# WATER FLUORIDATION TRAINING

# REGULATORY REQUIREMENTS

**NDEE – DIVISION OF DRINKING WATER & GROUNDWATER**

**OCTOBER 25, 2023**

# FLUORIDATED PUBLIC WATER IN NEBRASKA

- **1951- 1ST FLUORIDATED COMMUNITY IN NE**
- **CURRENTLY 63 COMMUNITY WATER SYSTEMS**
- **25 CWS PURCHASE FLUORIDATED WATER**
- **35 NATURALLY FLUORIDATED WATER SYSTEMS**

# NEBRASKA FLUORIDATION LAW (NEBRASKA REVISED STATUTE 71-3305)

- LB 245 (2008)
  - WENT INTO EFFECT APRIL 18, 2008.
  - JUNE 1, 2010 DEADLINE TO FLUORIDATE.
- LB 36 (2011)

# WHAT DOES THE LAW REQUIRE?

- **CITIES AND VILLAGES WITH A POPULATION OF 1000 OR MORE PEOPLE SHALL ADD FLUORIDE TO THEIR WATER SUPPLY.**

- **FLUORIDATION MUST BE CONDUCTED AS PROVIDED IN NDHHS REGULATIONS.**

# WHAT DOES THE LAW ALLOW?

- **CITIES OR VILLAGES WITH AT LEAST 0.7 MG/L OF NATURAL FLUORIDE IN THEIR WATER SUPPLY ARE NOT REQUIRED TO ADD ADDITIONAL FLUORIDE.**
  - **BASED ON THE LOWEST FLUORIDE LEVEL OF ALL SOURCES THAT PROVIDE WATER TO THE SYSTEM.**

# WHAT ELSE DOES THE LAW ALLOW?

- **ANY CITY OR VILLAGE REQUIRED TO ADD FLUORIDE COULD HAVE ADOPTED AN ORDINANCE BY A VOTE OF THE PUBLIC TO PROHIBIT THE ADDITION OF FLUORIDE.**

  - **A CITY OR VILLAGE THAT WAS ALREADY FLUORIDATING AS OF JANUARY 1, 2008 COULD NOT ADOPT SUCH AN ORDINANCE.**

# LB 36 AMMENDMENTS

- A CITY OR VILLAGE THAT GROWS TO OVER 1000 AFTER JUNE 1, 2010 MAY ALSO ADOPT AN ORDINANCE PROHIBITING FLUORIDATION
- ELIMINATED LANGUAGE NO LONGER NECESSARY AFTER JUNE 1, 2010.

# WHAT WAS THE IMPACT OF THE REVISED LAW?

- **APPROX. 65 COMMUNITIES HAD TO ADD FLUORIDE OR ADOPT AN ORDINANCE BY JUNE 1, 2010.**

- **8 COMMUNITIES HAVE BEGUN TO ADD FLUORIDE TO THEIR WATER SUPPLY.**

# NEBRASKA FLUORIDE REGULATIONS

- **APPLICABLE REGULATIONS FOR FLUORIDATED SYSTEMS:**

- **TITLE 179 NAC 1** → Fluoridated PWS Only
- **TITLE 179 NAC 2**
- **TITLE 179 NAC 3**
- **TITLE 179 NAC 22**

