Evaluation of Two Screening Technologies – Maintenance vs Capture Rates

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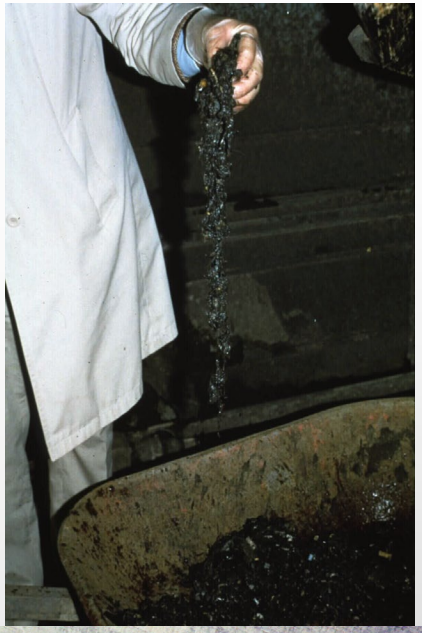
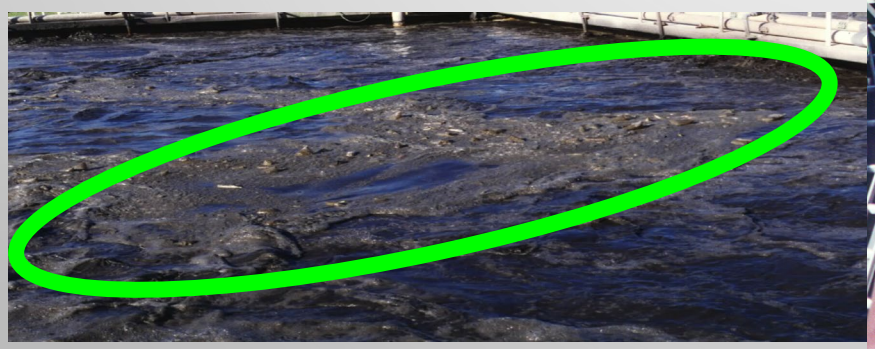
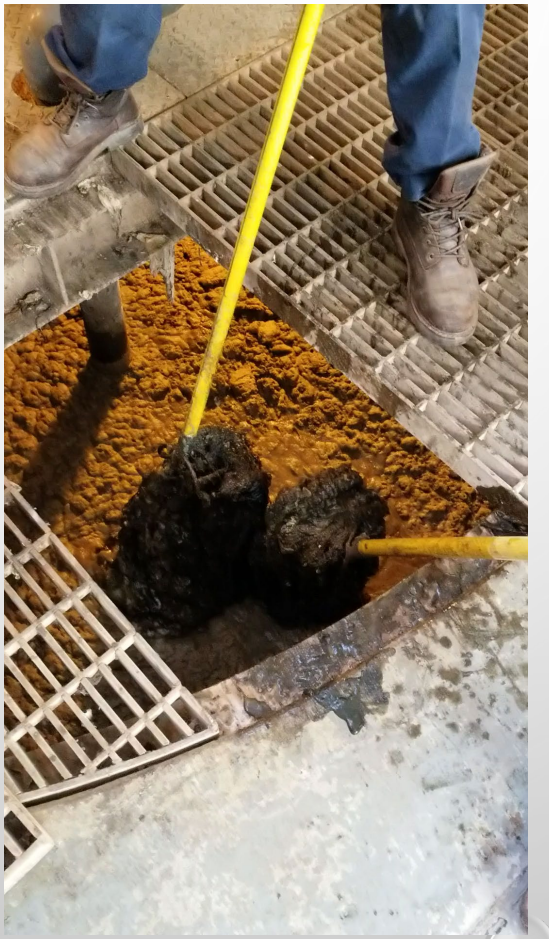
WHY SCREENING IS IMPORTANT

- PROTECTION OF DOWNSTREAM PROCESSES
  - MAINTAIN OPTIMIZATION OF DOWNSTREAM PROCESSES
  - REDUCED MAINTENANCE
  - MAINTAIN DESIGN DETENTION AND CONTACT TIMES
- REDUCED LONG TERM PLANT MAINTENANCE
- REDUCED PUMP MAINTENANCE
- REMOVAL OF INERTS
- REDUCED SLUDGE VOLUMES
- REDUCED BOD





WHAT HAPPENS WHEN INERT SOLIDS ARE NOT SCREENED



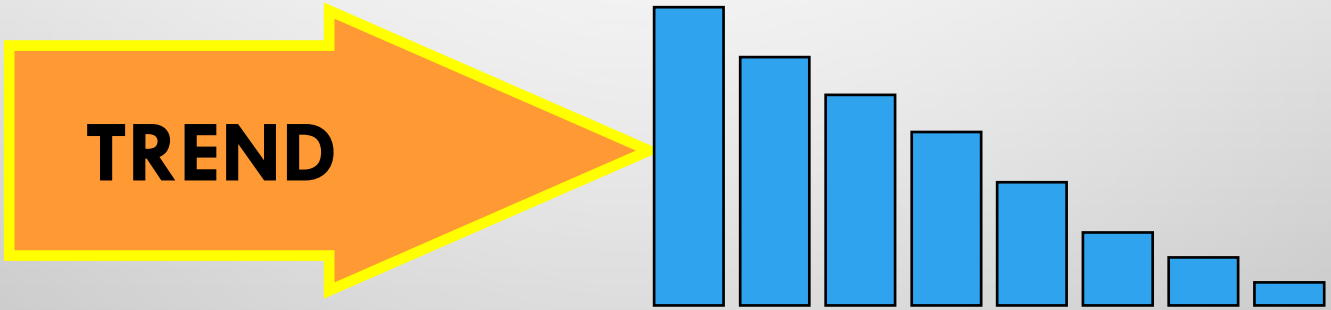
IMPORTANCE OF SCREENING DESIGN AND FUNCTION

- APPLICATION ENVIRONMENT
  - HARSHER ENVIRONMENT – MATERIALS OF CONSTRUCTION
  - H_2S HAS INCREASED AS A CONCERN AS ODOR CONTROL BECOMES MORE PREVALENT.
  - CORROSION INCREASES AT SOUTHERLY INSTALLATIONS AND NEAR OCEAN INSTALLATIONS
- DESIGN FOR PEAK FLOW
- CONSIDERATION AT LOW FLOWS AND AVERAGE DAILY FLOWS
- MAINTENANCE VS CAPTURE RATE

SCREEN CATEGORIES AND TRENDS

- COARSE VS. FINE
- 3/8” TO 3” 1/4” AND LESS

- MANUAL VS. SELF CLEANING



As regulations tighten, downstream process become more sensitive, screening requirements become finer

