General Overview of 316(b)
November 2014

Energy Group – Power & Intakes, Americas

Who is “OVIVO” ?

Ovivo consists of the merger of Brackett Green, Eimco Water Technologies and Christ Water Technology under one name to create a global force in clean water processes

Ovivo staff has 30+ years of direct “Fish Recovery Traveling Screen” experience and staff actually developed the improvements referred to as the “Fletcher” improvements noted in the “Apr. 20, 2011 Proposed Rules”

Considerations and Ramifications of the EPA OWM CWA Sec. 316(b)

Compliance for plants > 2MGD with >25% for cooling water

1. Intake rate equal to closed-cycle cooling
2. Operate CWIS with actual thru screen velocity < 0.5 ft/sec
3. Operate CWIS with a design max. thru screen velocity of < 0.5 ft/sec
4. Operate with offshore velocity cap meeting requirements
5. Install modern fish recovery and return screens meeting BTA
6. Apply combined technologies for impingement mortality reduction determined as BTA locally
7. Meet specified annual impingement mortality standard

Permit Planning Depends on Renewal Timing:

Study Mode:

1. Source water and intake structure data
2. Baseline biological characterization
3. Selected method for compliance with impingement mortality standard
4. Entrainment performance studies

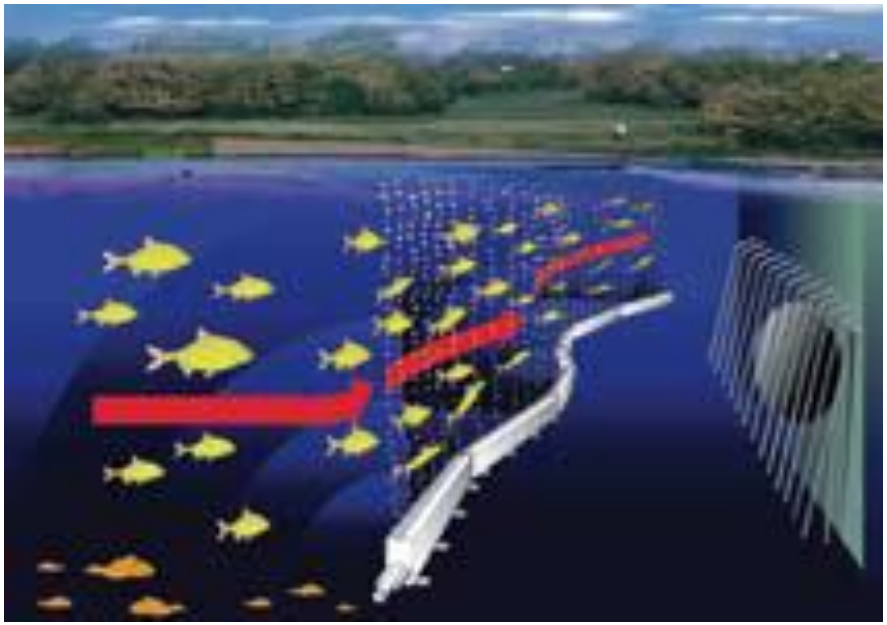
If > 125 MGD:

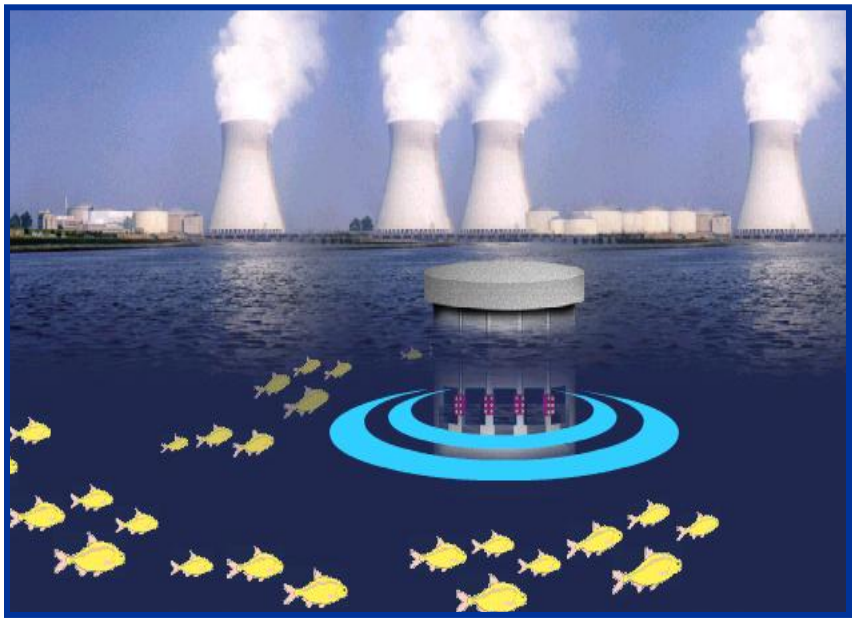
1. Entrainment characterization study
2. Technical feasibility and cost benefit analysis
3. Environmental impact study

