OPERATOR AWARENESS

WELCOME TO AFNWA TRAINING

ROSA Technical Services Inc.

afnwa potable water treatment - Google Search

OPERATOR AWARENESS

Roger Blanchard

- Industrial Instrumentation & Control Systems
  - Red Seal Trade's Person
  - Certified Engineering Technologist
- Oil Refining
- Petrochemical
- LNG
- Offshore Oil Processing
- Offshore Drilling
- Industrial instrumentation Instructor – NSCC
- Apprenticeship Trainer – NS Apprenticeship Agency
- International Training-
- ROSA Technical Services Inc.– Training & Consulting

OPERATOR AWARENESS

LET'S GET TO KNOW YOU!!!!!!!!

OPERATOR AWARENESS

What will we do today?

- Safety in the Workplace
- Importance of Operator's Job
- Plant Equipment Instrumentation
- Analyzers
- Analyzer Exercise

OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **Daily Safety Objective**
  - Return to your family healthy
- **Hazards**
  - Electricity
  - Harmful Chemicals
  - Heavy Pumps & Motors
  - Housekeeping
  - Stored Energy
  - Climbing Tanks
  - Chronic Injuries
  - Confined Space

OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **Electricity**
  - Voltage levels in your plant
    - AC Voltages – 120. 220, 277, 480, 600
    - DC Voltages – 1.5, 6, 12, 24, 40, 110
    - 40 & 110 DC are not Common but May Be in Your Plants
  - Current kills
    - 0.001 Amps - Barely perceptible
    - 0.016 Amps - Maximum current before you let go
    - 0.100 Amps - Ventricular fibrillation
    - 2.0 Amps – Heart stops, organ damage

OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **Deadly Chemicals**
  - **Chlorine**
  - **Chloramine**
  - **Ammonia**
  - **Bleach**
  - **Waste Water Gases – H_2S**

OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **Heavy Pumps & Motors**
  - Motors
    - Single-Phase
    - Three-Phase
  - Pumps
    - Metering
    - Centrifugal
    - Positive Displacement
    - Diaphragm
    - Submersible

OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **Housekeeping**
  - Eliminates Hazards
  - Organization
  - Neatness
  - Cleanliness
  - Standardization
  - Discipline

OPERATOR AWARENESS

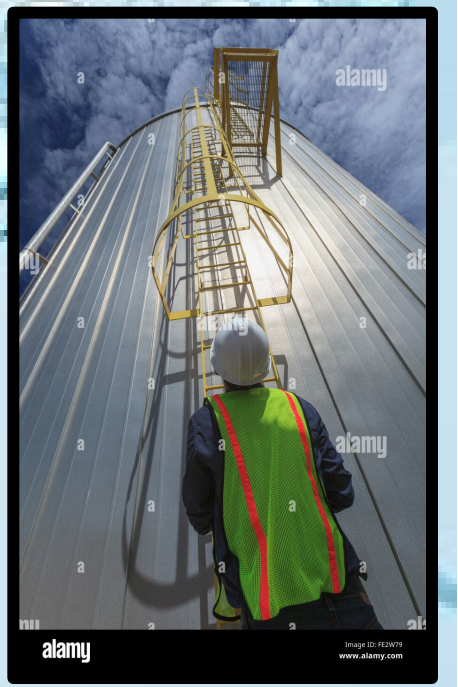
SAFETY IN THE WORKPLACE

- **Stored Energy**
  - Water Pressure
  - Disassembling Piping
  - Thermal Expansion

OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **Climbing Tanks**
  - Fall Protection (Training Required)
  - Anchor Points
  - 100% Tie-Off
  - Enclosed Ladders
  - Guard Rails
  - Ladder Inspection/Maintenance
  - Know Your Limits/Pace Yourself



OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **Chronic Injuries**
  - Overusing One Body Area Over a Long Period
  - Long Term Healing
  - Most Common in Joints

OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **Confined Space**
  - Training Required
  - Pump Rooms
  - Ventilation
  - Tanks
  - Respirators
  - SCBA
  - https://vimeo.com/149325335

OPERATOR AWARENESS

SAFETY IN THE WORKPLACE

- **What is your reason for working safe today?**

OPERATOR AWARENESS

FEEDBACK?

Hazards

Your Reason to Work Safe Today

ROSA Technical Services Inc.

OPERATOR AWARENESS

IMPORTANCE OF OPERATOR'S JOB

- **Who Depends on the Plant Operator**
  - **People**
  - **Community Centers**
  - **Businesses**
  - **E V E R Y O N E**
  - https://www.youtube.com/watch?v=S1wUOad-0ag&t=46s

OPERATOR AWARENESS

IMPORTANCE OF OPERATOR'S JOB

- **Plant Operator's Responsibilities**
  - Monitoring Water Quality
  - Operating and Maintaining Water Treatment Equipment
  - Monitoring pH, Turbidity and Chlorine Levels in the Water
  - Water Testing
  - Maintaining Records on Water Quality
  - Equipment Failures, Power Outages, Water Quality Issues
  - Play a Key Role in Protecting Public Health

OPERATOR AWARENESS

IMPORTANCE OF OPERATOR'S JOB

- **Basic Operator Duties**
  - Monitoring Equipment
  - Recording Data
  - Conducting Routine Maintenance
  - Work Under the Supervision of a More Senior Operator
  - Participate in On-The-Job Training
  - Basic Education Courses

OPERATOR AWARENESS

IMPORTANCE OF OPERATOR'S JOB

- **Extended Operator Duties**
  - Operating and Maintaining Equipment
  - Conduct Analyzer Verification Tests
  - Responding to Emergencies
  - Supporting other Operators

OPERATOR AWARENESS

IMPORTANCE OF OPERATOR'S JOB

- **Advanced Operator Duties**
  - **Manage Plant Operations**
  - **Ensure Compliance**
  - **Improving Plant Operations and Procedures**

OPERATOR AWARENESS

IMPORTANCE OF OPERATOR'S JOB

- **When Things Go Wrong**
  - 1993 Milwaukee Disaster – Cryptosporidium protozoan
  - 2000 Walkerton – Falsified Test Results
  - 2014 Flint, Michigan – Lead Leaching

OPERATOR AWARENESS

IMPORTANCE OF OPERATOR'S JOB

- **How to Avoid Disasters**
  - **Operator Training**
  - **Levels of Security**
  - **Back-up Systems**
  - **Avoid Complacency**

OPERATOR AWARENESS

IMPORTANCE OF OPERATOR'S JOB

- **How to Build Confidence**
  - **Training**
  - **Support Systems**
  - **Time & Experience**
  - **Continuous Improvement**

OPERATOR AWARENESS

FEEDBACK?