TECHNOLOGY OPTIONS

Types of Screens

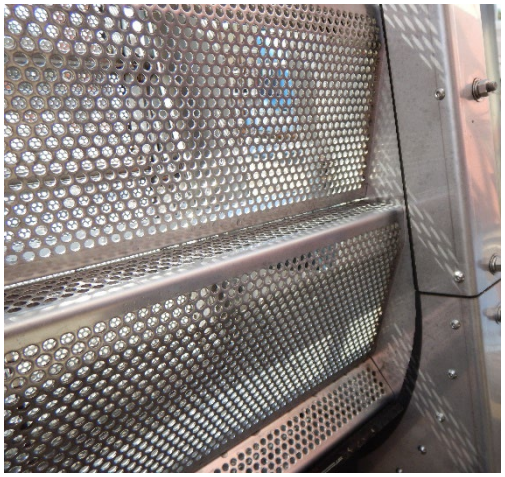
Bars / slots

Aqua Guard Filter Element

Perforated

Mesh

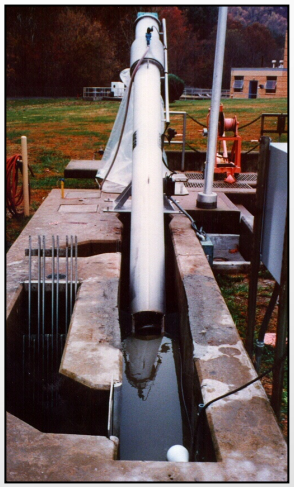
Types of Screens



Bars (Rake Screen)	Aqua Guard® Filter Element Belt	Aqua Guard® Perforated Belt
Capture Rates – 20% to 30% at ¼ inch	Capture Rates Aqua Guard –60% Aqua Guard UltraClean – 70%	Capture Rates – 80%+
Lower Capture Rates	⟷	Higher Capture Rates
Lower Maintenance	⟷	Higher Maintenance

TYPES OF HEADWORKS SCREENS

- BAR SCREENS
  - MULTI-RAKE SCREENS
  - CATENARY SCREENS
  - MODIFIED CATENARY SCREENS
  - RECIPROCATING SCREENS (GRABBERS, CLIMBERS)
- ELEMENT BELT SCREENS
- PERFORATED SCREENS
- STEP SCREENS
- ALL IN ONE
- INTERNALLY FED DRUM SCREENS
- EXTERNALLY FED DRUM SCREENS



IMPACT OF TECHNOLOGY

CASE STUDY: SOUTH TEXAS
FILTER BELT ELEMENT SCREENS REPLACED STEP SCREENS

- QTY 4 STEP SCREENS INSTALLED IN 2002
- DESIGN MAXIMUM FLOW – 40 MGD 10 MGD PER SCREEN
- 4 FT WIDE X 10 FT DISCHARGE HEIGHT 6 MM SLOTS
- SCREENINGS DISCHARGE TO SPIRAL CONVEYOR AND WASHER/COMPACTOR
- ISSUES:
  - NO UPSTREAM PROTECTION OF STEP SCREEN
  - LOW CAPTURE RATES CREATED OPERATIONAL INEFFICIENCIES

CASE STUDY: SOUTH TEXAS
FILTER BELT ELEMENT SCREENS REPLACED STEP SCREENS

- ALL 4 STEP SCREENS REMOVED 2013
- QTY 2 AG-MN-UC INSTALLED 2013, QTY 2 AG-MN-UC INSTALLED 2015

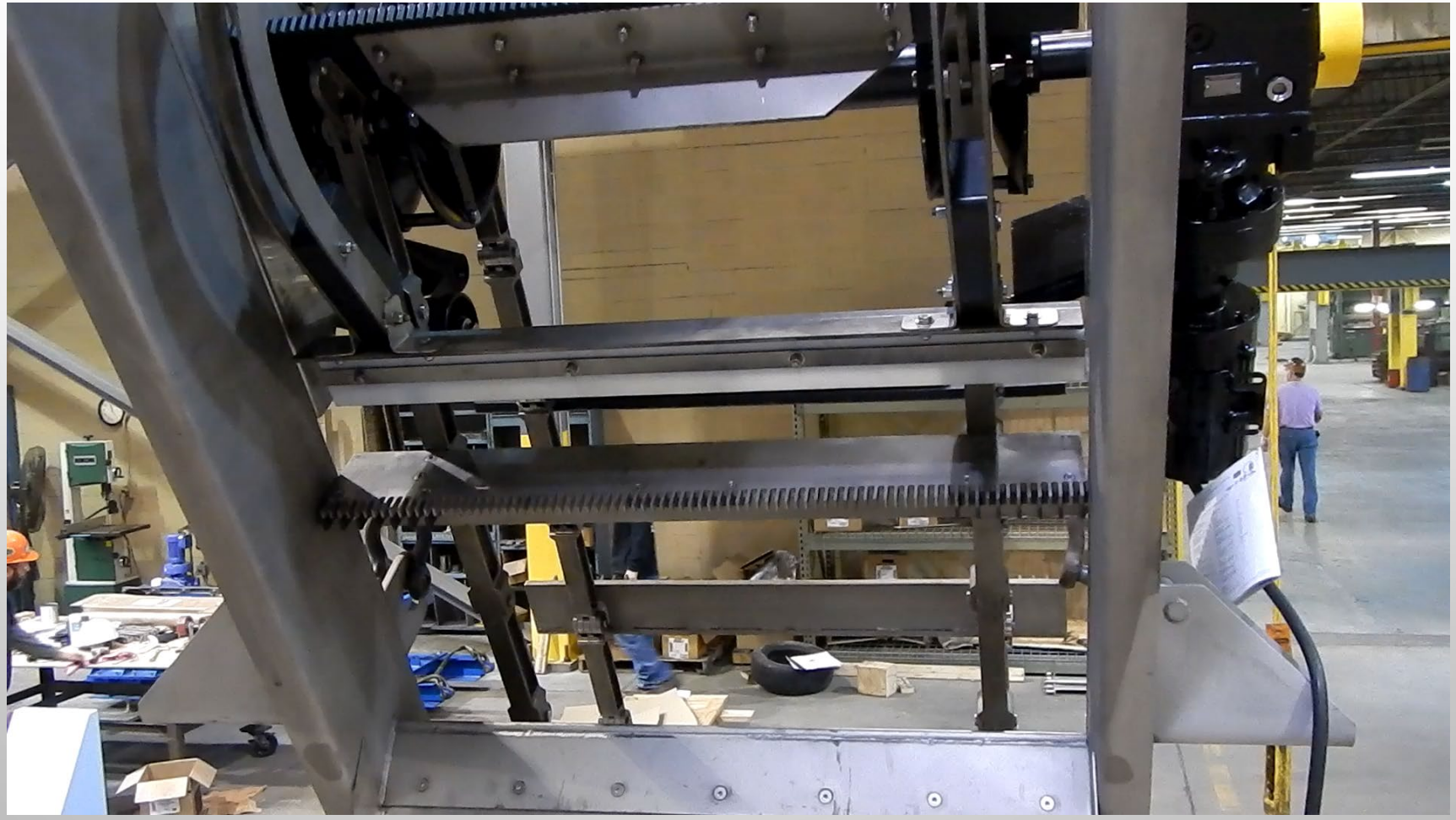
Step Screen Performance	New Filter Element Screen Performance
8 hours labor per day to maintain pumps / sensitive equipment	8 hours labor in 2.5 years to clean pumps
4 hours labor per day to maintain screens	4 hours labor every 2 weeks to maintain screens
32 hours labor per quarter to drain and clean clarifier	NO labor hours for clarifier in 2.5 years
→	Over 1,800 labor hours saved, so far.
→	$75,000.00 saved, so far. (At $40/hour)