Technologies to Consider

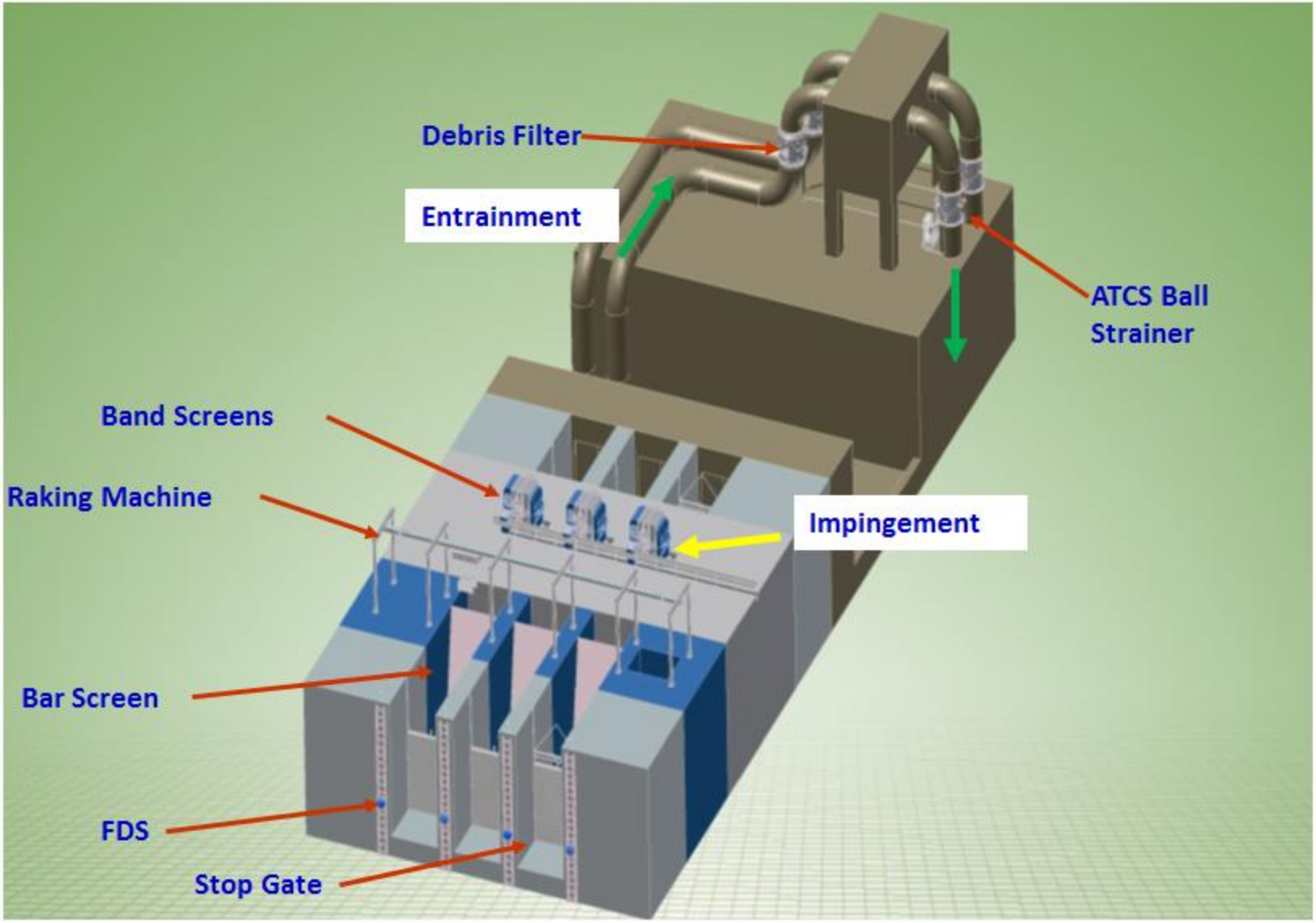
- **DIVERSION –** Fish Deterrent Systems
- **EXCLUSION –** Passive Wedge Wire Screens
- **RECOVERY –** S.I.M.P.L.E.® Fish Recovery Screens