→ All PWS

# TITLE 179 NAC 1

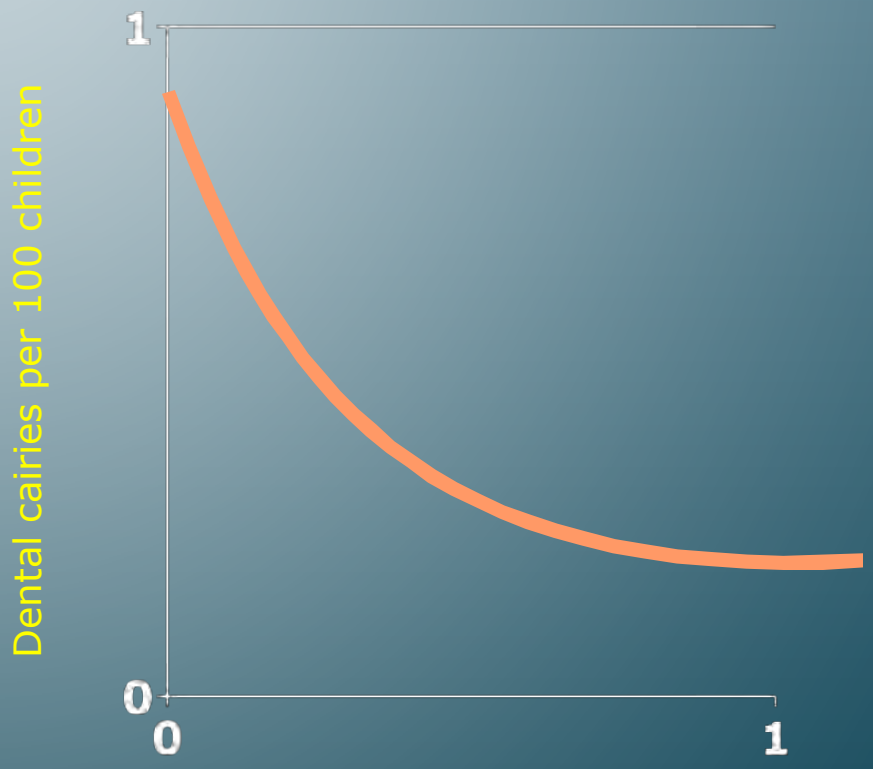
## RULES AND REGULATIONS GOVERNING FLUORIDATION OF PUBLIC WATER SUPPLIES

- **SECTION 001 AND 002 - CERTIFICATION**

- **SECTION 003.01 – OPERATION**
  - **0.8 TO 1.5 MG/L (PPM) FLUORIDE**
    - **OPTIMUM LEVEL OF 0.9 TO 1.0 MG/L**
  - **NO FLUORIDATION NEEDED IF AT LEAST 0.7 MG/L NATURAL FLUORIDE**

# TITLE 179 NAC 1

- **RECOMMENDED CDC CONTROL RANGE IS 0.1 BELOW TO 0.5 MG/L ABOVE OPTIMUM**
- **DECREASED BENEFITS BELOW OPTIMUM**
- **NO ADDITIONAL BENEFIT AND MORE SEVERE FLUOROSIS ABOVE 2 MG/L**



# NEW STANDARD!

- APRIL 2015 - CDC CHANGED THE RECOMMENDED OPTIMAL FLUORIDE LEVEL TO 0.7 MG/L.
  - OPERATIONAL RANGE = 0.5 TO 0.9 MG/L

# TITLE 179 NAC 1 (CONT.)

- **SECTION 003.02 – REPORTING/RECORD KEEPING**
  - **RECORDS OF OPERATIONS SHALL BE KEPT INCLUDING:**
    - **FLUORIDE ADDITIVE USED**
    - **AMOUNT OF WATER TREATED (TITLE 179 NAC 22)**
    - **AMOUNT OF FLUORIDE ADDITIVE USED (TITLE 179 NAC 22)**
      - **MIN. 5 DAYS/WEEK**
    - **FLUORIDE CONTENT OF FINISHED WATER**
    - **ANY IRREGULARITIES OF OPERATION**
  - **A COPY OF EACH MONTHS RECORDS ARE TO BE SENT TO DHHS BY THE 10TH OF THE FOLLOWING MONTH.**

# TITLE 179 NAC 1 (CONT.)

- **SECTION 003.03 – FINISHED WATER MONITORING**
  - **ONE FLUORIDE SAMPLE EACH MONTH SENT TO DHHS.**
    - **SAMPLE MUST REPRESENT WATER SUPPLIED TO THE CUSTOMERS.**

# TITLE 179 NAC 2
# DRINKING WATER STANDARDS

- **FLUORIDE MAXIMUM CONTAMINANT LEVEL (MCL)**
  - **PRIMARY MCL = 4.0 MG/L**
  - **SECONDARY MCL = 2.0 MG/L**

# TITLE 179 NAC 3
## MONITORING AND ANALYTICAL REQUIREMENTS

- **POINT-OF-ENTRY MONITORING**
  - **GROUND WATER = 1 SAMPLE/3 YEARS**
  - **SURFACE WATER = 1 SAMPLE/YEAR**
- **COMPLIANCE DETERMINATIONS**
  - **RUNNING ANNUAL AVERAGE OF QUARTERLY SAMPLES.**

