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Removal of cod from effluent by MBBR: Moving bed biofilm reactor

Vaibhavi G Patel[1*], Raju P Rajput[2], Saalvee H Kher[3], Mayuri R Prajapati[4], Anjali S Nair[5]
[1, 2, 3, 4] Environmental Science & Technology, Department of Environmental Science & Technology, Shroff SR Rotary Institute of Chemical Technology, Vataria, Gujarat, India
[5] Assistant Professor, Department of Environmental Science & Technology, Shroff SR Rotary Institute of Chemical Technology, Vataria, Gujarat, India

Abstract
The basic principle of the moving bed process is the growth of the biomass on plastic supports that move in the biological reactor via agitation generated by aeration systems (aerobic reactors) or by mechanical system. The moving bed processes come from the current trend in waste water treatment, from the use of systems that offer an increased specific surface in the reactor for the growth of the biomass, achieving significant reductions in the biological reactor volume.

Keywords: COD, BOD, MBBR, biomass

Introduction
MBBR: Moving bed biofilm reactor is the combination of both attached growth treatment & suspended growth treatment. MBBR treatment is nothing but carries the microbes present in the effluent. It will improve the contact area of microbes & their substrate. MBBR treatment is also similar with the activated sludge process & the biofilm process.

The biofilm carriers are retained in the reactor by the use of perforated plate at the outlet of tank, so that the media cannot pass out through the reactor. Continues Aeration system is provided for the passing of air. It is used to continuously circulate the packing and to keep it moving as to establish good contact with substrate which is present in wastewater & bacteria attached with the media. Packing of the tank volume is around 25 to 50% with specific surface area of 200 to 500 m^2/m^3. The main advantages of this process is that no return sludge is required & since the media is moving, there is no possibility of blocking the media which may of require back washing. A final settling tank is used to settle sloughed solids.

The bacteria grow on the surface of the carriers. Organic matters that are present in the wastewater will break down by the bacteria. The aeration system keeps continues with activated sludge in motion. The excess will be separated by the carriers & will flow to the final separator.

MBBR consist of polyethylene biofilm carries operating in mixed motion with an aeration system. This system can consist of a one or more than one stage system. This process is used for the removal of chemical oxygen demand (COD), biochemical oxygen demand (BOD), Nitrogen (N) from the effluent. This system is currently used in 16 countries in all over the world. The first MBBR technology used in the 1989. MBBR is highly effective method for removal of COD & BOD.

Problem summary
MBBR is an advanced high rate wastewater treatment technology with high treatment efficiency, low capital, operational, maintenance, and replacement cost. The MBBR has proved to be effective in removing up to 90% chemical oxygen demand and 95% biochemical oxygen demand with nutrients from the effluent stream at optimum condition. Now days the generation of wastewater are a major problem for all of the industries, because the effluent contains the high amount of COD. So it is necessary to remove this chemical oxygen demand from the effluent. There are several technologies for the removal of COD. MBBR is a upcoming technology for efficiently removal of chemical oxygen demand from the industrial effluent.

The main source of COD is various types of industries like Paper & pulp industry, textile industry, chemical industry, pesticides industry, pharmaceutical industry etc. Basically MBBR is a biological treatment similar to the process of Activated sludge process.

Aim & Objective
The main objective of the project is to reduce the chemical oxygen demand (COD) from the wastewater.

It includes
Set up of pilot plant
Determination & analysis of different parameters.
Checking the effectiveness of MBBR.

Methodology
The Moving Bed Biofilm Reactor (MBBR) technology is an attached growth biological treatment process based on a continuously operating, non-clogging biofilm reactor with low head loss, a high specific Biofilm surface area, and no requirement for backwashing. MBBR is often designed as

aerobic system. Samples will be collected from low income and high income society and its parameters will be evaluated prior to treatment.

The Moving Bed Bio-film reactor (MBBR) setup proposed for this study will be made up of plastic containing one compartment. The inlet arrangement for influent after primary treatment of industrial effluent will be given at the top of tank. The Outlet will be provided at lower level than inlet.

The Moving Bed Bio-film reactor (MBBR) process uses floating plastic carriers (media) within the aeration tank to increase the amount of microorganisms available to treat the wastewater compared to conventional secondary treatment. The microorganisms consume organic material. The media provides increased surface area for the biological microorganisms to attach to and grow in the aeration tanks. The increased surface area reduces the footprint of the tanks required to treat the wastewater. The media will be continuously agitated by bubbles from the aeration system that adds oxygen at the bottom of the compartment of the aeration tank. The microorganisms consume organic material. After treatment, final treated effluent will be taken outside through outlet.

Observation & Calculation

Table 1

Sample/Week	Blank Reading	Titration Reading	COD (mg/litre)
1st	23.9	21.9	3200
2nd	23.9	22	3040
3rd	25	23.2	2880
4th	25	23.8	1920
5th	25	24.1	1440
6th	25.2	24.6	960
7th	25.2	24.9	480

Calculation

- 1st sample (Initial sample)

$$= \frac{(23.9-21.98)*0.1*8000}{10*(5/100)}$$

= 3200 mg/l of COD

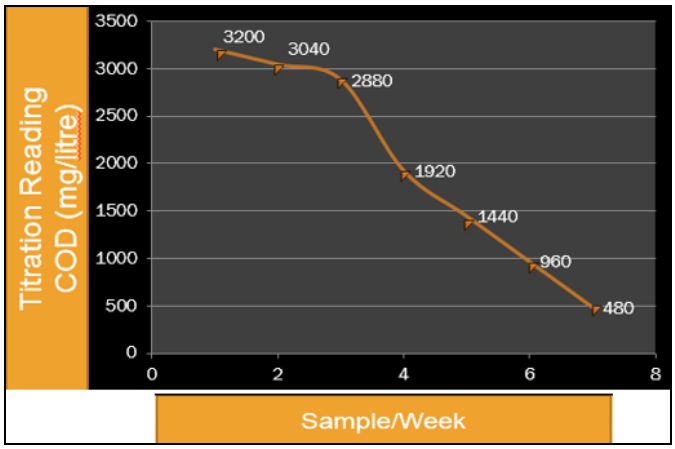

Fig 1: Graphical representation

Summary of the result

This study confirmed that the MBBR was highly effective in removing COD up to 480 mg/l with a removal efficiency of COD is 85%. In our experimental work, the media selected for the treatment purpose was polypropylene. The waste water sample which is taken for the experiment was the waste water of the Sugar factory. The physical properties of the waste water like color and COD are changed at last. After the completion of the experimental work, the value of COD decreases gradually at first and then becomes constant after 7-8 weeks.

The color of the waste water sample is also changed at last. The micro-organisms is also grown up in plastic media during the experiment due to continuous aeration. This is an environmentally safe alternative for treating waste water with the help of MBBR. A newly developed wastewater treatment by MBBR is gaining much importance and will give much better results compare to ASP.

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