AEROBIC MEMBRANE BIOREACTOR (AMBR)

Anil Kumar Dahiya, Hector Gracia, Ziauddin Shaikh Ahammad,
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PAVITRA GANGA

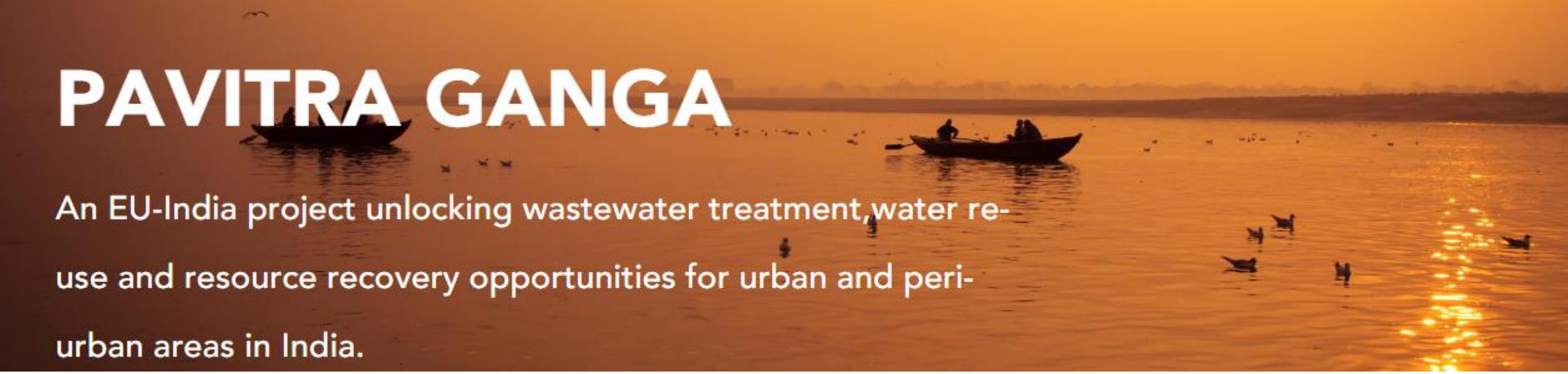
WORKSHOP

Innovative technologies for wastewater treatment, reuse and resource recovery

Advanced Analytical Lab

Department of Biochemical Engineering and Biotechnology

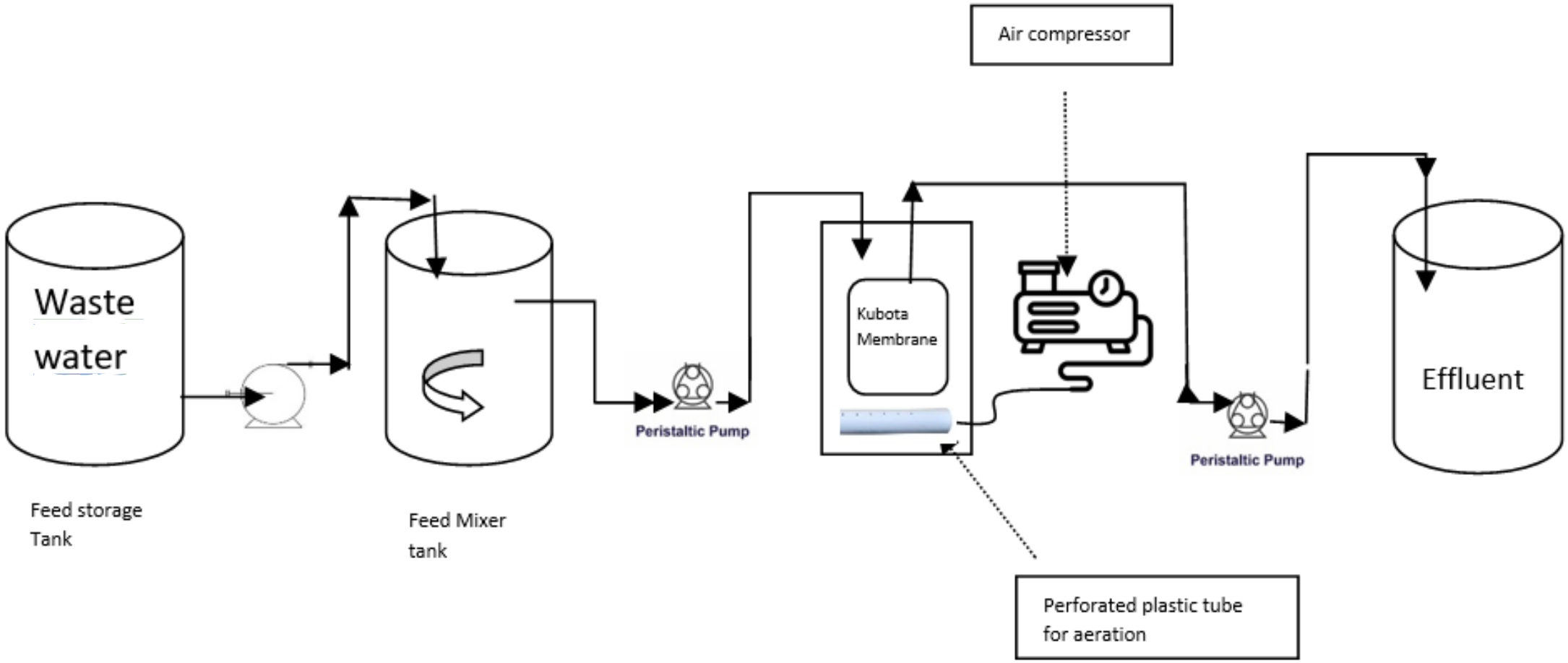
IIT Delhi, India



- Membrane Bioreactor
- LCMS Protocol

Anil Kumar Dahiya, PhD Scholar, IIT Delhi.
Prof Hector Gracia, IHE Delft
Prof Ziauddin Shaikh Ahammad, IIT Delhi
Prof T. R. ShreeKrishnan, IIT Delhi

Membrane Bioreactor – Flow diagram



Design and Operating Parameters

A Membrane reactor with a working volume of **eight litres** has been developed to treat the wastewater. The reactor works on the Kubota membrane of the following dimensions: **Length 23 cm; Width 0.7 cm; Height 31.5 cm; Filtration area = 0.1364 m^2.** The feeding tank with a capacity of **25 litres** feeds continuously stirred wastewater to the reactor based on level sensor inputs. The overall volume of the membrane reactor is 10 litres approximately to allow sensors to keep the working volume up to eight litres. Influent and effluent pumps used are peristaltic pumps.

The overall system seems to be stable with a flow of **7 ml/min** and is planned to be increased further to match the maximum efficiency of the membrane. The system is currently in the start-up phase and is being optimised. The next step is to analyse the chemical parameters followed by the **detection of emerging contaminants by LCMS-MS.**

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Figure1. Complete MBR Setup.

Figure 2. Feeding Tank with storage tank

Figure 3. Membrane Reactor with influent and effluent pumps.

