

Rawls, Bruce

From: John.Spencer1@ch2m.com
Sent: Thursday, April 13, 2006 7:47 AM
To: Rawls, Bruce
Subject: FW: membrane plants for phosphorus removal

Attachments: Table 3.3.jpg; Table 3.4.jpg; Table 3.1.jpg; Table 3.2.jpg



Table 3.3.jpg (485 KB)



Table 3.4.jpg (501 KB)



Table 3.1.jpg (417 KB)



Table 3.2.jpg (575 KB)

Thought you would be interested in

this information.

-----Original Message-----

From: Crawford, George/TOR
Sent: Thursday, April 13, 2006 4:42 AM
To: Correll, Jim/SPK; Smith, Rick/SPK
Cc: Irving, Kelly/SPK; Spencer, John F./SEA; Johnson, Bruce/DEN; Leaf, William/BOI
Subject: RE: membrane plants for phosphorus removal

Jim and Rick, I continued this phosphorus discussion with Bruce and Bill Leaf. The attached Figures from a WEF text may be useful.

The four tables are from the WEF book "Biological and Chemical Systems for Nutrient Removal".

Table 3.1 shows the theoretical solubility limit for P concentration using alum - at about 0.01 mg/L when in the best pH range. What this means is that the chemistry of Alum phosphate precipitation always results in some remaining soluble P concentration (even at infinite alum dosage!) that cannot be removed by membranes or filters, and that soluble concentration is about 0.01 mg/L. So the effluent from any plant will have, as a minimum, about 0.01 mg/L soluble P plus whatever P is associated with particulate matter in the effluent. So then it comes down to particulate removal - and by this we mean colloidal plus TSS, not just "TSS". Table 3.3 shows some observed P concentration data versus molar alum dosage - bottoming out at about 0.04 mg/L in the tests shown.

Tables 3.2 and 3.4 show the same for ferric - theoretical limit at about 0.04 mg/L, and observed P versus molar ratio bottoming out at about 0.06 mg/L.

So to get to below 0.04, we use alum instead of ferric, and we need to get closer to the theoretical solubility limit than has been observed in most batch lab tests. So this is one area where Blue Water must be making progress - in particulate removal. To achieve concentrations at the theoretical solubility limit of 0.01 mg/L suggests 100% removal of all TSS and of all colloidal material (or the presence of other precipitation reactions other than alum). To get below 0.01 mg/L using alum alone requires the pH to be in the ideal range and/or ion removal.

Jim and Rick, you may already understand this chemistry, however if not please feel free to contact Bruce or me to discuss.

GVC

-----Original Message-----

From: Crawford, George/TOR
Sent: Friday, April 07, 2006 1:00 PM
To: Johnson, Bruce/DEN; Correll, Jim/SPK; Smith, Rick/SPK
Cc: Irving, Kelly/SPK; Spencer, John F./SEA; Leaf, William/BOI
Subject: RE: membrane plants for phosphorus removal

Yup. Look at the basic chemistry of metal phosphate precipitation, and the solubility limit when metal salts are available in excess. 100% particulate and colloidal removal will still result in a residual TP concentration - in the 0.01 to 0.04 range. Getting below (or even close to) 0.01 mg/L requires ion removal, not metal salt filtration removal.

GVC

-----Original Message-----

From: Johnson, Bruce/DEN
Sent: Friday, April 07, 2006 12:29 PM
To: Correll, Jim/SPK; Smith, Rick/SPK
Cc: Irving, Kelly/SPK; Crawford, George/TOR; Spencer, John F./SEA; Leaf, William/BOI
Subject: RE: membrane plants for phosphorus removal

we are looking at it right now. We are awaiting the second phase data to get it worked out. As George would no doubt agree, MBRs alone will not reliably produce a TP less than 0.05, even with metal salt addition. Further treatment will always be required at those levels.

Bruce

-----Original Message-----

From: Correll, Jim/SPK
Sent: Friday, April 07, 2006 10:23 AM
To: Smith, Rick/SPK
Cc: Irving, Kelly/SPK; Crawford, George/TOR; Johnson, Bruce/DEN; Spencer, John F./SEA
Subject: RE: membrane plants for phosphorus removal

Rick -

So it appears that the Traverse and Henderson phosphorous discharge limits are approximately an order of magnitude higher than what we are dealing with here. Blue Water Technology continues to claim it consistently achieves <.05 mg/l TP and frequently <.01 mg/l with its Vandal Ion Fe-conditioned sand filtration. This is getting extensive regional press. The EPA in this region is about to embark on a "comprehensive" evaluation of phosphorous removal processes to determine if this kind of filtration is the next new technology. My skepticism results from the fact that EPA has assigned mgmt of the study to Dave Ragsdale who has made overt and covert efforts over the past 2 years to promote the new sand filters based on

vendor claims and to undermine the credibility of major engineers in this field including CH2M HILL. Hopefully, the data evaluation that Bruce Johnson is doing for Blue Water will shed some objective light on the how the process can be expected to perform.

Jim

Jim Correll, PE
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"Outperforming to Build a Better World"

-----Original Message-----

From: Smith, Rick/SPK
Sent: Friday, April 07, 2006 7:07 AM
To: Crawford, George/TOR
Cc: Correll, Jim/SPK; Irving, Kelly/SPK
Subject: RE: membrane plants for phosphorus removal

thanks, mate

-----Original Message-----

From: Crawford, George/TOR
Sent: Friday, April 07, 2006 3:44 AM
To: Smith, Rick/SPK
Cc: Correll, Jim/SPK; Irving, Kelly/SPK
Subject: Re: membrane plants for phosphorus removal

Traverse effluent P is 0.5 mg/L compliance, with a client objective of 0.3. Runs at about 0.3 but still relies on chemical for that since bio-P is not always optimized. Henderson has initial and final limits of 0,2 and 0,1 mg/P and we will do that primarily with bio-P.

GVC

-----Original Message-----

From: Smith, Rick/SPK
To: Crawford, George/TOR
CC: Correll, Jim/SPK; Irving, Kelly/SPK
Sent: Thu Apr 06 19:47:29 2006
Subject: RE: membrane plants for phosphorus removal

what is the target removal, and/or target effluent concentration?

btw, good job on the WEBCAST

-----Original Message-----

From: Crawford, George/TOR
Sent: Thursday, April 06, 2006 4:42 PM
To: Smith, Rick/SPK
Cc: Correll, Jim/SPK; Irving, Kelly/SPK

Subject: Re: membrane plants for phosphorus removal

Traverse City, Henderson, each 8 mgd. TVC operating since 2004.

-----Original Message-----

From: Smith, Rick/SPK

To: Crawford, George/TOR

CC: Correll, Jim/SPK; Irving, Kelly/SPK

Sent: Thu Apr 06 18:43:24 2006

Subject: membrane plants for phosphorus removal

George

Do we have any plants on line, or under design, or construction that have phosphorus removal as a part of the process?

cheers,

Rick

spk/297

cell phone 425.301.9096