BAR SCREEN – AQUA CAIMAN

BAR SCREENS – AQUA CAIMAN

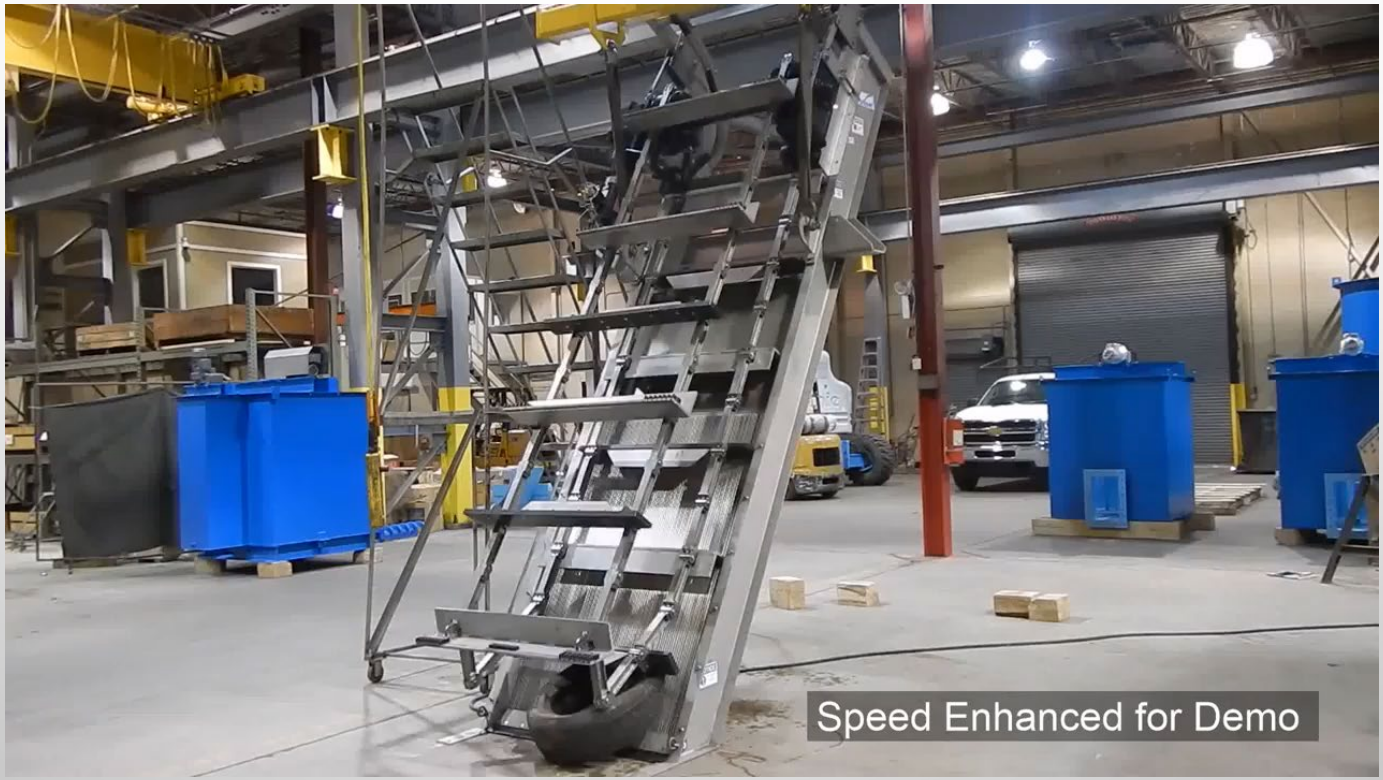
- STAINLESS STEEL MATERIALS
- NO SPROCKET IN THE WATER
- VERY LOW MAINTENANCE
- CAN CARRY LARGE OBJECTS
- SAME FOOTPRINT AS OTHER BAR SCREENS
- LOW CAPTURE RATES
- HIGHER COST THAN OTHER BAR SCREENS