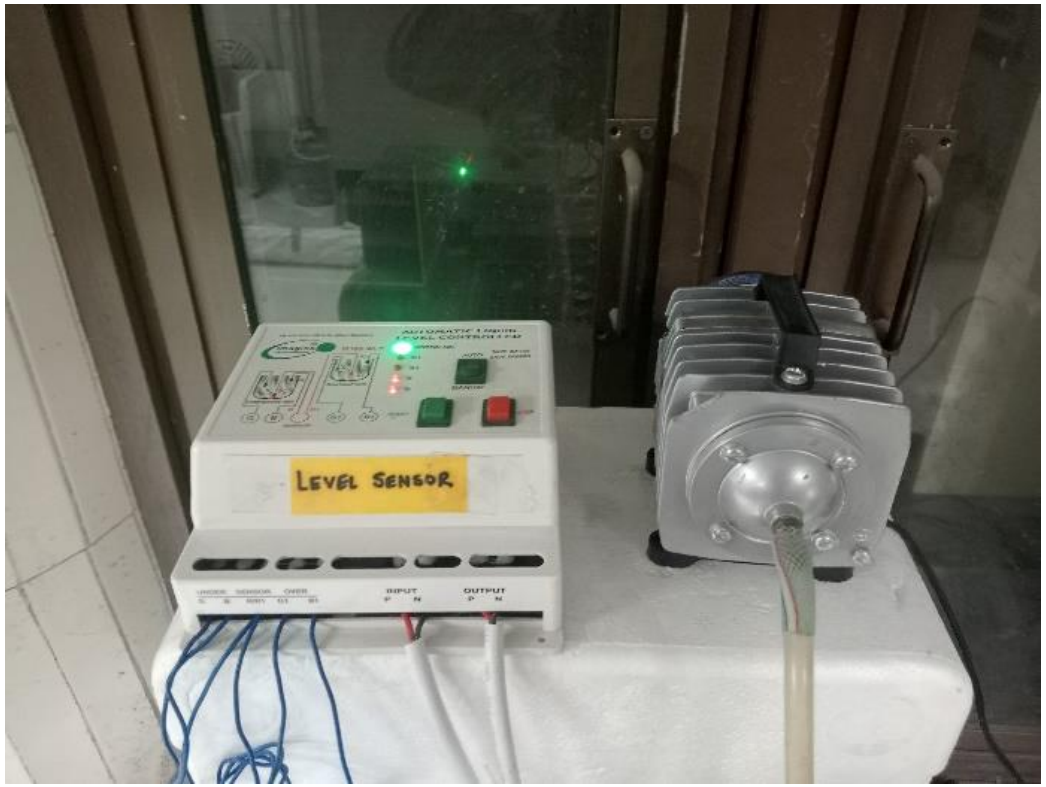


Figure 4. Level sensor and