NSF Standard 60
Joint Committee Meeting

November 28, 2018
Ann Arbor, Michigan
Agenda

- Introductions
- PQ Corporation and its product portfolio
- NSF/ANSI 60 Issue Papers - PQ sodium silicates
  - 1st issue - proposed maximum dosage increase
  - 2nd issue–proposed synonyms change
- PQ sodium silicates for corrosion control
- Examples and references
- Questions
PQ Corporation

- Headquarters in Malvern, Pennsylvania, USA
- Annual sales revenue over $1.6 billion
- About 3000 employees
- Over 67 manufacturing sites in 19 countries on 5 continents
- National Silicates is Canadian Affiliate of PQ Corporation; Head Office in Toronto
PQ Product Portfolio

Performance Chemicals

- Soluble Silicates
  - Water treatment
  - Paper bleaching
  - Silica feedstock
  - Welding rods
- Zeolites
- Specialty Adsorbents
- Specialty Silicas
- Meta Silicates
- Magnesium Sulfate
- Spray-dried Silicates

- Detergent builder
- PVC co-stabilizers
- Warm mix asphalt
- Paper filler
- Beer chillproofing
- Edible oil treatment
- Bio-fuel purification
- Matting agent
- Ink jet paper
- Polymer processing
- Anticaking
- Personal care
- I&I cleaning
- Dispersion agent for ceramic clays
- Detergent builder
- Epsom salt
- Animal feed
- Fertilizer
- Pharma
- Detergent builder
- Surfactant carrier
- Additive for refractory cements
Global Research & Development

• Primary R&D center located in Conshohocken, PA, USA
  Satellite R&D centers in:
  • Warrington, UK
  • Toronto, Canada
  • Maastricht, Netherlands

• Conshohocken facility
  • Laboratories, offices, pilot plant
  • Extensive analytical and testing equipment
1. Current Typical Use Limit (TUL) stated by NSF/ANSI Standard 60 is 16mg/L of active sodium silicate for corrosion control in drinking water.

The issue No.1: current TUL may be satisfactory for effective corrosion control in maintenance practices, however it is usually insufficient for a passivation phase of the treatment, as reported by water utilities (examples are provided).

To establish effective corrosion control with PQ sodium silicates, the revision to NSF/ANSI Standard 60 for sodium silicate is proposed, TUL increase to 100 mg/L.

The proposed increase aligns with the FDA Select Committee on Generally Recognized as Safe (GRAS) substances, Title 21, Section 184.1769a (SCOGS Report No.61)

Proposed increase does not constitute a public health concern.
(NSF toxicological assessment report available upon request)
2. Synonym “activated silica” is used for sodium silicate in Table 5.1-“Chemicals for corrosion and scale control”. Synonym ‘water glass” is used for sodium silicate in Table 4.1- “Coagulation and Flocculation”.

The issue No.2: The term “activated silica” refers to silica based polymer, a flocculent used in a coagulation process, hence is best suited in Table 4.1- “Coagulation and Flocculation”. The synonyms for sodium silicate in Table 5.1- “Chemicals for corrosion and scale control” should be water glass and silicic acid, sodium salt.

A correction to the synonyms used for sodium silicates in Tables 4.1, 5.1 and chemical index Table D1, Annex D is requested.
What are Soluble Sodium Silicates?

- Metal salts of Silicic Acid that exist in multiple polymeric forms in solution
- All silicates contain three basic components:
  - Silica -- SiO2
  - Alkali -- Na2O
  - Water -- H2O
- Silicon Dioxide (SiO₂) in a dissolvable form, stabilized by an alkali
- Versatile Chemistry with several SiO₂/Na₂O weight ratioS
  - Range from 1.6 up to 4.5
  - Most common: 3.2 weight ratio
Silicate Chemistry

Basic Silicate Species:

\[
\begin{array}{c}
\text{H}^+ & \text{Fe}^{+3} \\
\text{Na}^+ & \text{Pb}^{+2} \\
\text{K}^+ & \text{Ca}^{+2} \\
\text{Li}^+ & \\
\end{array}
\]

Silicate Species in Solution:

- monomer
- linear trimer
- cyclic trimer
Health & Safety for Sodium Silicates

• One of the safest industrial chemicals
• No toxic or volatile material
• Stable for extended periods of time
• No organics and non-flammable
• GRAS for food contact and use in water
• NSF certified for use in drinking water
PQ Sodium Silicates in Drinking Water

- Used for more than 80 years to control metal corrosion

- Recognized as a corrosion inhibitor under EPA Lead and Copper Rule (40CFR141.82, 7/1/1991)
  
  [Link](http://www.ecfr.gov/cgi-bin/text-idx?SID=531617f923c3de2cbf5d12ae4663f56d&mc=true&node=sp40.23.141.i&rgn=div6#se40.23.141_182)

- NSF/ANSI Std 60 for drinking water use
  
  [Link](http://info.nsf.org/Certified/PwsChemicals/Listings.asp?CompanyName=PQ&TradeName=&ChemicalName=Sodium+Silicate&ProductFunction=&PlantState=&PlantCountry=&PlantRegion)

- American Water Works Association AWWA/ANSI B404-03 Standard
PQ Silicates for Corrosion Control

- At water treatment dosages, silicate depolymerizes to a reactive monomeric silica

- Corrosion control with silicates is accomplished by monomeric silica reacting with metal surfaces and forming protective thin layer inside the pipes, hence preventing leaching of the metals to the water

- Initial passivation process requires high silicate dosages to establish protective film within a practical time

- Lower maintenance dosages can be applied once protective film is formed

- Maintaining sufficient SiO$_2$ levels is critical to preserve the integrity of the protective film and to provide effective corrosion control
Sodium Silicate Usage Levels - Water Utilities

- York, Maine, active sodium silicate dosage of 16-20 mg/L for two first months
- City Rochester, NJ, active sodium silicate dosage of 20 mg/L for first 20 weeks
- City of Newark, active sodium silicate dosage of 24 mg/L for several months
- Town of Hopkinton, MA, active sodium silicate dosage of 25-30 mg/L

FDA Select Committee on GRAS Substances Opinion: Silicates
SCOGS Report No. 61, 1979 stated use of sodium silicate at 100 mg/L as a corrosion preventative in a potable water as safe
Relevant References

- [6] NSF, B. Hughes, Assessment of sodium silicate. September 21, 2018
Thank you!

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