Customers

Operator Responsibilities

Disasters

Confidence

OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

- **Instrumentation – Operator's Assistant**
  - **Regulation & Compliance**
  - **Measurement**
  - **Control**
  - **Valves**
  - **Analyzers**
  - **Water Treatment Process Instrumentation**
  - **SCADA**

OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

- **Regulation & Compliance**
  - Water Quality Regulators
  - Due Diligence
  - Regulation and Compliance

OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

- **Water Quality Regulators**
  - **Environmental Protection Agency – EPA**
    - https://www.epa.gov/wqs-tech/water-quality-standards-handbook
  - **Government Of Canada Guidelines for Drinking Water Quality**
    - https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html#t1
  - **Nova Scotia Resource Water Management Strategy**
    - https://novascotia.ca/nse/water.strategy/#:~:text=It%20aims%20to%20ensure%20sustainability,of%20IWM%20and%20the%20strategy.
  - **Safe Drinking Water for First Nations Act**
    - https://www.sac-isc.gc.ca/eng/1697555066364/1697555089256

OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

- **Due Diligence**
  - A process or effort to collect and analyze information to avoid any loss or damage.

OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

- **Regulation & Compliance**
  - Meet Drinking Water Standards
  - Employ Certified Operators
  - Lab Certification
  - Monitor and Test Routinely
  - Protect Source Water
  - Keep Records
  - Report on Water Quality
  - Conduct System Assessments
  - Ensure appropriate and adequate operation

OPERATOR AWARENESS

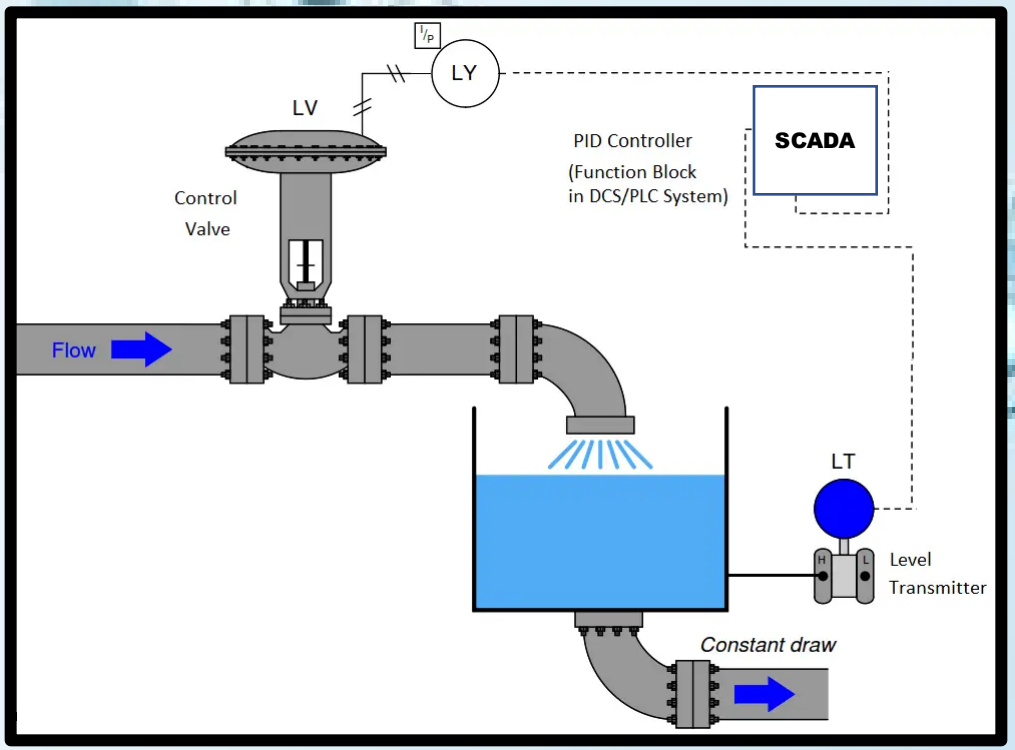
PLANT EQUIPMENT INSTRUMENTATION

- **Measurement**
  - **Transmitters (Indicators)**

OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

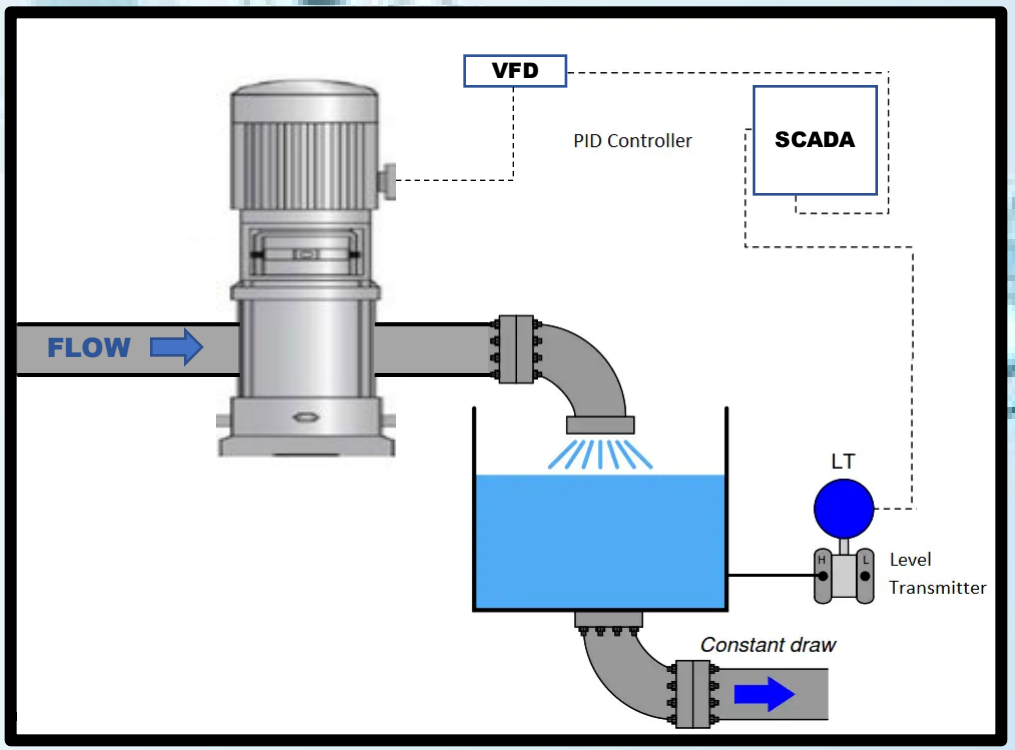
- **Control**
  - **Control Loops – Control Valve**



OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

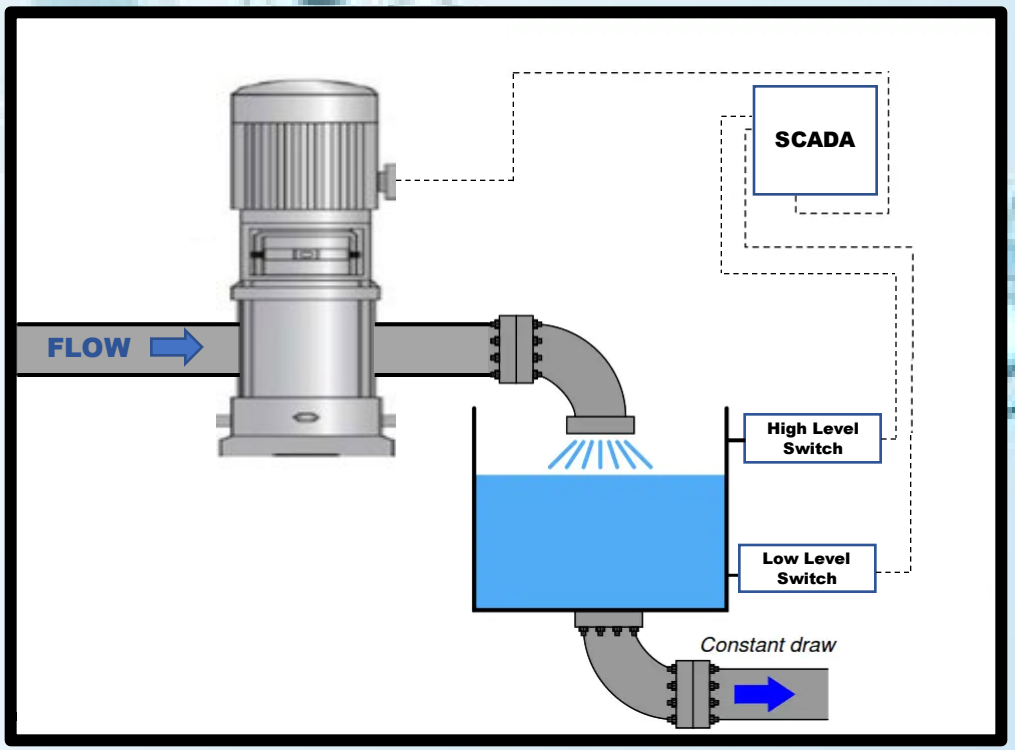
- **Control**
  - **Control Loops – Variable Speed Drive**



OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

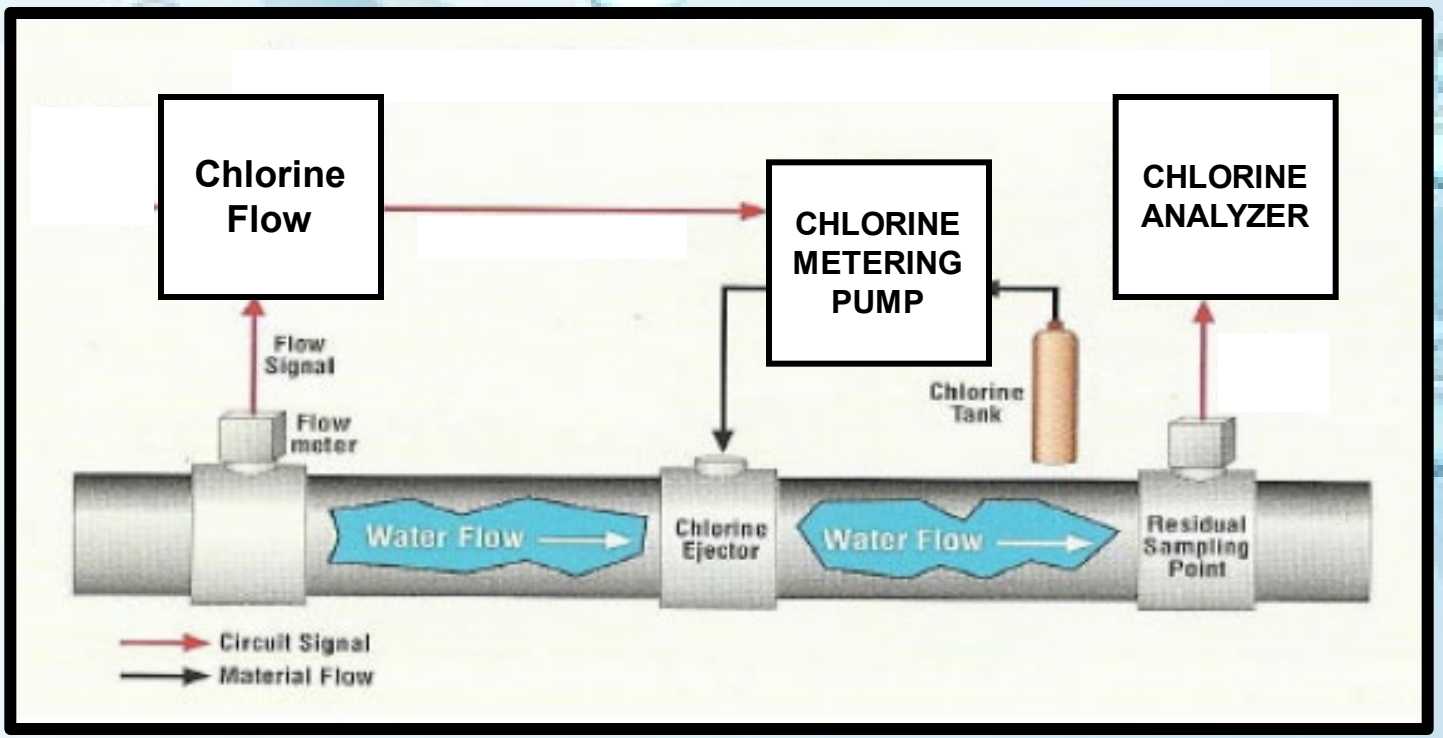
- **Control**
  - **Control Loops – High/Low Level Switches – ON/OFF Control**



OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

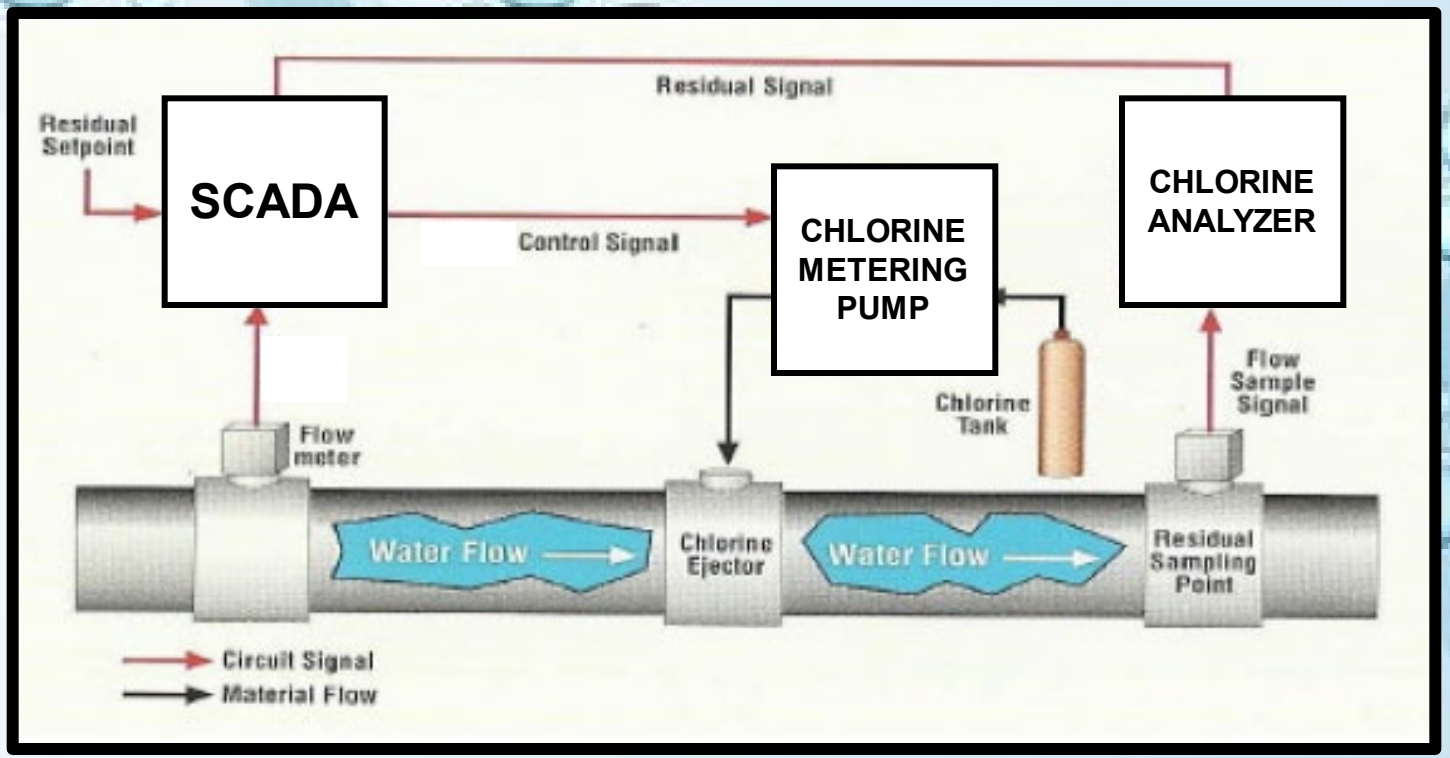
- **Control**
  - **Control Loops – Flow/Chlorine Stroke Adjustment Injection**
  - **Most Common in Your Plants**



OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

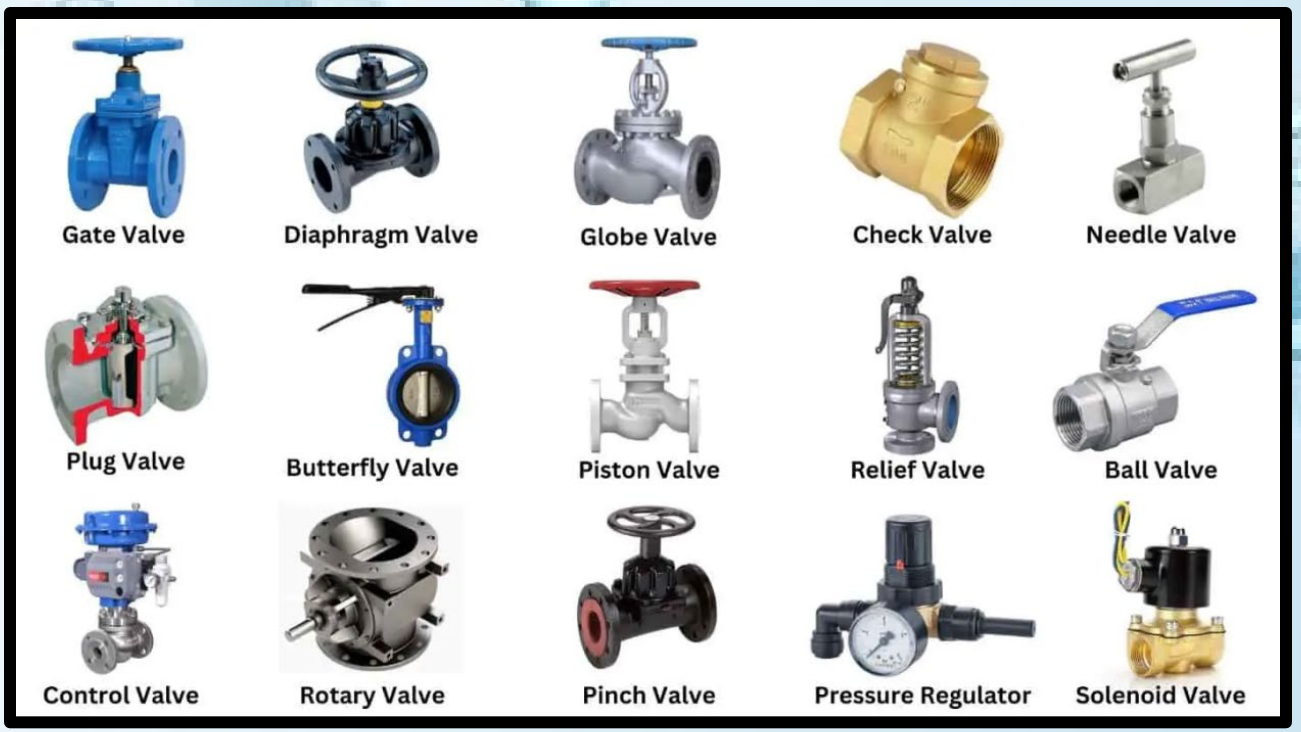
- **Control**
  - **Control Loops – Automatic Chlorine Injection**



OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

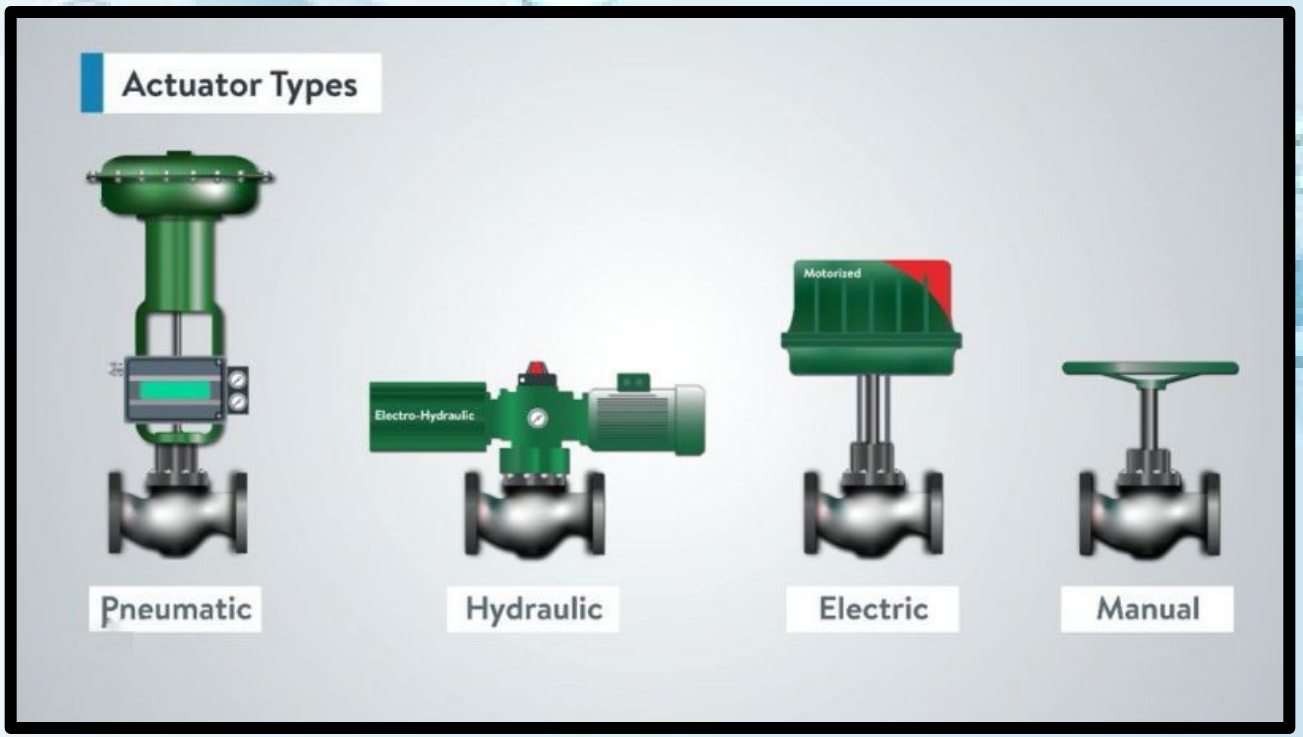
- **Valves**
  - **Valve – Manual Actuators**
  - **These Valves Seen Throughout Your Plants**



OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

- **Valves**
  - **Valve Actuators**
  - **Most Actuators in Your plants are Manual and Electric**



OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

- **Analyzers**
  - pH
  - Turbidity
  - Chlorine
  - Conductivity
  - Total Dissolved Oxygen

OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

- **pH Analyzers**
  - **Acidity or Alkalinity**
  - **Unitless Number**
  - **6.8 – 8.5**

OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

- **Turbidity Analyzers**
  - Water Clarity or Transparency
  - Unit:
  - Nephelometric Turbidity Units (NTU)
    - Your Plants All Use (NTU)
  - Formazin Nephelometric Units (FNU)
  - Ideally Not More Than 1(NTU) & Never More than 5 (NTU)

OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

- **Chlorine Analyzers**
  - Residual Chlorine from Drinking Water
  - Unit:
  - Mg/Liter
  - PPM (Parts Per Million)
  - 0.5 Mg/Liter or 1.0 PPM

OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

- **Conductivity Analyzers**
  - Solution's ability to conduct electricity
  - Unit - microsiemens per centimeter (mcg/cm)
  - 1,000 microsiemens per centimeter (mcg/cm)

OPERATOR AWARENESS

PLANT EQUIPMENT & MAINTENANCE

- **Total Dissolved Oxygen Analyzers**
  - Amount of gaseous oxygen contained in water
  - Unit:
    - mg/L
    - PPM (Parts per Million)
    - Percent (%)
  - Minimum 5mg/L to Maximum 18mg/L
  - Normally used at water outfall in waste treatment plants
  - Ensures correct amount of oxygen in water to maintain wildlife

