

#### BAND SCREENSAND FISH RECOVERY AND RETURN SYSTEMS

ENGINEERING CONSIDERATIONS BASED ON EXPERIENCE IN THE UNITED STATES

Institute of Fisheries Management Environment Agency
Fish Impingement and Entrainment Conference 2023

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#### AGENDA

- Operational and regulatory goals to drive design
- Plan for greater water use, electrical draw and instrumentation, weight/load
- Removing old and installing new screens
- Fish recovery and return systems
- Post-installation monitoring?
- Debris management
- Operations and maintenance
- > Schedule



BEFORE AND AFTER











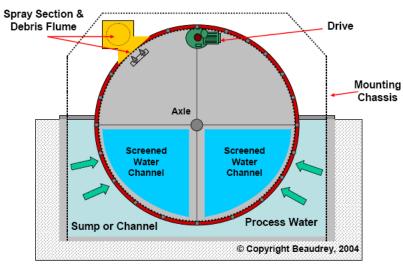


## SCHEMATIC OF AN INTAKE STRUCTURE





## ROTARY DRUM SCREENS



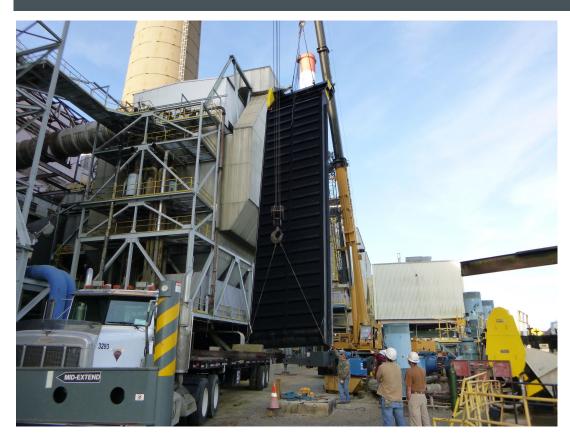
**CROSS-SECTION VIEW** 



Image: Beaudrey



## BAND SCREENSARE LONG!



The section visible above the operating deck is just the top 2 meters





#### OPERATIONAL AND REGULATORY GOALSTO DRIVE DESIGN

- Regulatory compliance
- Reliable facility operation
- Reduced facility downtime during construction and operations
- Ease of operation of intake
- Avoid post installation modifications
- Incorporate verification monitoring requirements into initial design



## NEED MORE WATER

- Continuous operation of screens reduces time organisms remain impinged
  - Wash all screens all the time
  - Need water for debris trough, fish trough, additional trough water





## **ELECTRICAL AND INSTRUMENTATION**

- Continuous operation of screens
  - Operate all screens all the time
  - Water filled fish buckets make screens heavier
  - Operate screenwash system all the time
  - Greater power draw
  - Greater need for reliable operation instrumentation







## GREATER STRUCTURAL LOAD

- > Heavier screens
- ➤ Greater support/load



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#### REMOVING OLD AND INSTALLING NEW SCREENSAND FRR

- Access
- > Space for staging, equipment
- > Need for crane
- ➤ Install screen whole or in parts?
- Structural modifications needed if switching from drum screens to band screens
- Downtime phased installation, coincide with maintenance outages







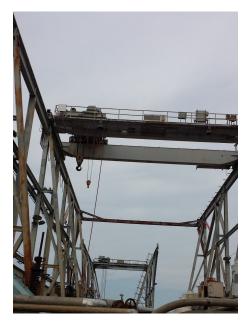




## REMOVING OLD AND INSTALLING NEW SCREENSAND FRR (2)

- > Access
- > Space for staging, equipment
- > Need for crane
- ➤ Install screen whole or in parts?
- Structural modifications needed if switching from drum screens to band screens
- Downtime phased installation,
   coincide with maintenance outages







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#### FISH RECOVERY AND RETURN

- Improve survival by limiting flow velocities and screenwash pressures
- Structural support for FRR onshore, offshore, tidal
- Gentle and consistent slopes
- Smooth surfaces, joints
- ➤ Plunge pool for return
- > Avoid barnacle and algae growth
- Operator access for inspection and cleaning
- Avoid predation







## FISH RECOVERY AND RETURN (2)

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Design is site-specific.
There are guidelines/literature on FRR design.







#### POST-INSTALLATION MONITORING - PLAN AHEAD

- Does the system work as expected?
- > Plan for testing/monitoring during screen/FRR design and installation stage
  - Access
  - Can test only if design allows testing
  - Consult biologists; incorporate compliance requirements



## DEBRISMANAGEMENT

- Understand debris, types, quantities, seasonality prior to screen replacement
- > Return debris to source water?
- > Arrest large quantities before band screens











## BYPASS SCREENSWHEN INUNDATED WITH DEBRIS

- > Safety over equipment
- > Controlled failure



## PLAN FOR DAMAGED SCREENS

- > Stop large, heavy debris well before band screens
- > Extra screens or panels











## **MATERIALS COMPATIBILITY**

- > Corrosion
- Microbially-induced corrosion
- > Select materials suitable for operating conditions
- > Regular inspections and maintenance



## **OPERATIONSAND MAINTENANCE**

- ➤ More equipment and instrumentation to maintain
- > Staff availability
- More or less automation
- > Local controls; main control room
- > Alarms phone, lights



## REALISTIC SCHEDULE

- > Planning, design, install take time
- > Things will go wrong
- Manage schedule expectations
- > Reasonable schedules result in cost-effective work



## SUMMARY

- > Well-designed and operated fish-friendly screens with FRR can provide meaningful fish protection
- Planning ahead can reduce cost and anxiety



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# QUESTIONS?



#### CONTACT US



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