WIPER ARM MOTION



BAR SCREENS – AQUA CAIMAN

BAR SCREENS – MODIFIED CATENARY SCREENS



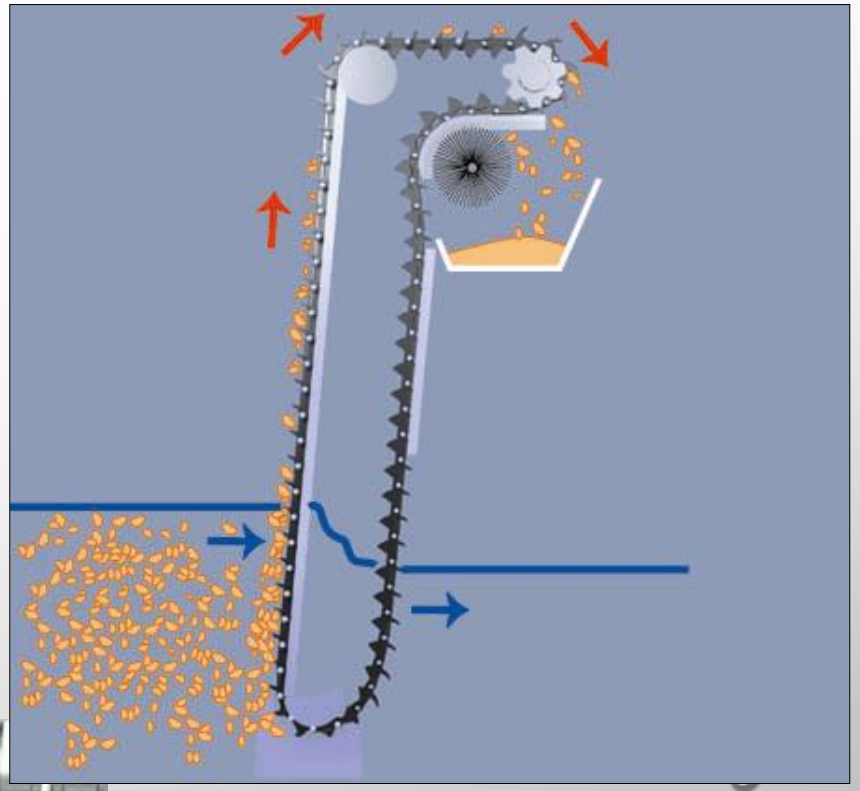
FILTER BELT SCREEN – AQUA GUARD

Grid Structure Captures Solids

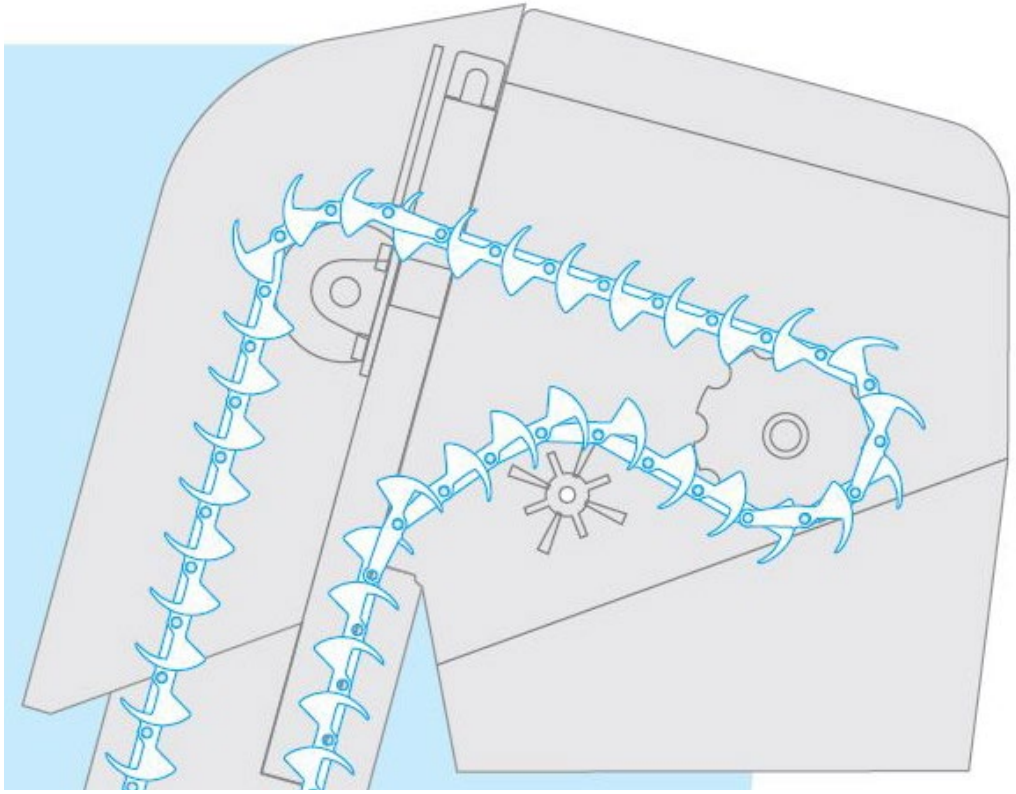
Bar Racks: no grid

FILTER ELEMENT BELT SCREENS – AQUA GUARD

- STAINLESS STEEL MATERIALS
- ELEMENTS AVAILABLE IN SS AND POLYMERIC
- HIGH CAPTURE RATES
- RECENTLY MODIFIED DESIGNS REDUCE MAINTENANCE AND REDUCE CARRYOVER
- CARRYOVER POTENTIAL



Aqua Guard® Screen Belt Path and Components

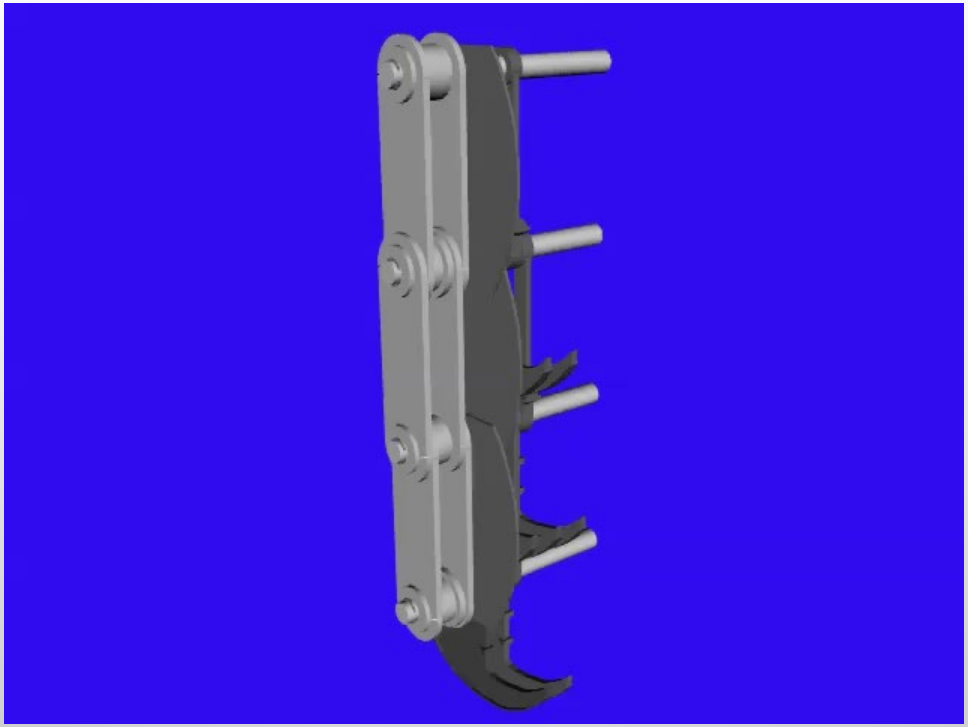


- Spray (optional)
- Guide Rails
- Brush
- Bottom Return Rail (no bearing)

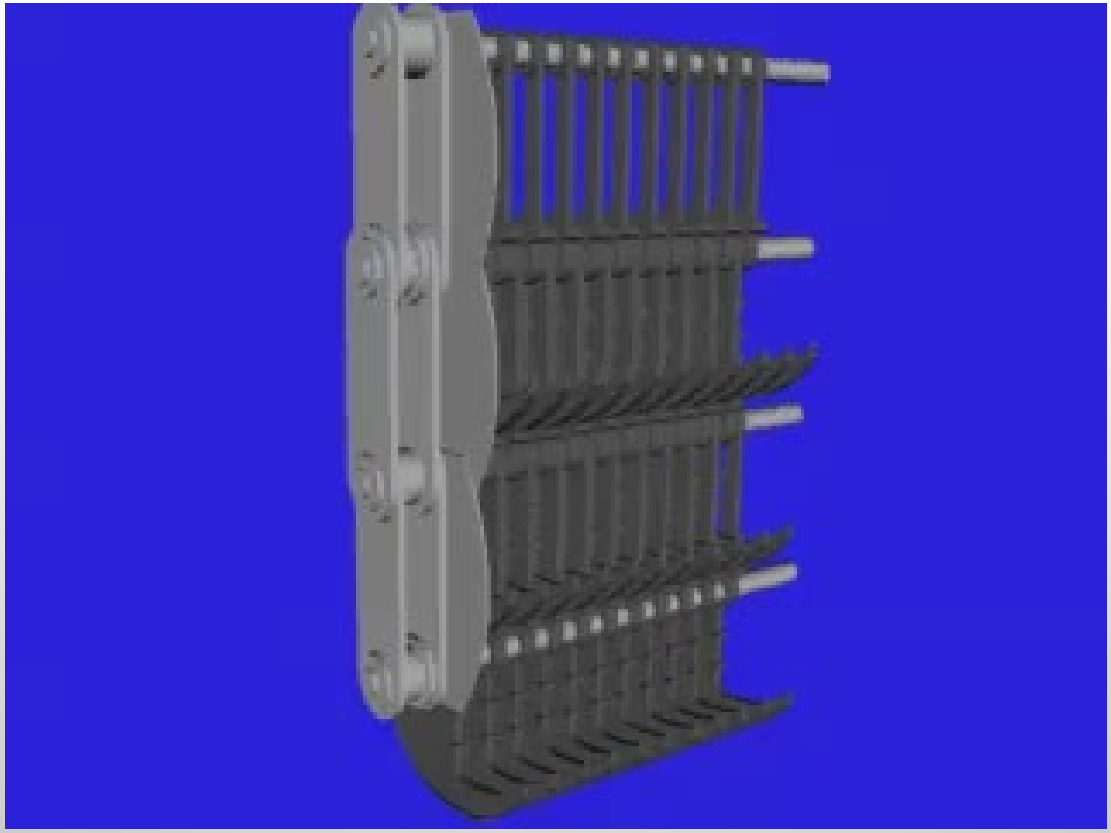
Aqua Guard® Elements Grid Structure

- **Polycarbonate Alloy**
- Hardness 13% more than ABS
- Tensile 24% more than ABS
- Impact resistance 320% more than ABS
- Per ASTM test results

AQUA GUARD BELT CHAIN CONSTRUCTION



AQUA GUARD ELEMENT MOVEMENT



AQUA GUARD BELT BRUSH VIDEO

AGUA GUARD ULTRACLEAN BRUSH VIDEO

COMPARISON TESTING

TESTING SITE

- HEADWORKS SCREENS
- GRIT REMOVAL
- PRIMARY CLARIFIERS
- IFAS TRAIN
  - INTEGRATE FIXED-FILM ACTIVATED SLUDGE
- SECONDARY CLARIFIERS
- UV DISINFECTION

