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CAW 13-25

REPORT TO CORE AREA WASTEWATER TREATMENT PROGRAM COMMISSION MEETING OF FRIDAY, AUGUST 23, 2013

SUBJECT **CORE AREA WASTEWATER TREATMENT PROGRAM COMMISSION REQUEST FOR INFORMATION**

ISSUE

The Core Area Wastewater Treatment Program Commission has requested additional information on a number of matters related to assumptions and criteria used to develop the current Core Area Liquid Waste Management Plan.

BACKGROUND

The Commission requested staff to provide more detailed information on a number of topics. One of the topics is attached to this report as a memo:

1) McLoughlin Wastewater Treatment Plant – Biological Aerated Filter (BAF) Process Description.

RECOMMENDATION

That the Core Area Wastewater Treatment Program Commission receive the information and forward them to the Core Area Liquid Waste Management Committee for information.

Tony Brcic, P.Eng
Deputy Program Director
Core Area Wastewater Treatment Program

J. A. (Jack) Hull, P.Eng, MBA
Interim Program Director
Core Area Wastewater Treatment Program
Concurrence

TB:hr

Attachment: 1

Stantec

To:	Tony Brcic, P.Eng.	From:	Bob Dawson, P.Eng.
	CRD - Victoria		Victoria, BC
File:	149009002	Date:	August 7, 2013

Reference: McLoughlin WWTP - BAF Process Description

The Biological Aerated Filter (BAF) process is an aerobic attached growth biological wastewater treatment process employed to achieve secondary effluent quality for the treatment of municipal sewage and industrial wastewater. BAF's are relatively recent proprietary systems developed in Europe over the last 15 to 20 years and has been gradually introduced into North America over the last 10 years – a similar development timeline as membrane processes.

The BAF units consist of a 2.5 to 4 meter deep bed of inert filter media into which the wastewater is introduced and distributed across the bottom or top of the packed bed of media and into which compressed air is added and distributed at the bottom of the bed as a source of dissolved oxygen for respiration of the micro-organisms. A micro-biological growth similar to activated sludge (a mixture of bacteria and protozoans) forms and attaches to the media and utilizes organic material contained in wastewater as a source of food for growth. Dissolved organics are converted to carbon dioxide, water and cellular material in an aerobic environment. As well, particular material is absorbed onto the attached growth and filtered out of the flow. The biological and physical processes occurring in the BAF achieves a 90 to 95 % reduction in both organics (Biochemical Oxygen Demand - BOD) and suspended solids contained in municipal wastewater similar to CRD's sewage at organic loading rates of about 4 kg BOD/m^3 of media.

Periodically the BAF units are backwashed (once per 24 hours) with effluent pumped from an effluent storage tank, or introduced from a common effluent channel to flush out excess attached growth which sloughs off of the media. Usually the beds are scoured with compressed air during the backwash cycle to assist in sloughing of excess biological solids. The backwash stream is directed to solids separation – usually by settling and co-thickening in primary settling tanks which pretreat the sewage prior to the BAF units. The biological solids wasted from the process in this manner are the main mechanism for removal of organic pollutants.

The BAF treatment systems are proprietary, with several manufacturers providing brand name equipment (eg Biofor or Biostyr or Biocarbone trade names). The systems are provided as multi-module units to enable continuous flow treatment, as modules are taken off line for backwashing. The media can consist of plastic (expanded polystyrene) beads or ceramic beads depending upon the supplier. A typical bed is shown in Figure 1. Usually the BAF systems are provided with automatic control systems for controlling the biological processes, air supply and backwashing sequences.