aeration pump

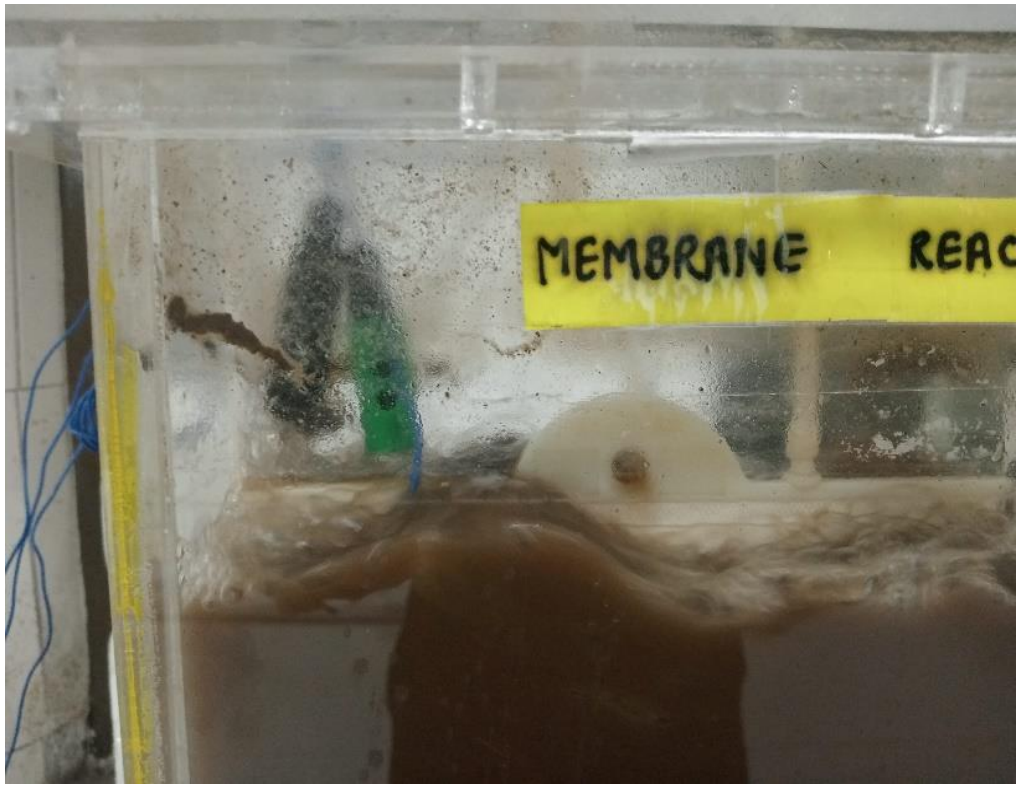