FGS Acoustic Fish Barrier Technology
Fish Deterrent Systems



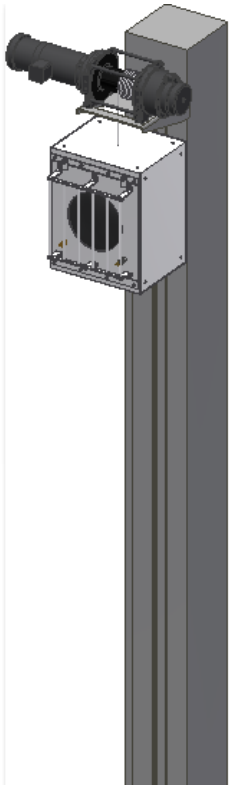


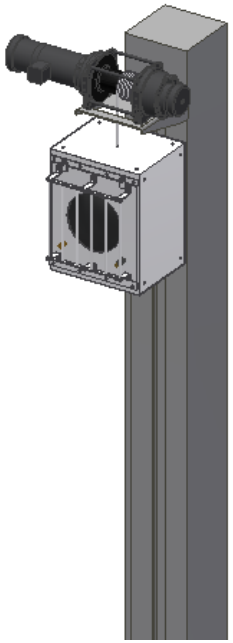
Circulating Cooling Water Systems
Impingement vs. Entrainment



Typical SPA

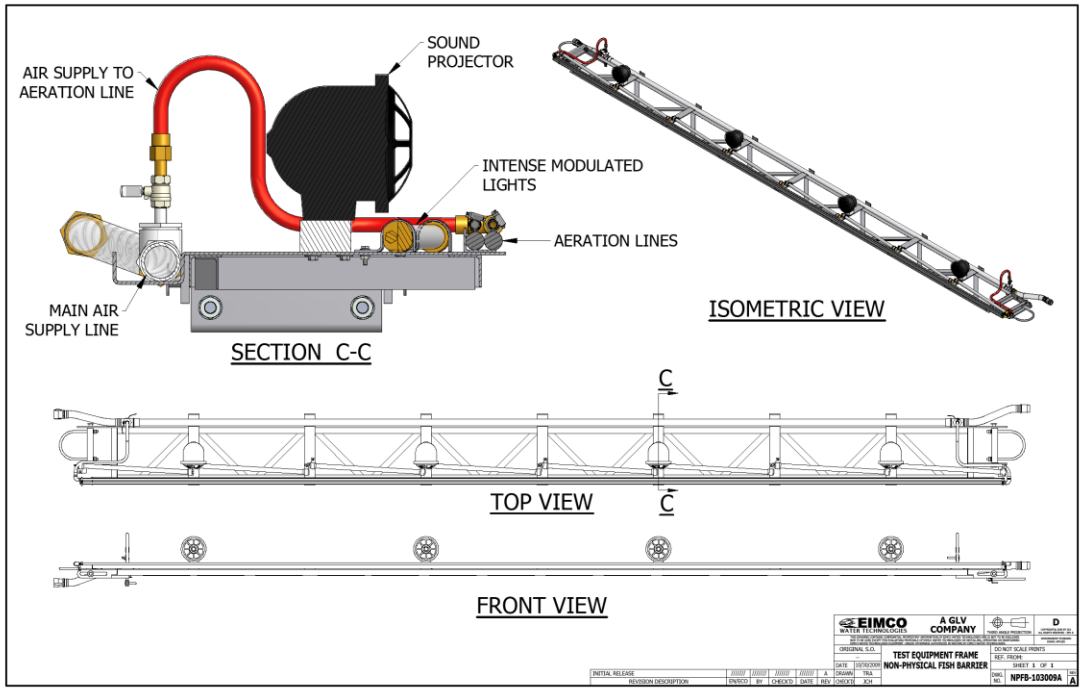
The SPA utilizes retractable speakers
for underwater projection,
ease of deployment and inspection