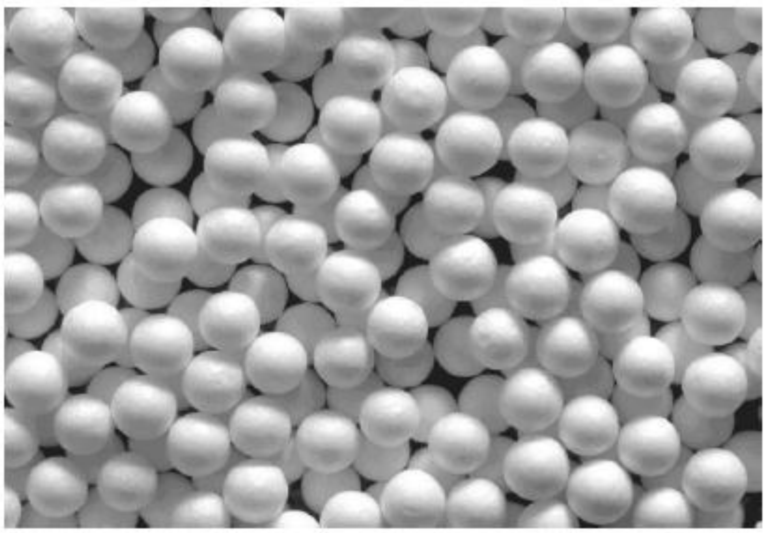

Figure 1 – Filter Media

The BAF processes can be designed for BOD and TSS removal at the higher loading rates or at significantly lower loading rates. The BAF process can achieve nitrification (ie conversion of ammonia to nitrate). Often the BOD removal and nitrification processes are separated into two stages of treatment carried out in series. De-nitrification can also be achieved by recycling nitrified effluent to BAF attached growth modules operating without air addition (anoxic conditions) to use organics in the primary effluent as a carbon source to convert the nitrate to elemental nitrogen gas. A typical, simplified BAF schematic for an up-flow BAF unit (Biostyr) is shown in Figure 2. This schematic shows a multiple module BAF cross-section with individual modules or cells operating in either treatment or backwash modes.

Reference: McLoughlin WWTP - BAF Process Description

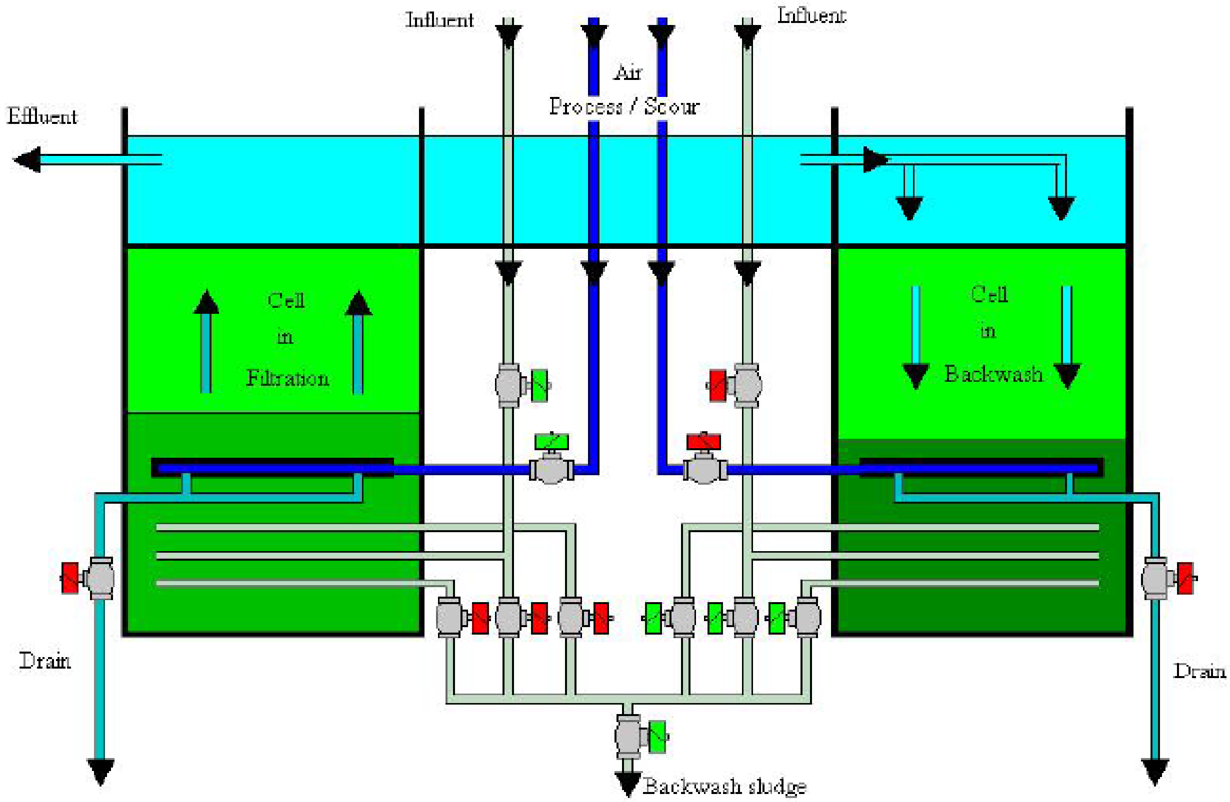

Figure 2 – Biostyr © System for BOD Removal and Nitrification

Figure 3 shows a down-flow BAF schematic with primary clarification for pretreatment, solids separation and co-thickening.