# FLUORIDE DATA AVAILABILITY

- **NEBRASKA'S DRINKING WATER WATCH**
  - **Drinkingwater.ne.gov**
  - **dee.ne.gov/Water/Drinking Water**
- **WATER FLUORIDATION REPORTING SYSTEM (WFRS)**
  - **CDC**
  - **FLUORIDE DATA FOR ALL CWS.**
- **MY WATER'S FLUORIDE**
  - **DATA FROM WFRS**
  - **HTTP://APPS.NCCD.CDC.GOV/MWF/INDEX.ASP**

# QUESTIONS?

# WATER FLUORIDATION TRAINING

# FLUORIDE ADDITIVES

**NDEE – DIVISION OF DRINKING WATER & GROUNDWATER**

**OCTOBER 25, 2023**

# FLUORIDE ADDITIVES

- **THREE COMMON ADDITIVES IN U.S.**
  - **FLUOROSILICIC ACID ($H_2SIF_6$)**

    **(FSA, HYDROFLUOROSLICIC ACID, HFS)**
  - **SODIUM FLUORIDE (NAF)**
  - **SODIUM FLUOROSILICATE ($NA_2SIF_6$)**

    **(SODIUM SILICOFLUORIDE, SODIUM SIL)**

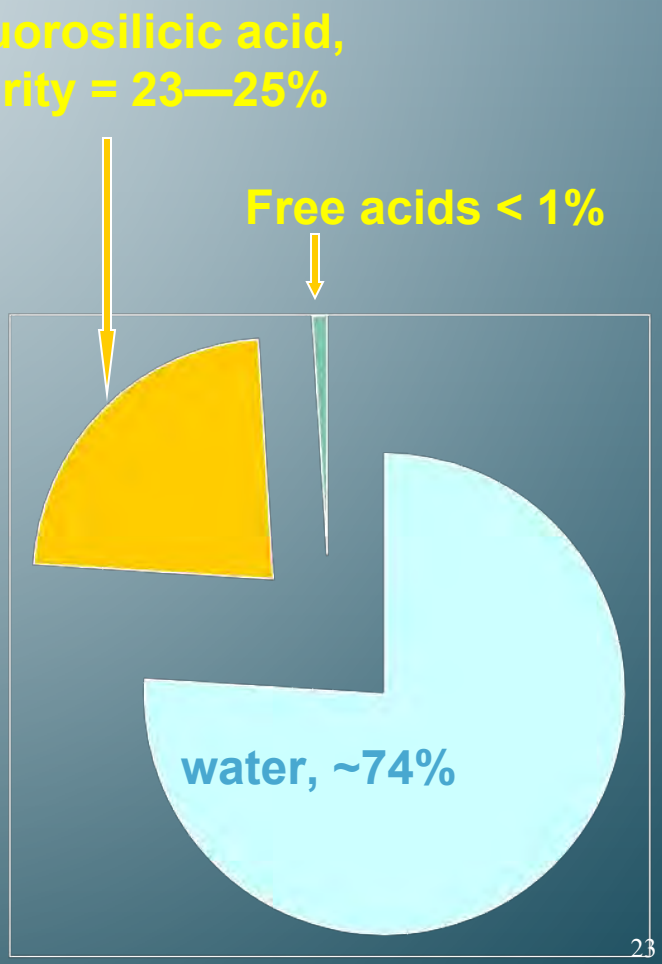
# TERMINOLOGY

- **AVAILABLE FLUORIDE ION (AFI) – THE AMOUNT OF ACTUAL FLUORIDE IN A CHEMICAL COMPOUND.**
  - **EXPRESSED AS A PERCENTAGE (%).**