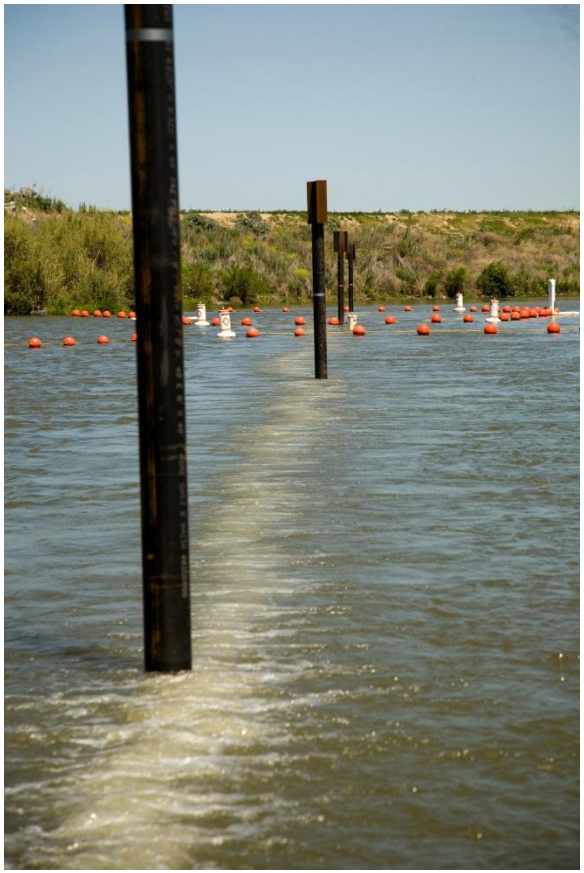




Typical BAFF - Modular Section

The BAFF utilizes air, sound and light to divert fish and is available in modular sections for ease of deployment





Cooling Water Intake Structures – CWA Sec. 316(b)

How will 316(b) affect your plant ?

- Change allowable thru-mesh velocity thus increasing the number of screens
- Change mesh sizes for entrainment vs. impingement considerations
- Possibly construction of new intake structure
- Possibly different arrangement and type of screen
- Require continuous operation of screens
- Require monitoring, sampling and survival percentages

Ovivo Products Offered for Fish Protection

- Fish Guidance & Deterrent Systems
- Static Screens
- Passive Wedge Wire Screens
- Fish Handling Dual Flow Conversion Band Screens
- Fish Handling Thru Flow Band Screens

Fish Deterrent Systems
Applications

- Previous to the recent 316(b) Notice of Data Availability (NODA), plants were not considering diversion technologies due to survival reporting criteria
- However the recent NODA specifically mentions diversion based on the plants ability to demonstrate increased survivability
- Plants previous studies should indicate the number of fish drawn into the intake and reducing these numbers can have a significant impact on survivability

Doel Nuclear Power Station

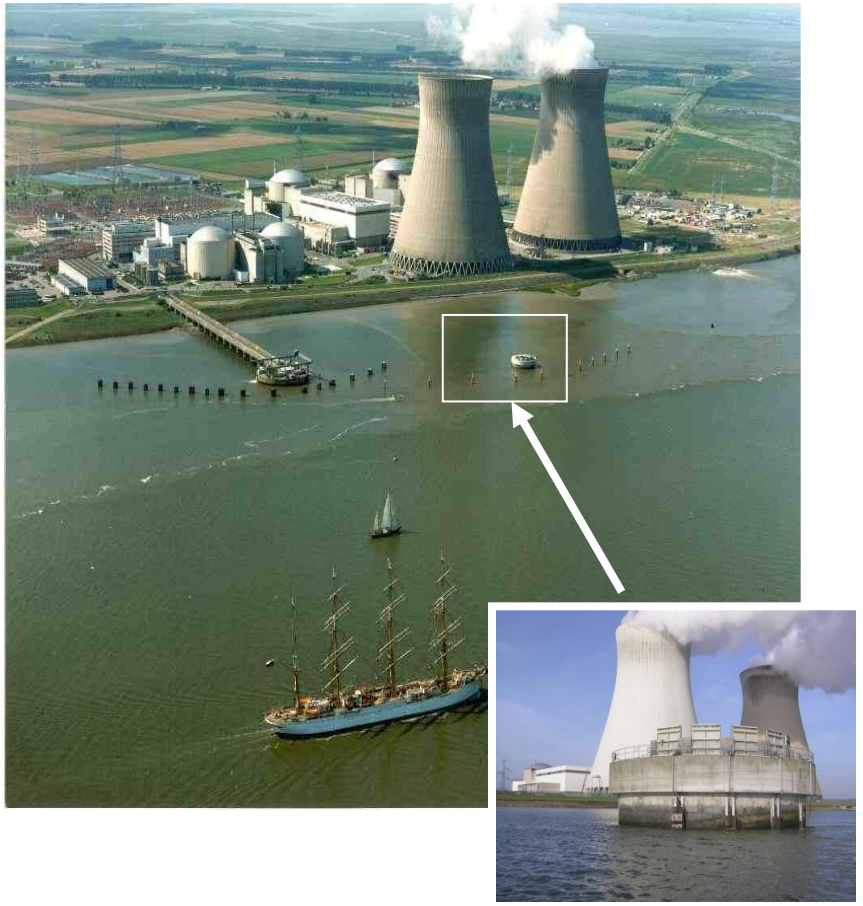
Tidal Estuary

System installed on off-shore intake for Reactors 3 & 4 (2,000 MW)