TEST SITE CONDITIONS

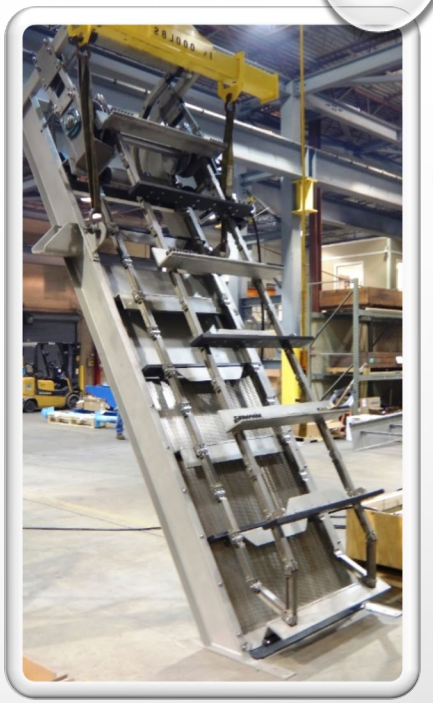
- REDUNDANCY IN DESIGN
- PARALLEL INFLUENT CHANNELS
  - DESIGNED TO ALLOW PEAK FLOW THRU A SINGLE CHANNEL
- SINGLE WASHER COMPACTOR
- PLANT PROCESS FLOW
  - PEAK DESIGN OF 12.0 MGD
  - MAX DAILY FLOW OF 8.0 MGD
  - DAILY FLOW AVERAGING BETWEEN 4.5 AND 4.8 MGD

TEST SITE EQUIPMENT

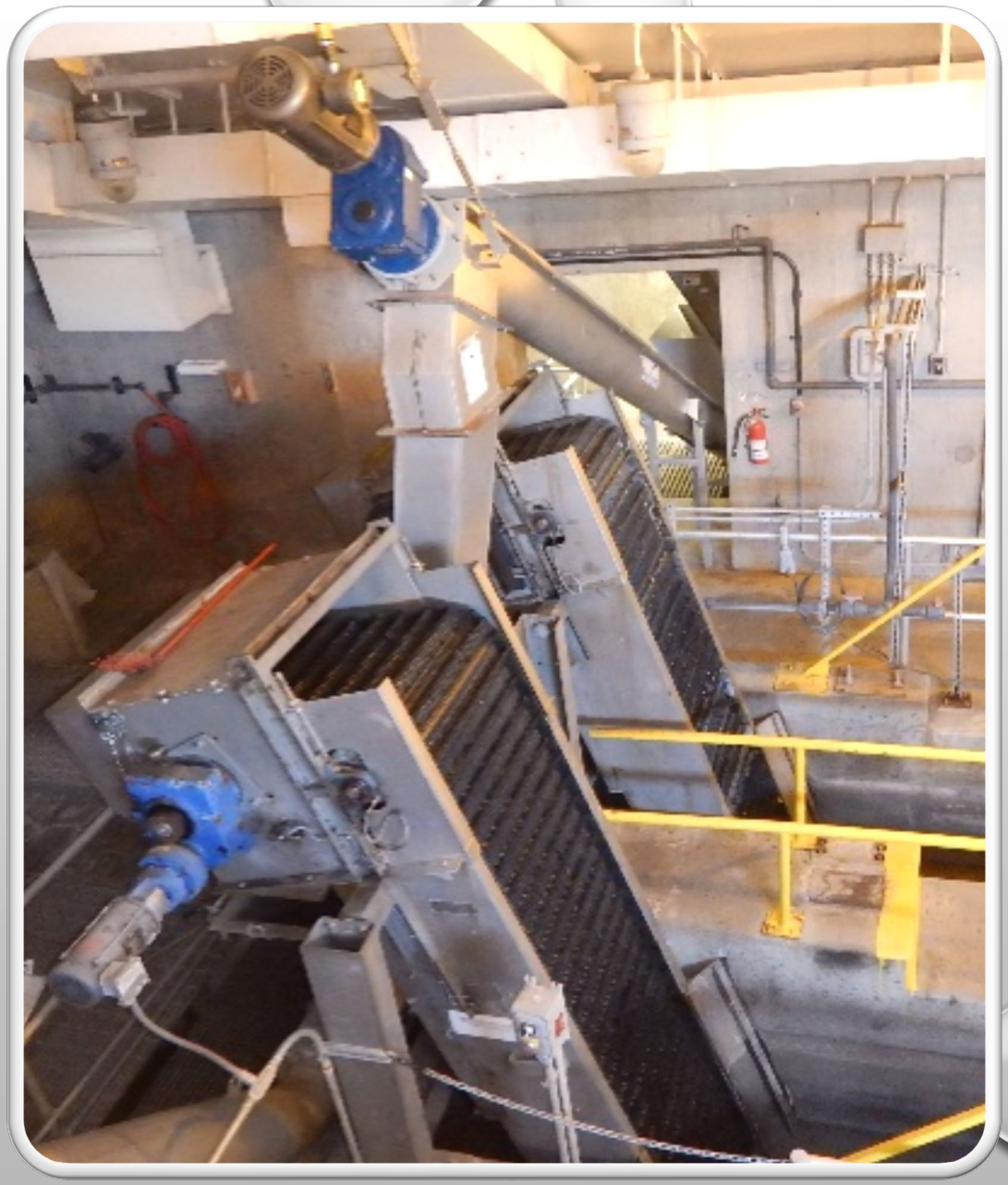
- BAR SCREEN – AQUA CAIMAN
- FILTER ELEMENT SCREEN – AQUA GUARD

TEST SITE EQUIPMENT

- BAR SCREEN – AQUA CAIMAN
  - INSTALLED NEW 2017
  - REPLACED MANUAL SCREEN IN EMERGENCY BY-PASS CHANNEL
- FILTER ELEMENT SCREEN – AQUA GUARD
  - QTY 1 INSTALLED IN 1998, QTY 1 INSTALLED IN 2003
  - SCREEN SURFACE AND WEAR PARTS REFURBISHED IN 2012 AND 2013