**EXAMPLE: $F_6$ IN $H_2SIF_6$ = 79.2%**

# TERMINOLOGY

- **PURITY-THE AMOUNT OF FLUORIDE COMPOUND AN ADDITIVE CONTAINS.**
  - **EXPRESSED AS A PERCENTAGE (%)**



# TERMINOLOGY

- **SOLUBILITY – THE AMOUNT OF A GIVEN SUBSTANCE TO DISSOLVE IN A SOLVENT.**
  - **EXPRESSED AS g/100 ml OF WATER**

# FLUOROSILICIC ACID ($H_2SIF_6$)

- STRAW-COLORED, TRANSPARENT LIQUID
- FUMING CORROSIVE ACID
- pH = 1.2
- DERIVED FROM PHOSPHATE FERTILIZER MANUFACTURING
- AFI = 79.2%
- PURITY = 23-25%
- DENSITY (25%) 10.1 POUNDS PER GALLON
- AVOID DILUTION RANGE OF 10:1 TO 20:1 (PRECIPITATION OF SILICA IS A POTENTIAL PROBLEM)
- AVOID MIXING!!!

# SODIUM FLUORIDE (NAF)

- WHITE ODORLESS SALT; POWDER OR CRYSTALLINE
- PRODUCED BY NEUTRALIZING FLUOROSILICIC ACID WITH CAUSTIC SODA (NAOH)
- RELATIVELY CONSTANT SOLUBILITY OF 4 g/100 ml
- IDEAL FOR FLUORIDE SATURATORS
- SOLUTION PH 7.6
- AFI = 45.2 %
- PURITY = 98% (100%)

# SODIUM FLUOROSILICATE ($NA_2SIF_6$)

- WHITE ODORLESS CRYSTALLINE POWDER
- PRODUCED BY NEUTRALIZING FLUOROSILICIC ACID WITH SODIUM CARBONATE OR SODIUM CHLORIDE
- SOLUBILITY VARIES WITH TEMPERATURE
- SOLUTION pH 3.0 TO 4.0
- USED IN DRY FEED APPLICATIONS
- AFI = 60.7%
- PURITY = 98% (100%)

# FLUORIDE ADDITIVE SHIPMENT METHODS

- **FLUOROSILICIC ACID**
  - **TRUCK TANK CARS**
  - **55-GALLON DRUMS**
  - **13-GALLON CARBOYS**
- **SODIUM FLUORIDE/SODIUM SIL**
  - **50-100 POUND BAGS**
  - **125 TO 400-POUND FIBER DRUMS**
  - **2,500-POUND SUPERSACKS**

# FLUORIDE ADDITIVE APPLICATIONS

- **FLUOROSILICIC ACID**
  - **CHEMICAL FEED PUMP**
    - **PISTON**
    - **PERISTALTIC**
- **SODIUM FLUORIDE**
  - **SATURATOR**
- **SODIUM FLUOROSILICATE**
  - **DRY FEED APPLICATION**

- **ALL ADDED TO SYSTEM AS A LIQUID!**

# QUESTIONS?

# WATER FLUORIDATION TRAINING

# REPORTING/MATH

**NDEE – DIVISION OF DRINKING WATER & GROUNDWATER**

**OCTOBER 25, 2023**

# REPORTING REQUIREMENTS

- **AT THE END OF EACH MONTH A REPORT IS TO BE SUBMITTED TO DHHS THAT INCLUDES:**
  - **FLUORIDE ADDITIVE USED**
    - **AFI**
    - **PURITY**
  - **AMOUNT OF WATER TREATED**
  - **AMOUNT OF FLUORIDE ADDITIVE USED**
  - **FLUORIDE CONTENT OF FINISHED WATER**
  - **ANY IRREGULARITIES OF OPERATION**

- **A SEPARATE REPORT SHOULD BE SUBMITTED FOR EACH FLUORIDE APPLICATION POINT.**

# REPORTING

- **REPORTING FORMS ARE AVAILABLE FROM DHHS.**
- **MONTHLY REPORTS SHOULD BE SUBMITTED TO:**

**ANDY KAHLE**
**DRINKING WATER DIVISION**
**PO BOX 98922**
**LINCOLN, NE 68509-8922**
**FAX #: (402) 471-2909**
**E-MAIL: ANDY.KAHLE@NEBRASKA.GOV**