Reference: McLoughlin WWTP - BAF Process Description

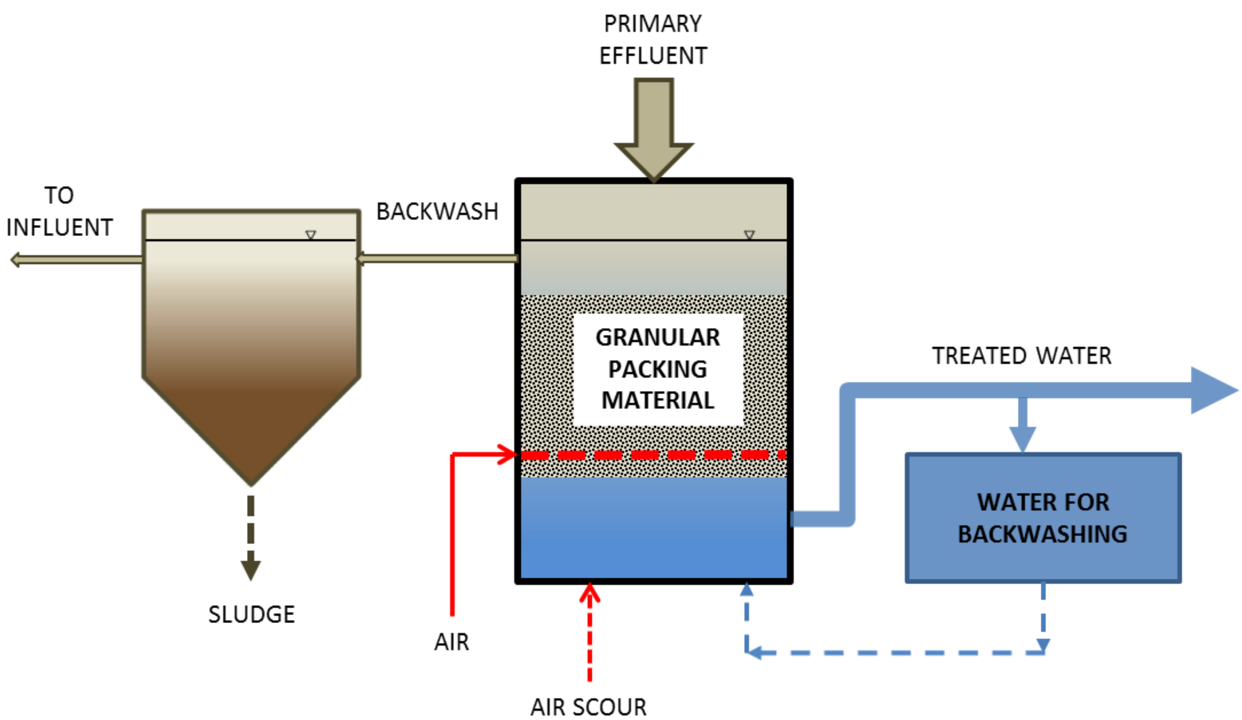

Figure 3 – Schematic of Biocarbone © Downflow BAF Process

The BAF process has been utilized at hundreds of locations throughout Europe, particularly in France, and has been applied more recently over the last ten years in North America for cities such as Baltimore Maryland, Binghamton New York, Canmore Alberta, and Windsor, Thunder Bay and Kingston Ontario. BAF's have been constructed at many locations in Europe where limited land is available in urban and coastal areas such as Aberdeen Scotland and Brighton/Hove England.

It is particularly applicable for locations where there is limited space for construction of a plant because the process does not require final clarifiers for solids separation. BAF's also can be operated at variable high flow rates without loss of biomass or process removal efficiency.

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