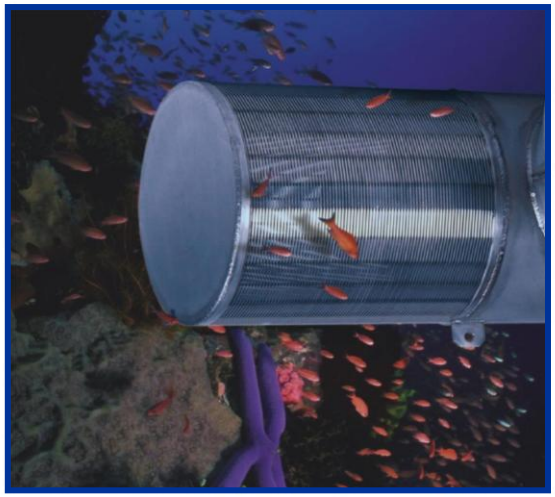
Installed 1997

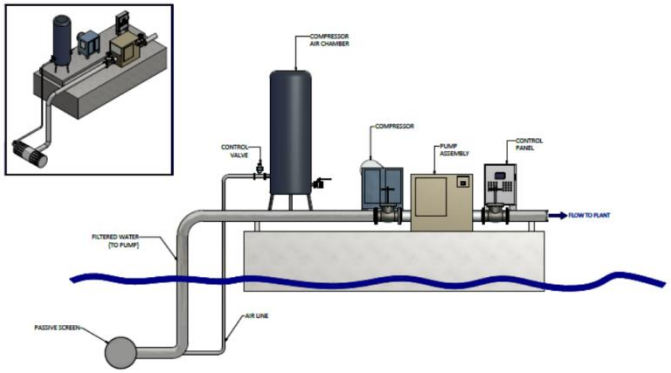
System comprises

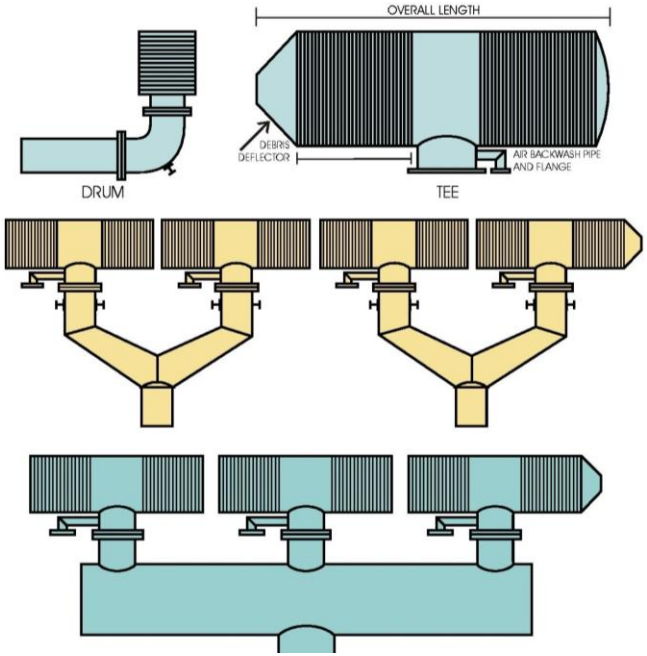
- 20 Sound Projectors
- 20 Amplifiers
- 1 Signal Generator