TESTING SITE CONFIGURATION

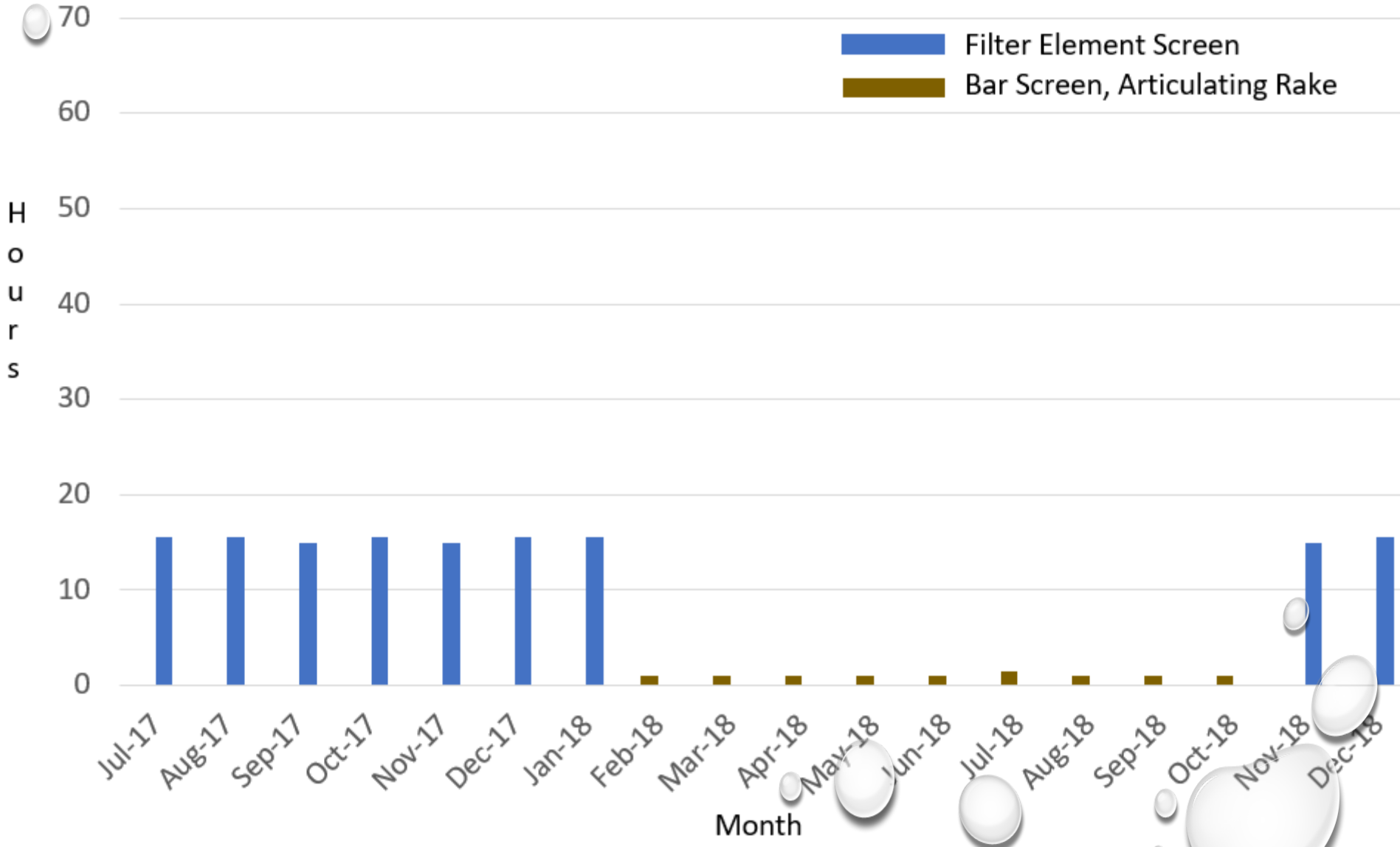


TESTING SITE CONFIGURATION

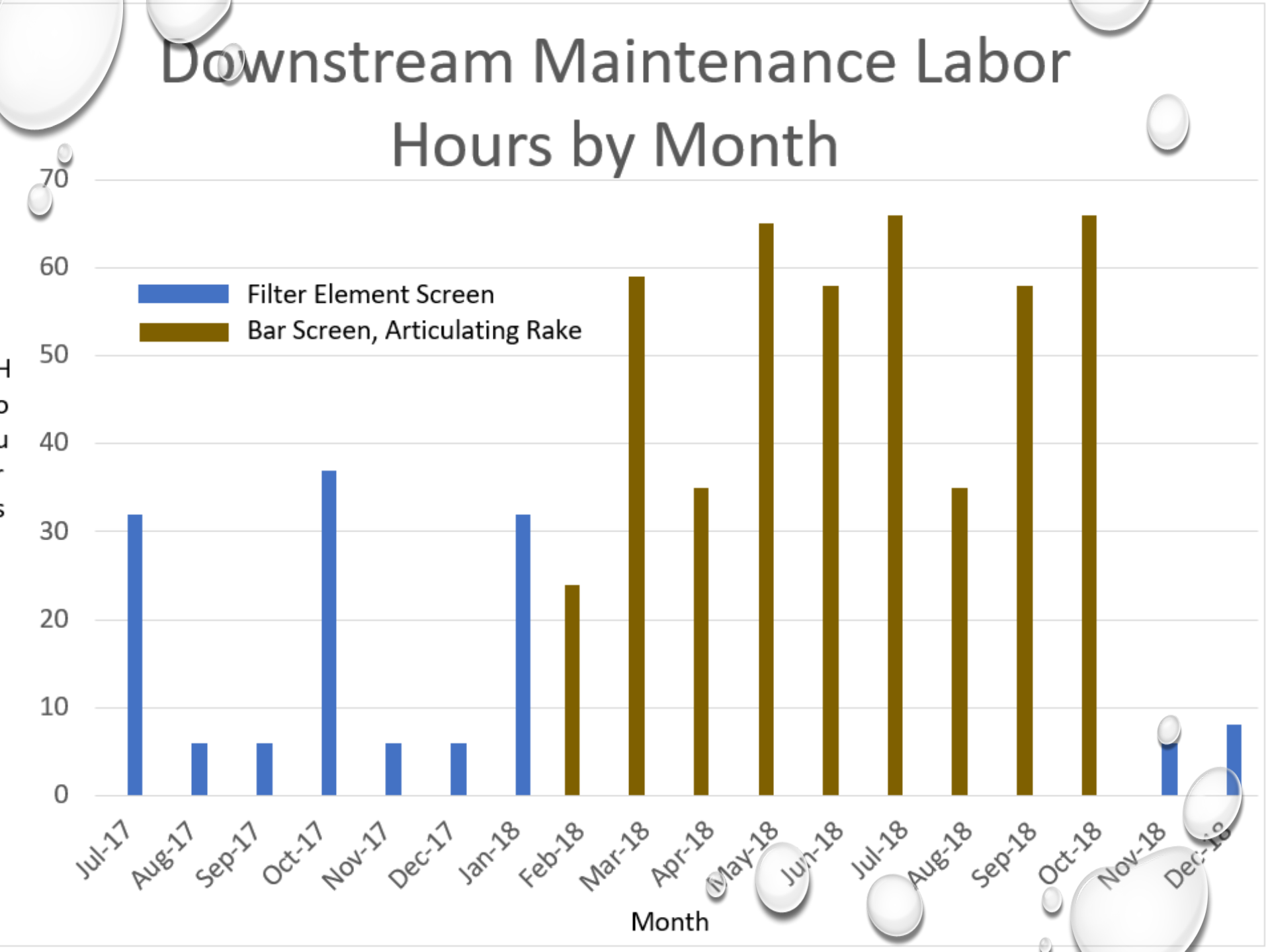
TESTING OBJECTIVES AND METHODS

- INITIAL APPROACH – DUMPSTER WEIGHTS
  - SAME WASH PRESS FOR BOTH TYPES OF SCREENS
  - FORK LIFT SCALE (USED FOR PALLET WEIGHING)
  - DATA COLLECTION WAS PROBLEMATIC
  - GAP STILL LEFT FOR REAL WORLD INTERPRETATION
- MAINTENANCE LABOR
  - IMPROVED EFFICIENCY FOR STAFF TO COLLECT DATA
  - IMPROVED RECORDING
  - DIRECTLY APPLICABLE TO REAL WORLD OPERATIONS