OPERATOR AWARENESS

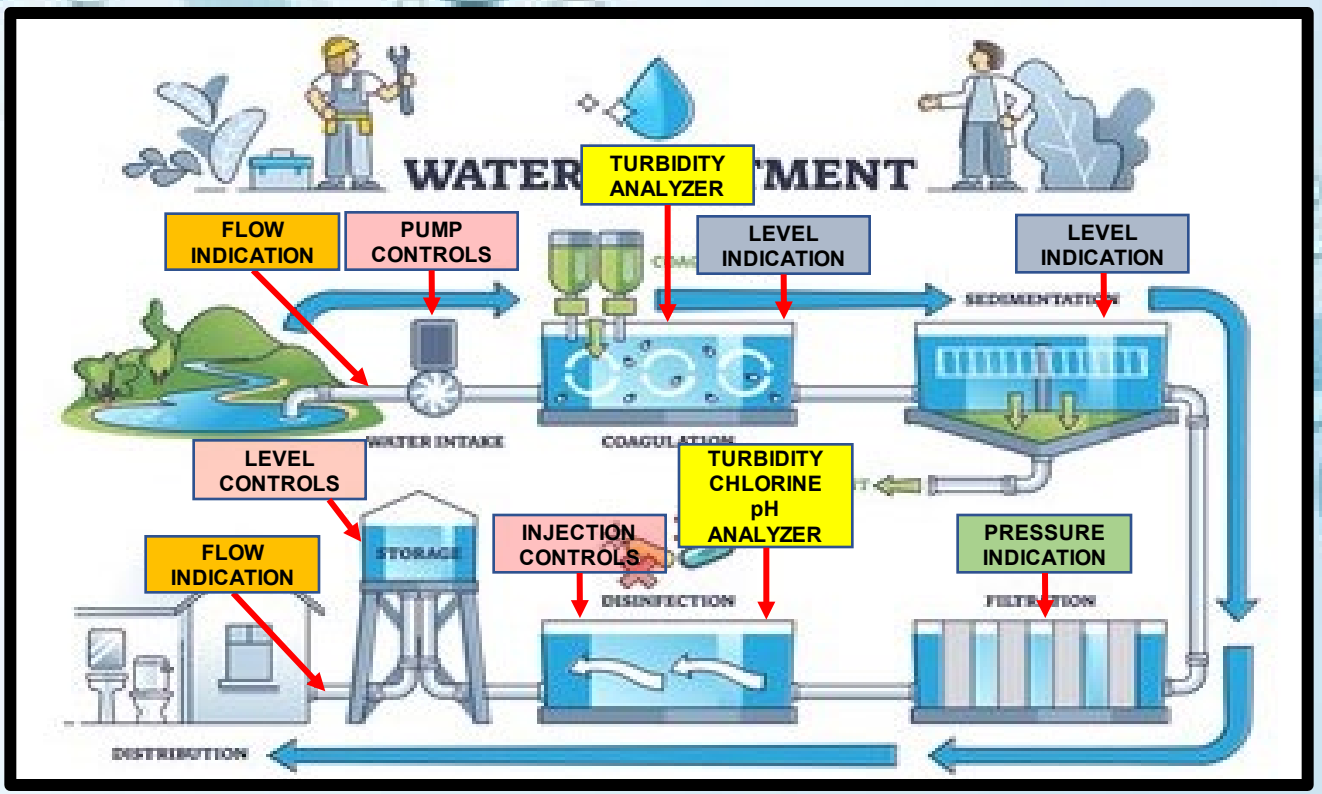
PLANT EQUIPMENT INSTRUMENTATION

- **Water Treatment Process**
  - **Purification**
  - **Distribution**
  - **Waste Treatment**

OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

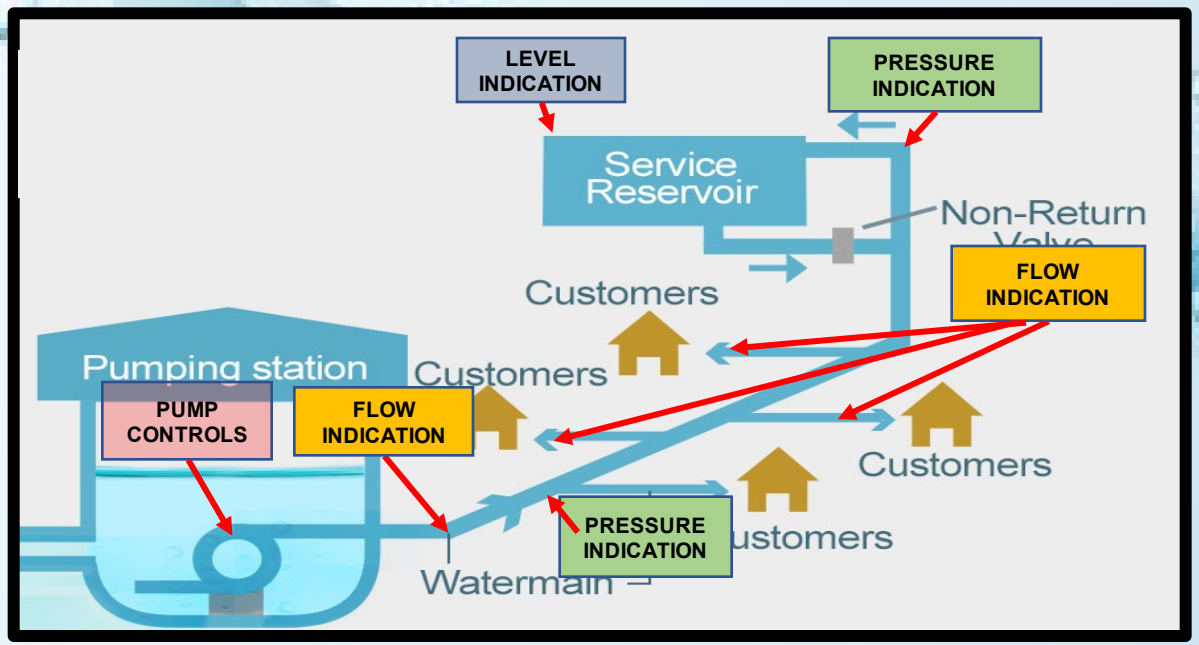
- **Purification**
  - **Water Purification Instrumentation**



OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

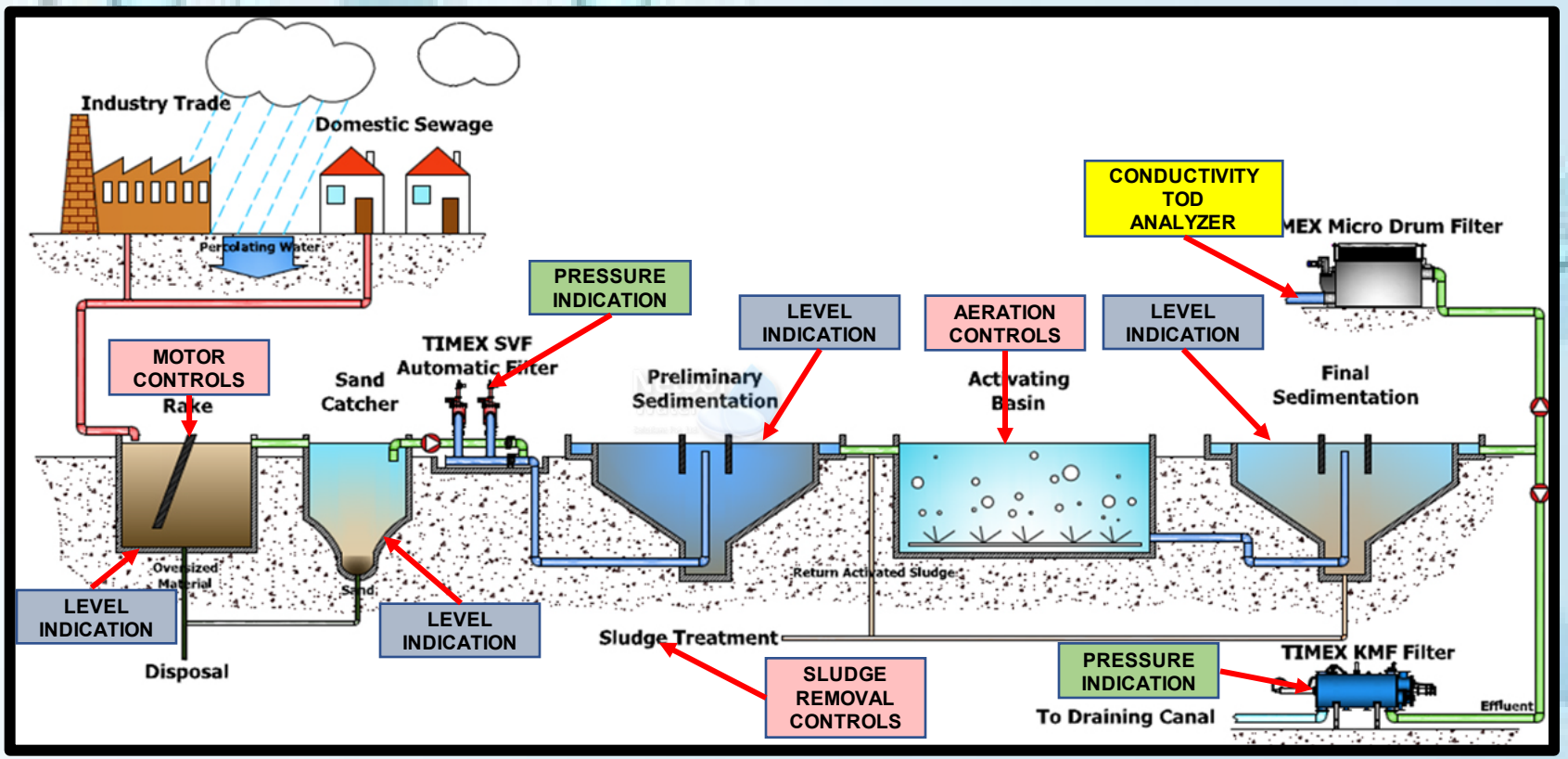
- **Distribution**
  - **Water Distribution Instrumentation**
  - **AFNWA Meters Commercial Customers - Not Residential**



OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

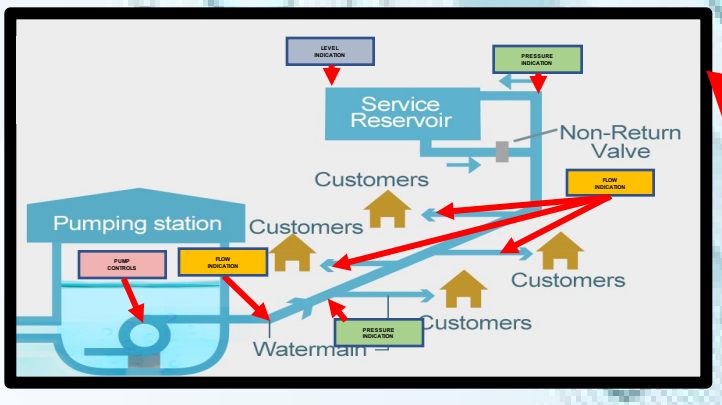
- **Waste Treatment**
  - **Waste Water Treatment Instrumentation**

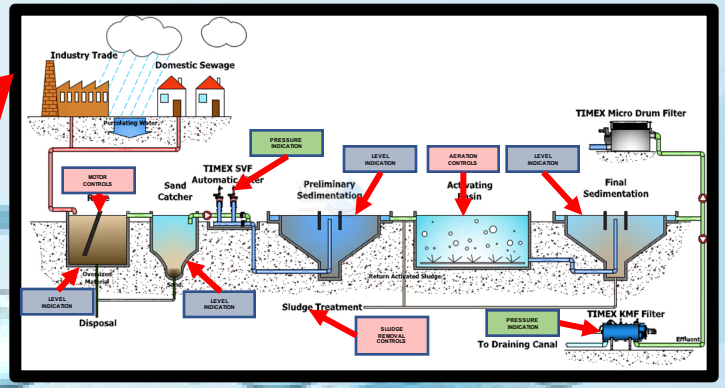


OPERATOR AWARENESS

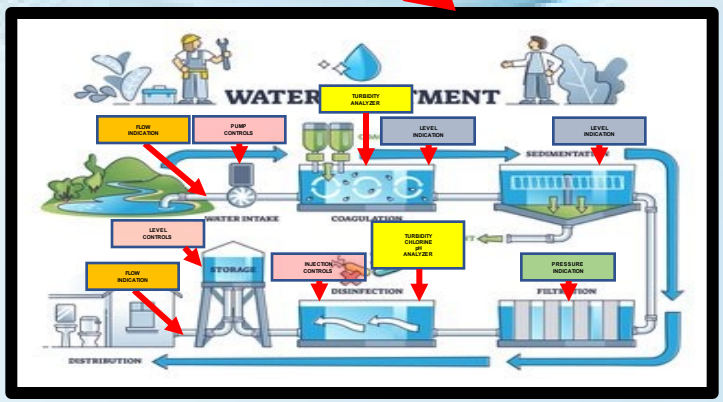
PLANT EQUIPMENT INSTRUMENTATION

- **SCADA**
  - **SCADA Communications**





SCADA



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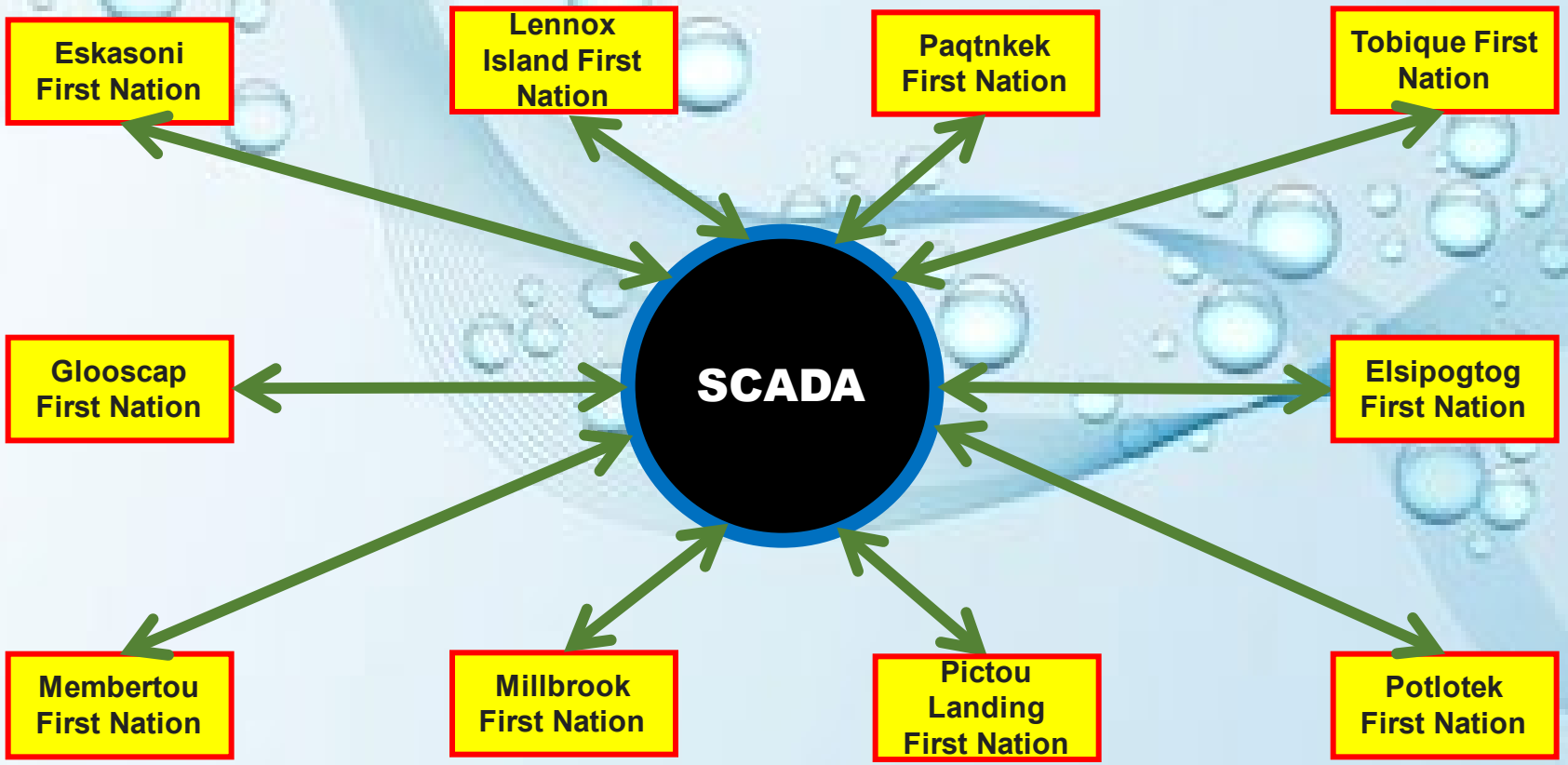
OPERATOR AWARENESS