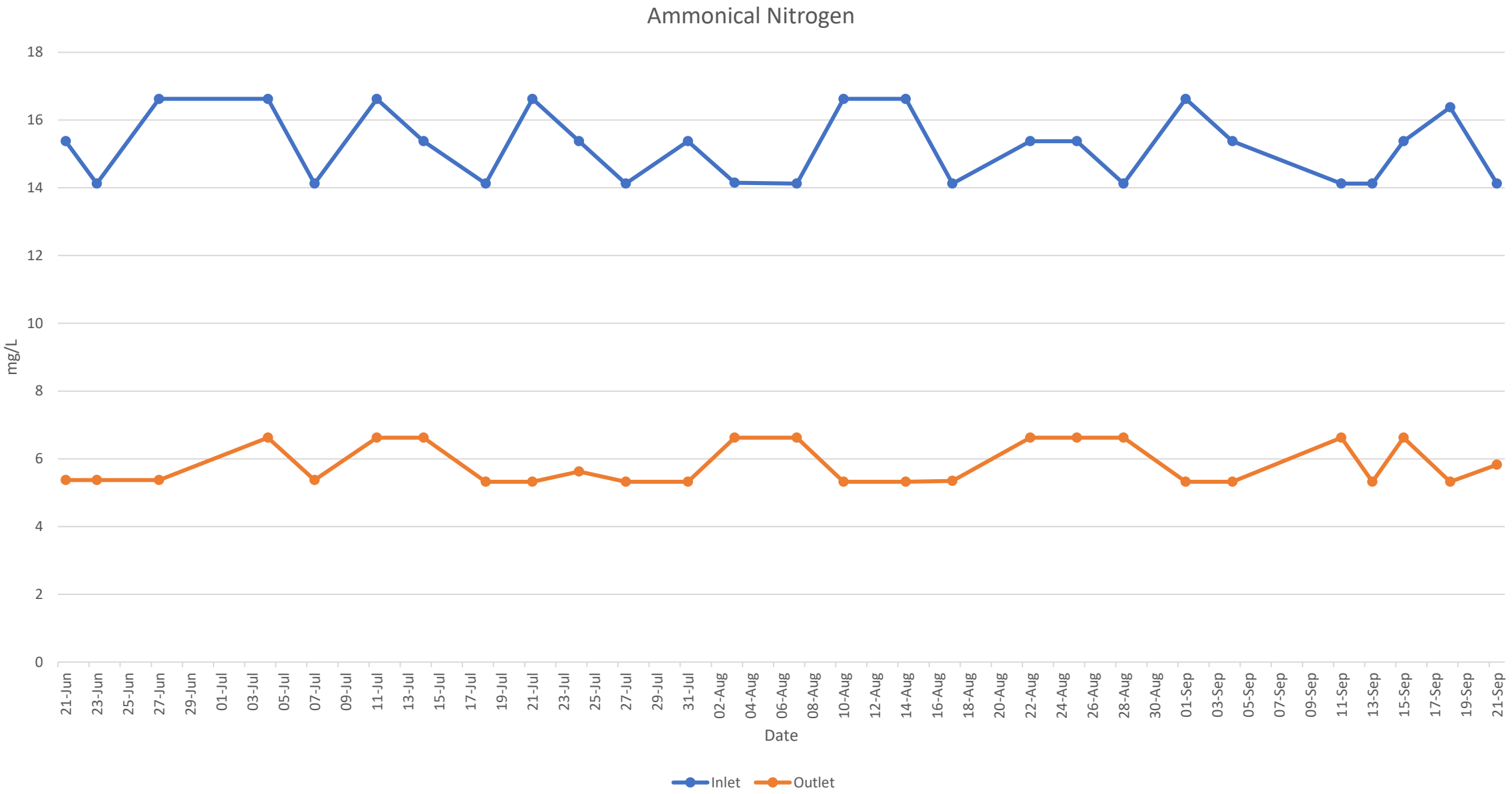
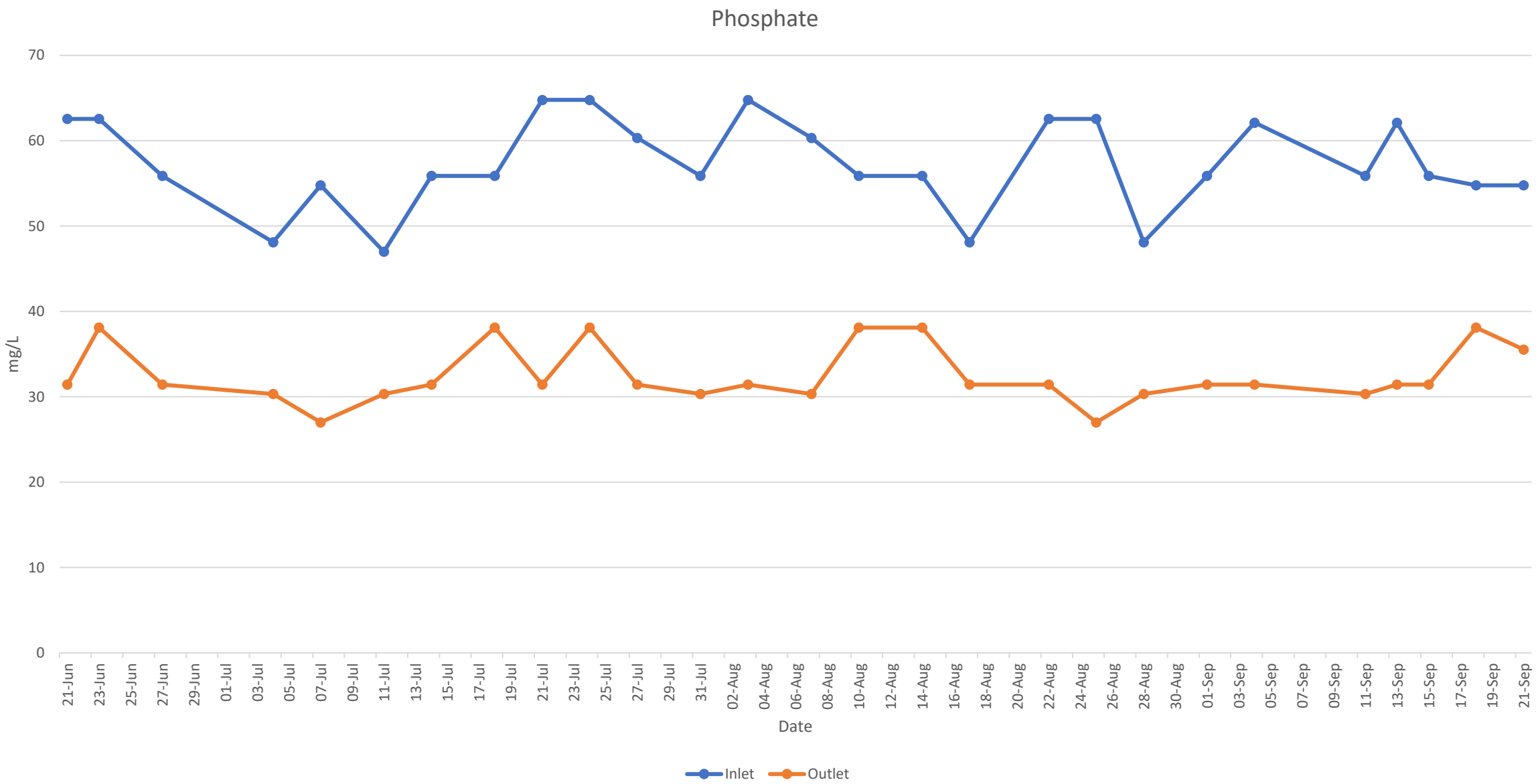