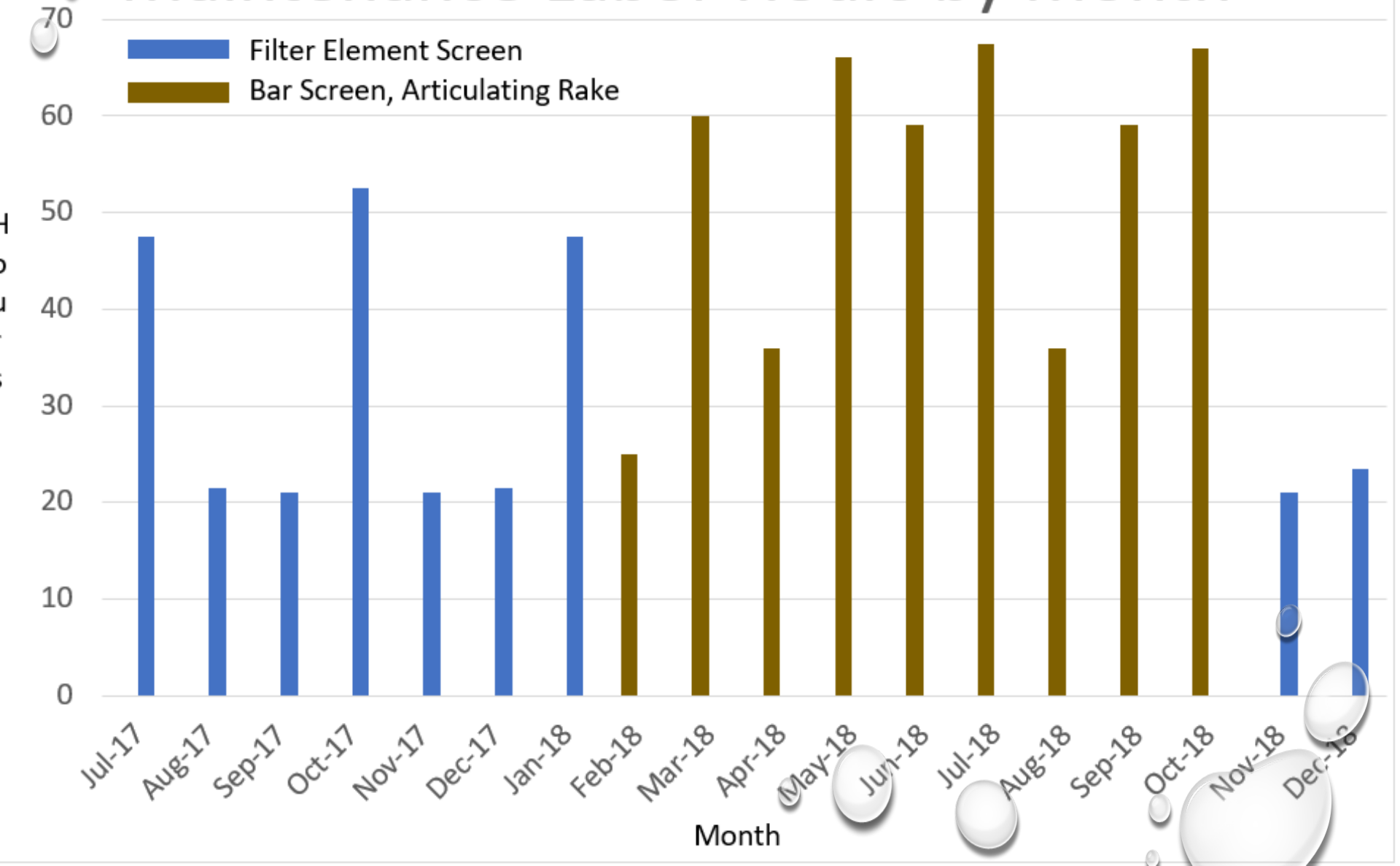
Screen Maintenance Labor Hours by Month



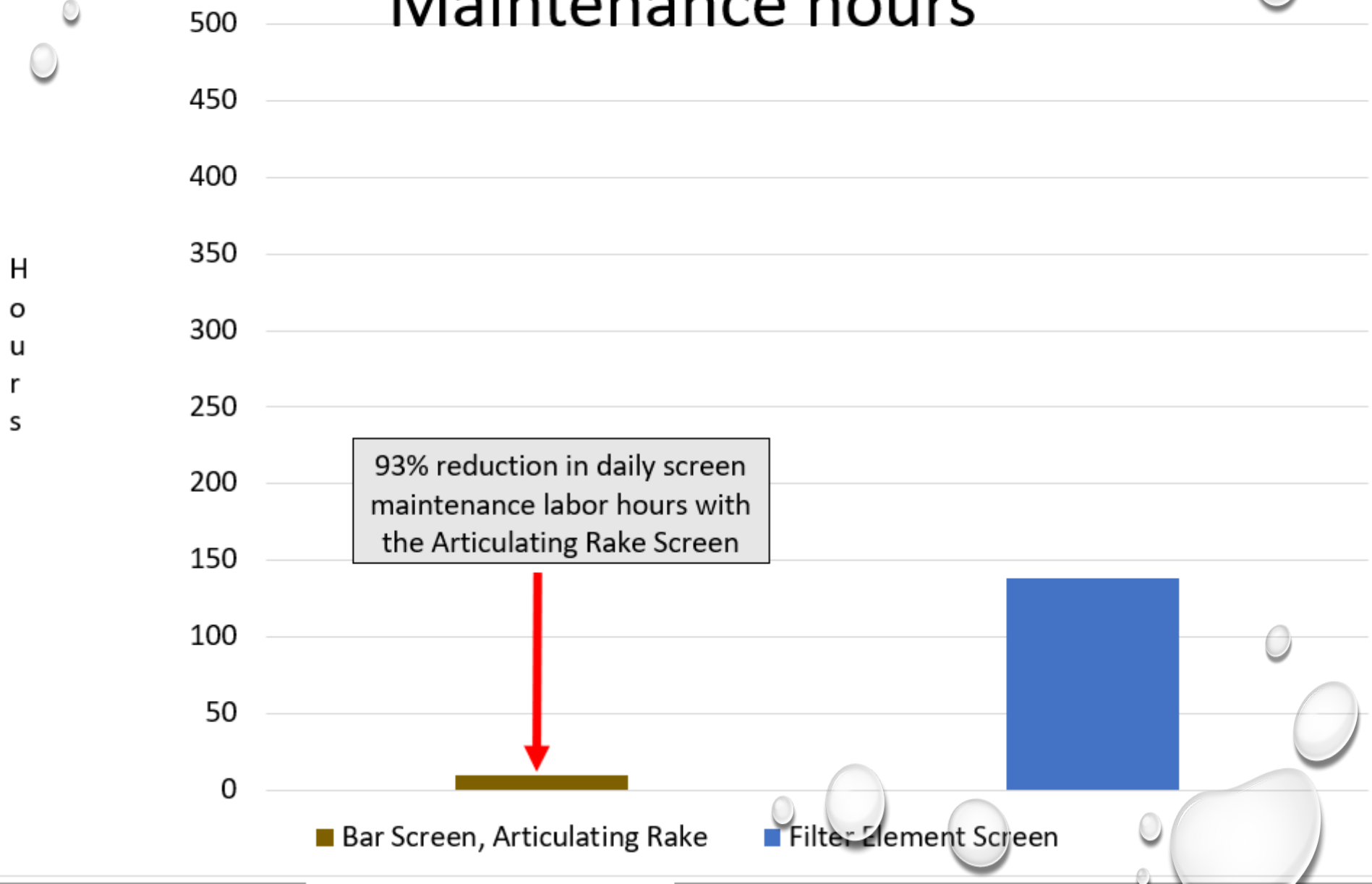
Downstream Maintenance Labor Hours by Month



