

## Sewage Treatment via Envirosource's EMM-MBBR EMMAS® Process

### Preliminary: Treatment to produce clean effluent

Sewage Treatment Plant (STP) to produce clean effluent suitable for discharge to maintain rivers and streams clean (at Class II of the National Water Quality Standard (NWQS) Malaysia) or to protect recreational beaches, or for water reuse has to be designed to produce clean effluent (such as effluent of the same standard as the Class II of the NWQS). This treated effluent water may be reused for industrial purposes or to replenish city rivers or lakes, or to supplement rivers supplying potable water. If the carrying capacity of the receiving water body is substantial, STP treatment may be more relaxed, but to a level where it would not negatively impact the receiving water body, at extreme weather conditions (Table 1 or Table 2 below applies). Envirosource's EMM-MBBR EMMAS® Process may be tailored to produce Class II water or Standard A treated effluent.

**Table 1. Environmental Quality (Sewage) Regulation 2009**

Parameter	Unit	Std A	Std B
(a) Temperature	°C	40	40
(b) pH Value	—	6.0-9.0	5.5-9.0
(c) BOD <sub>5</sub> at 20°C	mg/L	20	50
(d) COD	mg/L	120	200
(e) Suspended Solids	mg/L	50	100
(f) Oil and Grease	mg/L	5.0	10.0
(g) Ammoniacal-N (lake*)	mg/L	5.0	5.0
(h) Ammoniacal-N (river)	mg/L	10.0	20.0
(i) Nitrate-N (river)	mg/L	20.0	50.0
(j) Nitrate-N (lake*)	mg/L	10.0	10.0
(k) Phosphorous (lake*)	mg/L	5.0	10.0

\*enclosed water body

**Table 2. National Water Quality Standard Malaysia**

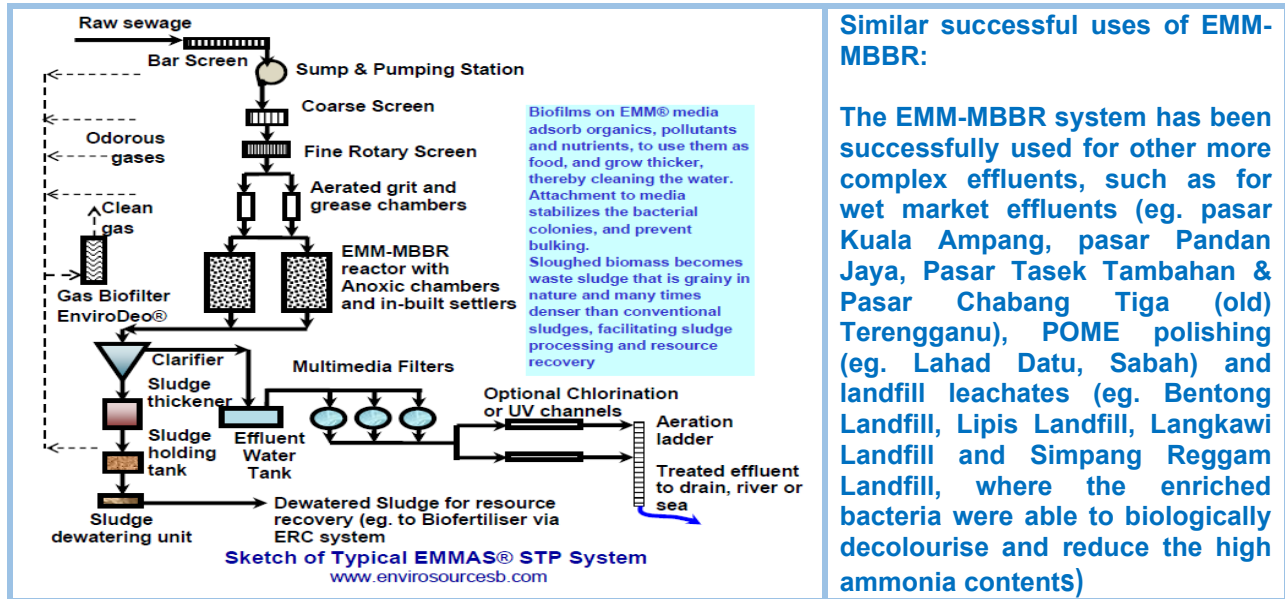
Parameters (units)	Class I	Class IIA	Class IIB	Class III
Ammoniacal-N(mg/L)	0.1	0.3	0.3	0.9
BOD <sub>5</sub> (mg/L)	1	3	3	6
COD (mg/L)	10	25	25	50
DO (mg/l)	7	5 – 7	5 – 7	3 – 5
pH	6.5 - 8.5	6 – 9	6 – 9	5 – 9
Colour (TCU)	15	150	150	-
Cond.#(mmhos/cm)	1,000	1,000	-	-
Floatables	N	N	N	-
Odour	N	N	N	-
Salinity* (‰)	0.5	1	-	-
Taste	N	N	N	-
Total Diss. Solid (mg/L)	5000	1,000	-	-
Total SS (mg/L)	25	50	50	150
Temperature (°C)	-	Norm+2	-	Norm+2
Turbidity (NTU)	5	50	50	-
E. Coli <sup>+</sup> (MPN/100ml)	10	100	400	5,000

### STP Design Philosophy

To achieve clean water of Class II as in Table 1, the most challenging is ammonia-N removal. The STP to yield low ammonia-nitrogen should be easy to operate, economical and low in energy requirement. The main objective of the Envirosource EMMAS® process (EMM® media Activated Sludge process) is: to remove SS, organics, nutrients and pathogens from sewage, down to low, harmless levels, using reliable technologies at sustainable costs. The EMMAS® sewage treatment system sustains high biomass concentrations, enriches Nitrifiers and Denitrifiers, and yield denser (grainy) sludges, greatly saving on sludge processing. A sketch of a typical EMMAS system is shown below.

The EMM® media made of PP is long lasting, requiring no replacement, and is designed to be self-cleaning (via density and configuration), while protecting Nitrifiers and Denitrifiers to

remove ammonia and rich in biopolymers to adsorb recalcitrant organics and traces of heavy metals, yielding reusable water. The sludges generated are grainy, thus dewater more easily, cutting down on flocculant costs and disposal costs.



### Existing STP Upgrading

Existing STP capabilities may be upgraded to cater to higher population (PE) or to achieve cleaner treated effluent by converting available tanks to EMM-MBBR tanks. At the very least existing STP aeration tanks or ponds may be easily and economically upgraded by addition of EMM® media.

### Example of EMMAS® STP

Shown below is a green STP using the typical EMMAS® system as in the above sketch.