# MATH

## WHEN WILL I EVER NEED TO USE THIS STUFF?

# COMMON FLUORIDATION CALCULATIONS

- **ACID/SODIUM FLUOROSILICATE**
  - **DOSAGE**

$$\text{mg/L} = \frac{\text{lbs. chem} \times \text{AFI} \times \text{Purity}}{\text{MG} \times 8.34}$$

  - **CHEMICAL NEEDED**

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

# COMMON FLUORIDATION CALCULATIONS

- **SODIUM FLUORIDE**
  - **DOSAGE**

$$\text{mg/L} = \frac{\text{gallons solution} \times 18{,}000\ \text{mg/L}}{\text{gallons produced}}$$

  - **FEED RATE (GPM)**

$$\text{Feed rate} = \frac{\text{prod. capacity (gpm)} \times \text{dose (mg/L)}}{18{,}000\ \text{mg/L}}$$

# EXAMPLE #1

**FLUOROSILICIC ACID (FSA)**

**AFI = 79.2%**

**PURITY = 23%**

**DOSE = 0.4 MG/L**

**PROD. = 1.3 MG**

**HOW MUCH FSA WILL BE NEEDED TO FLUORIDATE 1.3 MG?**

# EXAMPLE #1 – STEP 1

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

**FLUOROSILICIC ACID (FSA)**

**AFI = 79.2%**

**PURITY = 23%**

**DOSE = 0.4 MG/L**

**PROD. = 1.3 MG**

**HOW MUCH FSA WILL BE NEEDED TO FLUORIDATE 1.3 MG?**

# EXAMPLE #1 – STEP 2

**FLUOROSILICIC ACID (FSA)**

**AFI = 79.2%**

**PURITY = 23%**

**DOSE = 0.4 MG/L**

**PROD. = 1.3 MG**

**HOW MUCH FSA WILL BE NEEDED TO FLUORIDATE 1.3 MG?**

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

$$= \frac{1.3 \times 0.4 \times 8.34}{0.792 \times 0.23}$$

# EXAMPLE #1 – STEP 3

**FLUOROSILICIC ACID (FSA)**

**AFI = 79.2%**

**PURITY = 23%**

**DOSE = 0.4 MG/L**

**PROD. = 1.3 MG**

**HOW MUCH FSA WILL BE NEEDED TO FLUORIDATE 1.3 MG?**

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

$$= \frac{1.3 \times 0.4 \times 8.34}{0.792 \times 0.23}$$

$$= \frac{4.3}{.18216}$$

# EXAMPLE #1 – STEP 4

**FLUOROSILICIC ACID (FSA)**

**AFI = 79.2%**

**PURITY = 23%**

**DOSE = 0.4 MG/L**

**PROD. = 1.3 MG**

**HOW MUCH FSA WILL BE NEEDED TO FLUORIDATE 1.3 MG?**

$$\text{lbs. chem.} = \frac{\text{MG x mg/L x 8.34}}{\text{AFI x Purity}}$$

$$= \frac{\text{1.3 x 0.4 x 8.34}}{\text{0.792 x 0.23}}$$

$$= \frac{\text{4.3}}{\text{.18216}}$$

**= 23.8 lbs Acid**

# EXAMPLE #2

**USING FSA**

**AFI = 79.2%**

**PURITY = 24%**

**PROD. = 0.07 MG**

**LBS. CHEM. = 2.5**

**WHAT CONCENTRATION OF FLUORIDE WAS ADDED?**

# EXAMPLE #2 – STEP 1

$$\text{mg/L} = \frac{\text{lbs. chem x AFI x Purity}}{\text{MG x 8.34}}$$

**USING FSA**

**AFI = 79.2%**

**PURITY = 24%**

**PROD. = 0.07 MG**

**LBS. CHEM. = 2.5**

**WHAT CONCENTRATION OF FLUORIDE WAS ADDED?**

# EXAMPLE #2 – STEP 2

**USING FSA**

**AFI = 79.2%**

**PURITY = 24%**

**PROD. = 0.07 MG**

**LBS. CHEM. = 2.5**

**WHAT CONCENTRATION OF FLUORIDE WAS ADDED?**

$$\text{mg/L} = \frac{\text{lbs. chem x AFI x Purity}}{\text{MG x 8.34}}$$