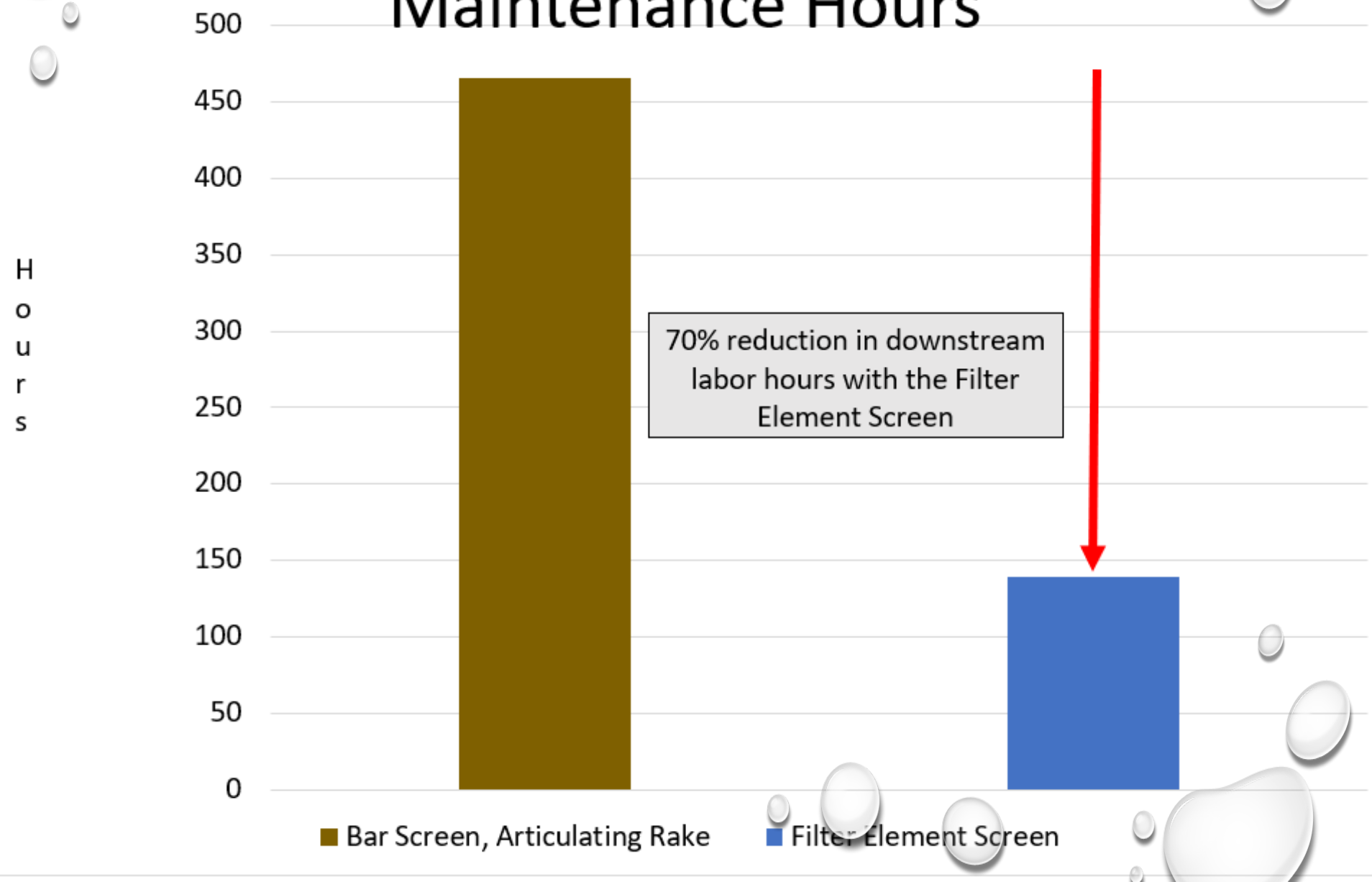
Screen and Downstream Maintenance Labor Hours by Month



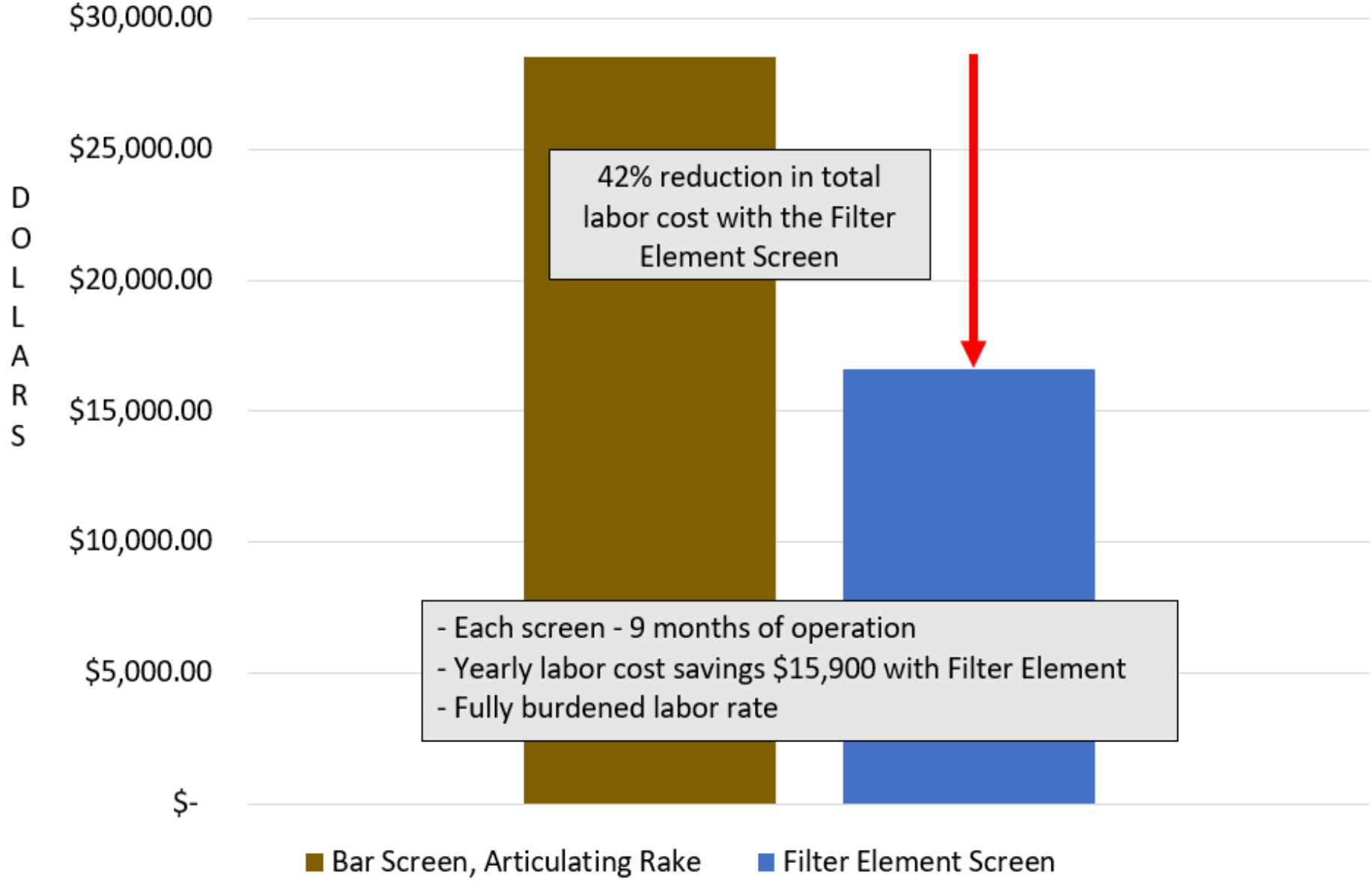
Total AC and AG Screen Daily Maintenance hours



AC and AG Downstream Maintenance Hours



Total Screen Maintenance and Downstream Maintenance Labor Costs



WASHER COMPACTORS

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THANK YOU

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