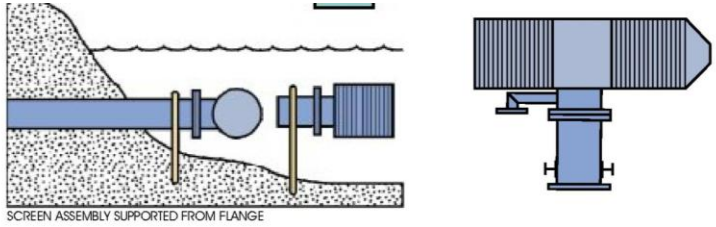


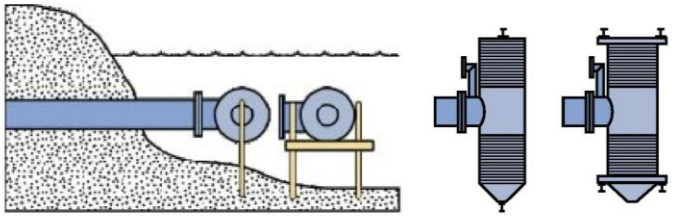
Passive Wedge Wire Screens

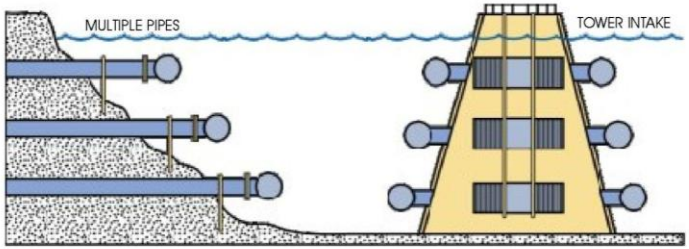




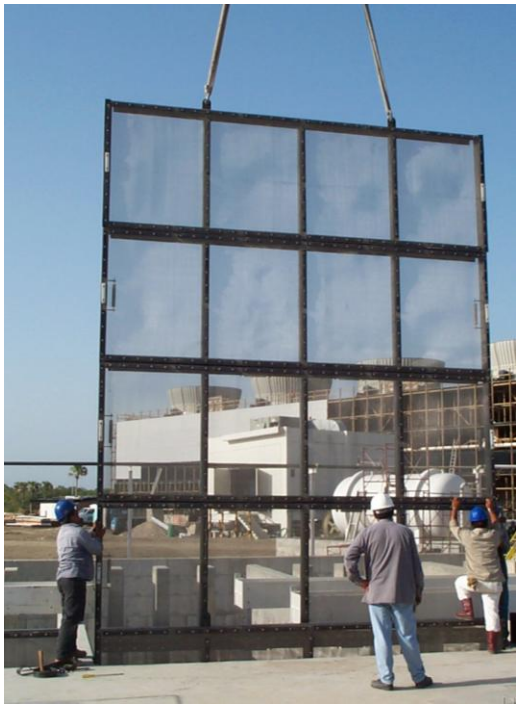



SCREEN ASSEMBLY SUPPORTED FROM FLANGE


SCREEN ASSEMBLY SUPPORTED WITH H PILES FROM FLANGE



Static or Stationary Screens



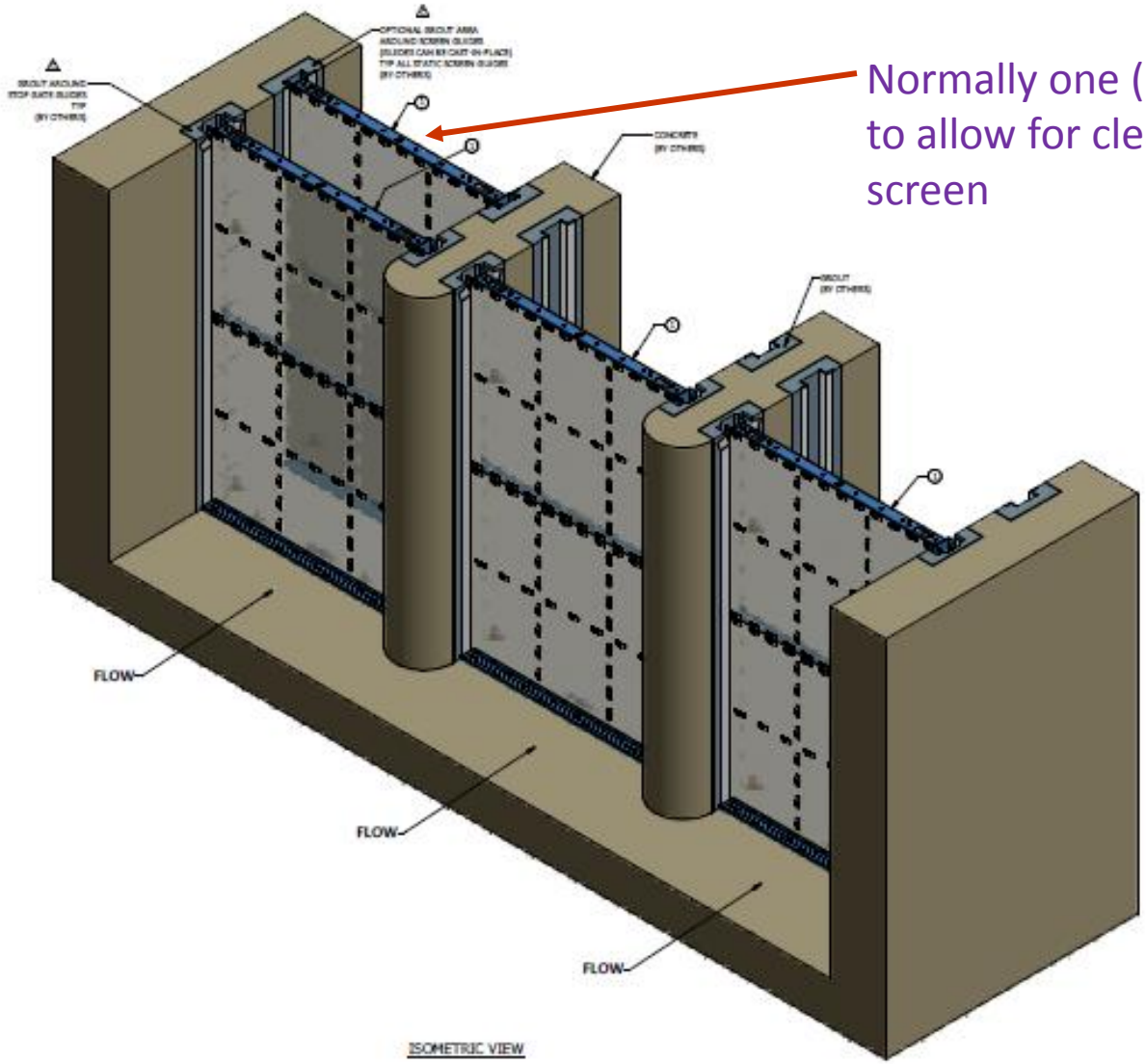
Normally used for closed loop cooling applications, sub-surface piped or low velocity intakes

