WWT Task Group on NSF/ANSI 245
Straw Ballot
February 19, 2021

Purpose

This straw ballot will revise language regarding alkalinity in Section 8 of NSF/ANSI 245.

Background

Annex N-1 of NSF/ANSI 245 provides information about nitrogen treatment stoichiometry. Section A.1.3 states that approximately 7.1 lbs of alkalinity (as calcium carbonate [CaCO3]) are destroyed per 1 lb of ammonia oxidized to nitrate. Section A.2.3 states that approximately 3.6 lbs of alkalinity is produced for each 1 lb of nitrate nitrogen removed. Section 8.2.1 states that the average wastewater characteristics delivered to the system over the course of the testing shall fall within:

- BOD5: 100 to 300 mg/L
- TSS: 100 to 350 mg/L
- TKN: 35 to 70 mg/L as N
- alkalinity: > 175 mg/L as CaCO3 (alkalinity may be adjusted if inadequate)
- temperature: 10 to 30 ºC (50 to 86 ºF)
- pH: 6.5 to 9 SU

Assuming ammonia is approximately 70% of the incoming TKN, 35 mg/L TKN x 0.7 ammonia = 24.5 mg/L ammonia x 7.1 parts alkalinity = 171.5 mg/L alkalinity. The minimum average alkalinity value of 175 mg/L appears to be based on the lower bound of the TKN influent range, recognizing that the required reduction is 50%. For a higher incoming level of TKN, 175 mg/L may be insufficient to meet the 50% reduction requirement. If this were the case, the standard does not **require** adjustment of the alkalinity level to account for average influent TKN concentration, as the wording indicates adjusting alkalinity is optional. A testing center would therefore not be required to monitor and adjust for influent TKN concentration when insufficient alkalinity is available.

An r1 straw ballot drew some comments, and the WWT Task Group on NSF/ANSI 245 met 2 times to discuss revisions. R3 language was then sent to a Joint Committee approval ballot, which received a negative vote regarding a potential conflict regarding a “shall” statement and a line in a later paragraph with the phrase “unless requested by the manufacturer”. The WWT TG on NSF/ANSI 245 met two additional times to review and revise language, and an r6 straw ballot in January 2021 drew comments. The Task Group met again in February to review the comments, and the attached language is the culmination of their efforts..

This straw ballot will last two weeks.

The grey highlighted portions of the language are proposed additions to the language of the standard.
The ~~strikeout~~ portions of the language are proposed deletions to the language of the standard.

An affirmative (yes) vote on this straw ballot means you agree with the revised language as submitted.

A negative (no) vote on this straw ballot means you disagree with the revised language as submitted. A negative vote must include an explanation of why you disagree with the revised draft.

[Note – the recommended changes to the standard which include the current text of the relevant section(s) indicate deletions by use of ~~strikeout~~ and additions by grey highlighting. Rationale Statements are in *italics* and only used to add clarity; these statements will NOT be in the finished publication.]

NSF/ANSI Standard
For Wastewater Technology –

Residential Wastewater Treatment Systems – Nitrogen Reduction

8 Performance testing and evaluation

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8.2 Testing conditions, hydraulic loading and schedules

8.2.1 Influent wastewater characteristics

Except as required by NSF/ANSI 40 for systems seeking concurrent NSF/ANSI 40 and nitrogen reduction certification, the average wastewater characteristics delivered to the system over the course of the testing shall fall within:

— BOD_5: 100 to 300 mg/L;
— TSS: 100 to 350 mg/L;
— TKN: 35 to 70 mg/L (as N);
— Alkalinity : ~~> 175 mg/L~~ ratio of no less than 5:1 alkalinity (as $CaCO_3$):TKN
— temperature: 10 to 30 ºC (50 to 86 ºF); and
— pH: 6.5 to 9 SU.

~~Unless requested by the manufacturer, the raw influent shall be supplemented with sodium bicarbonate if the wastewater is found to be deficient in alkalinity. In addition, the influent shall be supplemented with urea to meet the required influent TKN concentration. The influent may also be supplemented with methanol to maintain a carbon:nitrogen ratio of no less than 5:1.~~

The raw influent shall be supplemented to meet the required influent alkalinity, TKN, and carbon:nitrogen ratio. The influent shall be supplemented with:

— sodium bicarbonate to achieve the minimum ratio of no less than 5:1 alkalinity:TKN, unless the manufacturer and certification body may agree to a lower ratio alkalinity:TKN as described below;

— urea to meet the required influent TKN concentration; and

— methanol, or products such as MicroC®2000 and MicroC®4000 (or equivalent) to maintain a carbon:nitrogen ration of no less than 5:1

The manufacturer and certification body may agree to a lower alkalinity : TKN ratio. Adjustments shall be made based on the 30-day rolling averages of TKN, BOD, and alkalinity.

NOTE — For this testing, minimum alkalinity may be calculated as described in Annex I-1.

If the influent temperature drops below 10 ºC (50 ºF), impacting the nitrification process, sample collection may be suspended until the influent temperature returns to 10 ºC (50 ºF).

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Informative Annex 1

Information about nitrogen process

The information contained in this Annex is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. Therefore, this Annex may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

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I-1.3 Calculation example

Assuming that the minimum TKN (35 mg/L as N) is all in the ammonium-N form, the wastewater will contain 35 mg/L of ammonium-N. The US EPA *Nitrogen Control* manual (page 92), states that the theoretical alkalinity destruction ratio is 7.1 mg of alkalinity destroyed per mg of ammonium-N oxidized. An ammonium concentration of 35 mg/L would result in the destruction of 248 mg of alkalinity.

The denitrification process adds alkalinity, as described on page 103 of the *Nitrogen Control* manual, with the theoretical alkalinity production of 3.57 mg per mg of NO_3 nitrogen. If it is assumed that all of the ammonium-N is converted to NO_3 nitrogen (which is a generous assumption), the production of alkalinity for denitrification of 35 mg/L of NO_3 will be 125 mg/L.

For this example, the amount of alkalinity needed in the influent would be around 123 mg/L (248 mg/L – 125 mg/L) just to cover the process. In actuality, excess alkalinity is needed because if the alkalinity goes close to zero, wide pH swings could occur that will kill the bacteria. Allowing 50 mg/L of excess alkalinity, 173 mg/L (123 mg/L + 50 mg/L) of alkalinity will be required if the average influent TKN is 35 mg/L, the lowest allowable influent TKN. (175 mg/L Alkalinity : 35 mg/L TKN = 5 : 1)