Figure 5. Close-up of MBR showing sensors (green and black).

KEY RESULTS FROM THE MBR


Ammonical Nitrogen
18
16
14
12
10
8
6
4
2
0
mg/L
21-Jun
23-Jun
25-Jun
27-Jun
29-Jun
01-Jul
03-Jul
05-Jul
07-Jul
09-Jul
11-Jul
13-Jul
15-Jul
17-Jul
19-Jul
21-Jul
23-Jul
25-Jul
27-Jul
29-Jul
31-Jul
02-Aug
04-Aug
06-Aug
08-Aug
10-Aug
12-Aug
14-Aug
16-Aug
18-Aug
20-Aug
22-Aug
24-Aug
26-Aug
28-Aug
30-Aug
01-Sep
03-Sep
05-Sep
07-Sep
09-Sep
11-Sep
13-Sep
15-Sep
17-Sep
19-Sep
21-Sep
Date
Inlet
Outlet


Phosphate
70
60
50
40
30
20
10
0
mg/L
21-Jun
23-Jun
25-Jun
27-Jun
29-Jun
01-Jul
03-Jul
05-Jul
07-Jul
09-Jul
11-Jul
13-Jul
15-Jul
17-Jul
19-Jul
21-Jul
23-Jul
25-Jul
27-Jul
29-Jul
31-Jul
02-Aug
04-Aug
06-Aug
08-Aug
10-Aug
12-Aug
14-Aug
16-Aug
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20-Aug
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24-Aug
26-Aug
28-Aug
30-Aug
01-Sep
03-Sep
05-Sep
07-Sep
09-Sep
11-Sep
13-Sep
15-Sep
17-Sep
19-Sep
21-Sep
Date
Inlet
Outlet

Current Update

- R&D Leads and outcomes:
  - Procurement of pilot scale reactor MBR
  - MBR is installed at the site and currently operating in a start-up phase.
  - The major objective of site selection has already been achieved.
  - The preliminary equipment requirement for conventional water parameters by COD digester, multi-parameter pH probe which was taken care by basic amenities at the site lab.
  - Developments of the analytical methods to analyse different micro pollutants have been tried and tested; few methodologies have been finalized looking at the variation and availability of resources depending up on the seasons and change in temperature conditions.
  - The LCMS-MS is being used for development of analytical protocols focusing mainly on Emerging Contaminants which are usually difficult to trace appropriately in different water samples at extremely low levels but at concerning amount. LCMS analytical methods for the targeted compounds have been developed and analysis of samples are under process.
  - Parameter like pH, Temperature, COD, Ammonical Nitrogen, Phosphate and Nitrates have been recorded for a length of time.

End of the Presentation

PAVITRA GANGA

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