$$\text{mg/L} = \frac{2.5 \times .792 \times .24}{0.07 \times 8.34}$$

# EXAMPLE #2 – STEP 3

**USING FSA**

**AFI = 79.2%**

**PURITY = 24%**

**PROD. = 0.07 MG**

**LBS. CHEM. = 2.5**

**WHAT CONCENTRATION OF FLUORIDE WAS ADDED?**

$$\text{mg/L} = \frac{\text{lbs. chem x AFI x Purity}}{\text{MG x 8.34}}$$

$$\text{mg/L} = \frac{2.5 \times .792 \times .24}{0.07 \times 8.34}$$

$$\text{mg/L} = \frac{0.48}{0.58}$$

# EXAMPLE #2 – STEP 4

**USING FSA**

**AFI = 79.2%**

**PURITY = 24%**

**PROD. = 0.07 MG**

**LBS. CHEM. = 2.5**

**WHAT CONCENTRATION OF FLUORIDE WAS ADDED?**

$$\text{mg/L} = \frac{\text{lbs. chem x AFI x Purity}}{\text{MG x 8.34}}$$

$$\text{mg/L} = \frac{2.5 \times .792 \times .24}{0.07 \times 8.34}$$

$$\text{mg/L} = \frac{0.48}{0.58}$$

**mg/L = 0.8 mg/L**

# EXAMPLE #3

**USING FSA**

**AFI = 79.2 %**

**PURITY = 25%**

**DOSE NEEDED = 0.6 MG/L**

**WELL PROD. = 250 GPM**

**HOW MUCH ACID (LBS.) WILL BE NEEDED PER HOUR?**

# EXAMPLE #3 – STEP 1

**USING FSA**

**AFI = 79.2 %**

**PURITY = 25%**

**DOSE NEEDED = 0.6 MG/L**

**WELL PROD. = 250 GPM**

**HOW MUCH ACID (LBS.) WILL BE NEEDED PER HOUR?**

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

# EXAMPLE #3 – STEP 2

**USING FSA**

**AFI = 79.2 %**

**PURITY = 25%**

**DOSE NEEDED = 0.6 MG/L**

**WELL PROD. = 250 GPM**

**HOW MUCH ACID (LBS.) WILL BE NEEDED PER HOUR?**

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

$$\text{lbs. chem.} = \frac{? \times 0.6 \times 8.34}{0.792 \times 0.25}$$

# EXAMPLE #3 – STEP 2

**USING FSA**

**AFI = 79.2 %**

**PURITY = 25%**

**DOSE NEEDED = 0.6 MG/L**

**WELL PROD. = 250 GPM**

**HOW MUCH ACID (LBS.) WILL BE NEEDED PER HOUR?**

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

$$\text{lbs. chem.} = \frac{0.015 \times 0.6 \times 8.34}{0.792 \times 0.25}$$

# EXAMPLE #3 – STEP 3

**USING FSA**

**AFI = 79.2 %**

**PURITY = 25%**

**DOSE NEEDED = 0.6 MG/L**

**WELL PROD. = 250 GPM**

**HOW MUCH ACID (LBS.) WILL BE NEEDED PER HOUR?**

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

$$\text{lbs. chem.} = \frac{0.015 \times 0.6 \times 8.34}{0.792 \times 0.25}$$

$$\text{lbs. chem.} = \frac{0.08}{0.198}$$

# EXAMPLE #3 – STEP 4

**USING FSA**

**AFI = 79.2 %**

**PURITY = 25%**

**DOSE NEEDED = 0.6 MG/L**

**WELL PROD. = 250 GPM**

**HOW MUCH ACID (LBS.) WILL BE NEEDED PER HOUR?**

$$\text{lbs. chem.} = \frac{\text{MG} \times \text{mg/L} \times 8.34}{\text{AFI} \times \text{Purity}}$$