Typically uses 2 per channel is series to allow hand washing of screens

Used to capture foreign debris, disintegrating cooling tower elements, etc…

Variable widths, depths, mesh openings and materials

Static or Stationary Screens



Normally one (1) roving screen used to allow for cleaning of upstream screen

Factors considered affecting screen design :

- Type of plant & operating requirements
- Environmental considerations such as Fish Handling, velocity restrictions, head loss limitations, etc…
- Body of water source - river, lake or sea
- Adverse conditions such as silt, sand, curves, etc…
- Typical debris to be removed and anticipated loads
- Flow conditions and external parameters
- Level of filtration and automation required
- Desired materials of construction
- Service life and maintenance requirements

S.I.M.P.L.E. Fish Recovery Process

- S Stabilized (flow across basket rail)
- I Integrated (into basket rail)
- M Marine (juvenile fish recovery)
- P Protection (from harmful vortices)
- L Lifting (removal from intake flow)
- E Environment (sheltered region)

This design is commonly referred to as S.I.M.P.L.E. and is the only proven design with a greater than 10 year track record for recovery and high percentage of survivability by independent sources and actual field conditions.

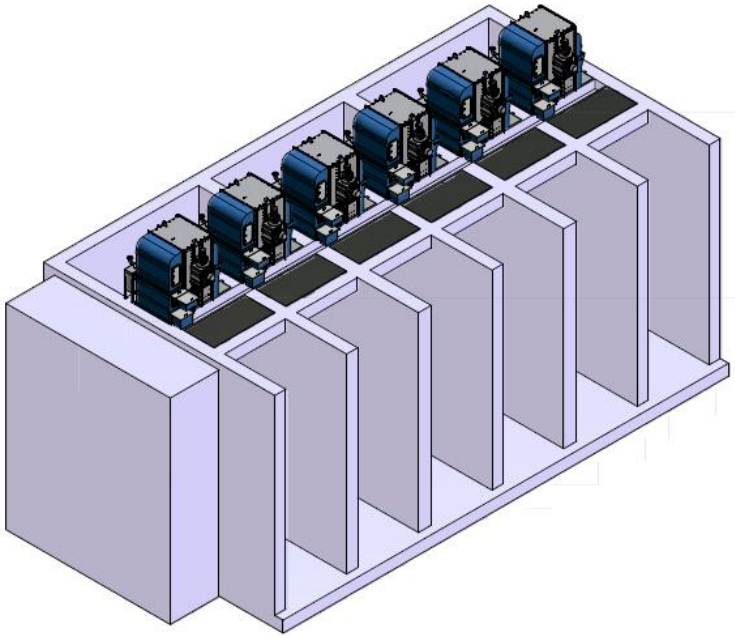
S.I.M.P.L.E. Benefits and Performance

- Considered one of the BTA's for existing plants under rule 316 (b) now under review due to "cost" considerations (vs. cooling tower option) to increase survivability of juvenile marine life

