the membrane at a predetermined rate, or flux, established for each specific application. The mixed liquor suspended solids (MLSS) are rejected and moved away from the membrane by the air scour and hydraulic action. Permeate is drawn through the membranes under suction by permeate pumps and discharged to a clean water storage tank or for further polishing.

Typical System Results:

BOD: < 5 mg/L

TSS: < 5 mg/L

Nutrient removal levels (e.g. Total Nitrogen, Total Phosphorus) may be tailored to specific discharge or reuse requirements.

**Enereau**

Enereau Systems Group Inc. is a water technology firm specializing in the design and supply of advanced, affordable and easy-to-use systems for water reuse and reclamation. Founded by industry veterans, Enereau combines best available technology with best in class know-how to lower the cost of advanced wastewater treatment.

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