$$\text{lbs. chem.} = \frac{0.015 \times 0.6 \times 8.34}{0.792 \times 0.25}$$

$$\text{lbs. chem.} = \frac{0.08}{0.198}$$

**lbs. chem. = 0.4 lbs/hr**

# EXAMPLE #4

**USING FSA**

**AFI = 79.2 %**

**PURITY = 23%**

**NATURAL $F^-$ = 0.3 MG/L**

**PROD. = 0.18 MG**

**LBS. CHEM. = 3.5 LBS.**

**WAS THIS SYSTEM BEING FLUORIDATED TO AN OPTIMAL LEVEL OF 0.7 MG/L?**

# EXAMPLE #4 – STEP 1

**USING FSA**

**AFI = 79.2 %**

**PURITY = 23%**

**NATURAL F- = 0.3 MG/L**

**PROD. = 0.18 MG**

**LBS. CHEM. = 3.5 LBS.**

**WAS THIS SYSTEM BEING FLUORIDATED TO AN OPTIMAL LEVEL OF 0.7 MG/L?**

$$\text{mg/L} = \frac{\text{lbs. chem x AFI x Purity}}{\text{MG x 8.34}}$$

# EXAMPLE #4 – STEP 2

**USING FSA**

**AFI = 79.2 %**

**PURITY = 23%**

**NATURAL F- = 0.3 MG/L**

**PROD. = 0.18 MG**

**LBS. CHEM. = 3.5 LBS.**

**WAS THIS SYSTEM BEING FLUORIDATED TO AN OPTIMAL LEVEL OF 1.0 MG/L?**

$$\text{mg/L} = \frac{\text{lbs. chem x AFI x Purity}}{\text{MG x 8.34}}$$

$$\text{mg/L} = \frac{3.5 \times 0.792 \times 0.23}{0.18 \times 8.34}$$

# EXAMPLE #4 – STEP 3

**USING FSA**

**AFI = 79.2 %**

**PURITY = 23%**

**NATURAL F- = 0.3 MG/L**

**PROD. = 0.18 MG**

**LBS. CHEM. = 3.5 LBS.**

**WAS THIS SYSTEM BEING FLUORIDATED TO AN OPTIMAL LEVEL OF 1.0 MG/L?**

$$mg/L = \frac{\text{lbs. chem x AFI x Purity}}{\text{MG x 8.34}}$$

$$mg/L = \frac{3.5 \times 0.792 \times 0.23}{0.18 \times 8.34}$$

$$mg/L = \frac{0.6}{1.5}$$

# EXAMPLE #4 – STEP 4

**USING FSA**

**AFI = 79.2 %**

**PURITY = 23%**

**NATURAL F- = 0.3 MG/L**

**PROD. = 0.18 MG**

**LBS. CHEM. = 7.5 LBS.**

**WAS THIS SYSTEM BEING FLUORIDATED TO AN OPTIMAL LEVEL OF 1.0 MG/L?**

$$mg/L = \frac{\text{lbs. chem x AFI x Purity}}{\text{MG x 8.34}}$$

$$mg/L = \frac{7.5 \times 0.792 \times 0.23}{0.18 \times 8.34}$$

$$mg/L = \frac{1.4}{1.5}$$

**mg/L = 0.4 mg/L**

# PROBLEM #1

**Your community is about to place a new well into service. The new well will produce 300 gpm, and will run an average of 12 hours per day. The new well scan showed natural fluoride levels of 0.3 mg/l. You use fluorosilicic acid with a purity of 25% to adjust the fluoride level to 0.7 mg/l. How much additional acid (lbs.) will you need to budget for next year?**

# PROBLEM #1

- **Answer = 1327 lbs.**

# PROBLEM #2

**You have been fluoridating to 1.2 ppm, and want to know how much chemical ($$$$) would be saved per year by only adjusting to 0.7 ppm. The natural fluoride level of your water is 0.5 ppm, and you produce 2.6 MG/day on average. The town is using fluorosilicic acid that is 23% pure. How many pounds of chemical will you save per year?**

# PROBLEM #2

- **ANSWER = 21,724 LBS.**

- Andy Kahle, NDEE Drinking Water Division
- (402) 471-0521
- andy.kahle@nebraska.gov