PLANT EQUIPMENT INSTRUMENTATION

- **SCADA**
  - **SCADA Communications**



OPERATOR AWARENESS

FEEDBACK?

Measurement

Control

Analyzers

Water Treatment Process

Instrumentation

SCADA

Regulation & Compliance

ROSA Technical Services Inc.

OPERATOR AWARENESS

ANALYZERS

- Analyzers
  - Accuracy
  - Validation
  - Verification
  - Calibration
  - Maintenance
  - Technology Advances
  - HACH TU5300 SC Turbidity Analyzer
  - HACH CL17 SC Chlorine Analyzer

OPERATOR AWARENESS

ANALYZERS

- **Analyzer Accuracy**
  - **Accuracy Important to Maintain Water Quality**
    - **Reliable Results**
    - **Quality Assurance**
    - **Traceability**
    - **Regulatory Compliance**
    - **Cost Savings**
    - **Builds Confidence in Equipment & Process**

OPERATOR AWARENESS

ANALYZERS

- **Validation**
  - **Comparison to a Independent Source**
  - **Quantify Analyzer Performance**
  - **Determines Analyzer Capabilities**
  - **Determines if the Analyzer Matches the Application**

OPERATOR AWARENESS

ANALYZERS

- **Verification**
  - One-Point Check
  - Appropriate Reference
  - Compare Measurement to Single Point Reference
  - Follow Verification Procedures
  - Notify Tech Services of Irregularities
  - Repeat Verification at a Specified Frequency
  - Record verification in logbook and SCADA operator notes for records

OPERATOR AWARENESS

ANALYZERS

- **Calibration**
  - Verifies the overall accuracy
  - Adjusted to a known standard
  - Compare Measurement to Multi-Point Reference
  - Follow Manufacturer's Calibration Procedures
  - Record Calibration Results
  - Done by Utility Techs

OPERATOR AWARENESS

ANALYZERS

- **Maintenance**
  - **Operator Maintenance**
    - **Verifying Analyzer Sample Flow**
    - **Cleaning Measuring Cell**
    - **Check Filters**
    - **Check for Leaks**
    - **Verification Check**

OPERATOR AWARENESS

ANALYZERS

- **Maintenance**
  - **Technician Maintenance**
    - **Verifying Analyzer Sample Flow**
    - **Repair Sampling System**
    - **Replace Measuring Cell**
    - **Replace Filters**
    - **Analyzer Calibration**

OPERATOR AWARENESS

ANALYZERS

- **Technology Advances**
  - **Automation of calibration processes**
  - **Remote calibration capabilities**
  - **Integration of calibration data with data management**

OPERATOR AWARENESS

FEEDBACK?

Accuracy

Validation

Verification

Calibration

Maintenance

Technology Advances

OPERATOR AWARENESS

ANALYZER EXERCISE

- **HACH TU5300 SC Turbidity Analyzer**
  - **Principle of Operation**
    - **Light Intensity**
    - **Higher the Turbidity – Less Light Passes**

https://uk.hach.com/tu5300-sc-low-range-laser-turbidimeter-with-rfid-iso-version/product-video?id=25114274377

OPERATOR AWARENESS

ANALYZER EXERCISE

- **HACH TU5300 SC Turbidity Analyzer**
  - **Verification**
  - **Refer to the HACH TU5300 SC Verification Procedure**

OPERATOR AWARENESS

ANALYZER EXERCISE

- **HACH TU5300 SC Turbidity Analyzer**
  - **Cell Cleaning**
  - **Refer to the HACH TU5300 SC Cell Cleaning Procedure**

OPERATOR AWARENESS

ANALYZER EXERCISE

- **HACH CL17 SC Chlorine Analyzer**
  - **Analyzes Both Free and Total Chlorine**
  - **Sample Mixed with Reagent to Form a Colored Solution**
  - **Intensity of Colored Solution Determines Chlorine Content**
  - **https://www.google.ca/search?sca_esv=1e69a4e84dfc1d5f&q=MEasuring+principle+of+a+HACH+cl17sc+chlorine+analyzer&tbm=vid&source=lnms&sa=X&ved=2ahUKEwiW2fnpzZSEAxUbmYkEHfjxA0cQ0pQJegQIDBAB&biw=1920&bih=892&dpr=1#fpstate=ive&vld=cid:34dcb314,vid:dxkp-VnJ1FU,st:0**
  - **210 - 235**

OPERATOR AWARENESS

ANALYZER EXERCISE

- **HACH CL17 SC Chlorine Analyzer**
  - **Verification**
  - **Refer to the HACH CL17 SC Verification Procedure**

OPERATOR AWARENESS

ANALYZER EXERCISE

- **HACH CL17 SC Chlorine Analyzer**
  - **Cell Cleaning**
  - **Refer to the HACH CL17 SC Cell Cleaning Procedure**

OPERATOR AWARENESS

THANKS FOR YOUR TIME

WORK SAFE