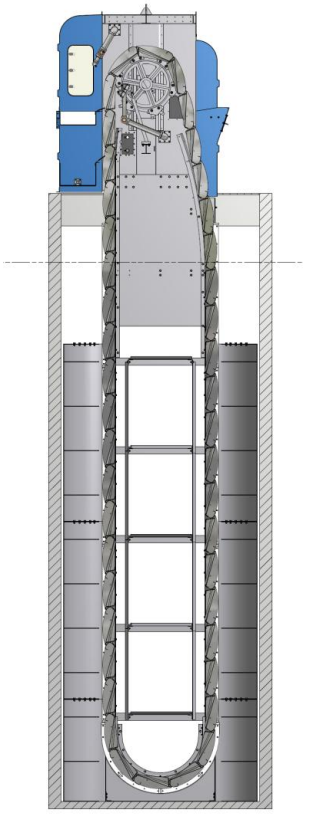
- > 50 North American installations

Various Considerations
Cost Benefit Analysis

Cooling Tower
$ 400m…….



New Intake
$ 40m…….



Screen Retro Fit
$ 4m…….

Many plants will apply the 1% consideration for spending:
$ 400m for Cooling Tower…….$ 40m for new Intake…….$ 4m for Retro Fit

Operational Differences, Existing vs. Fish Handling:

Fish Handling screens have simple operational rule:

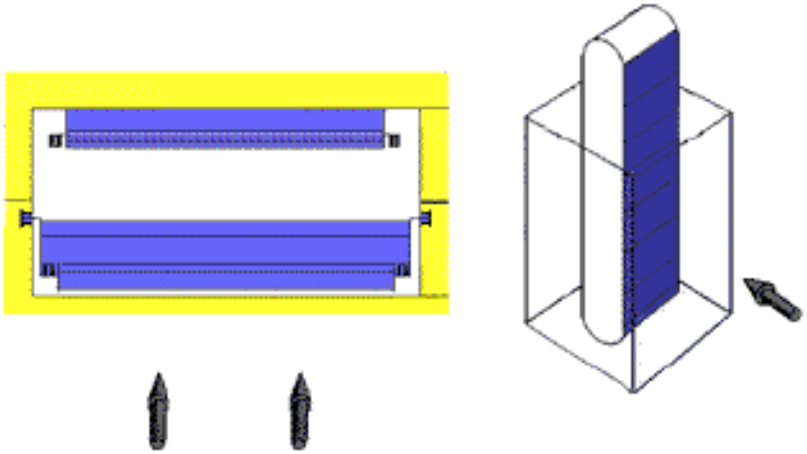
- If the circulating pump is on, the traveling screen(s) **MUST be running (i.e. 24 / 7 / 365).**

- **Screens should operate at the LOWEST turning speed** possible (i.e. 2.5 to 3 Ft/min compared to TF @ 10 Ft/min) and then transfer to higher speed(s) when debris is detected by differential system

- Differential controls are installed to transfer screen from low speed and **VFD drives may incorporate multiple speeds** for various circumstances and usually double the speed (2.5 – 5.0 – 10.0-20.0)

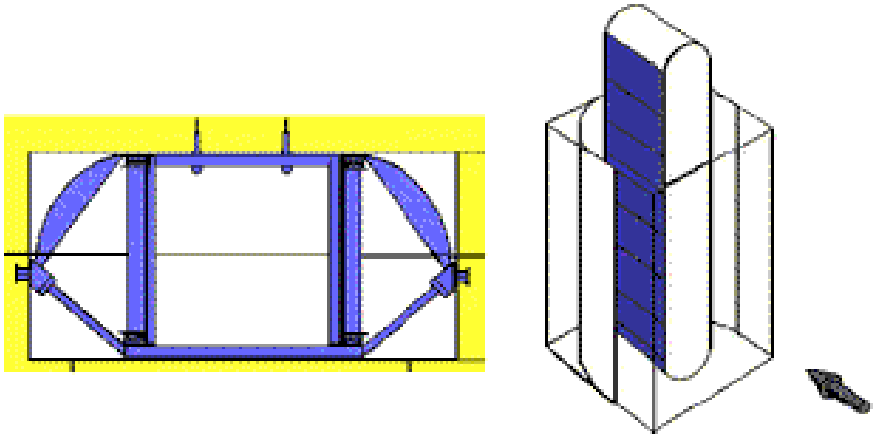
Straight Thru Screen vs. Dual Flow Screen

Influent Side is in contact with Effluent Side. **Debris Carry over cannot be avoided**.



Thru-Flow Screen

Influent Side is separated from Effluent Side. **Debris Carry over is completely eliminated.**

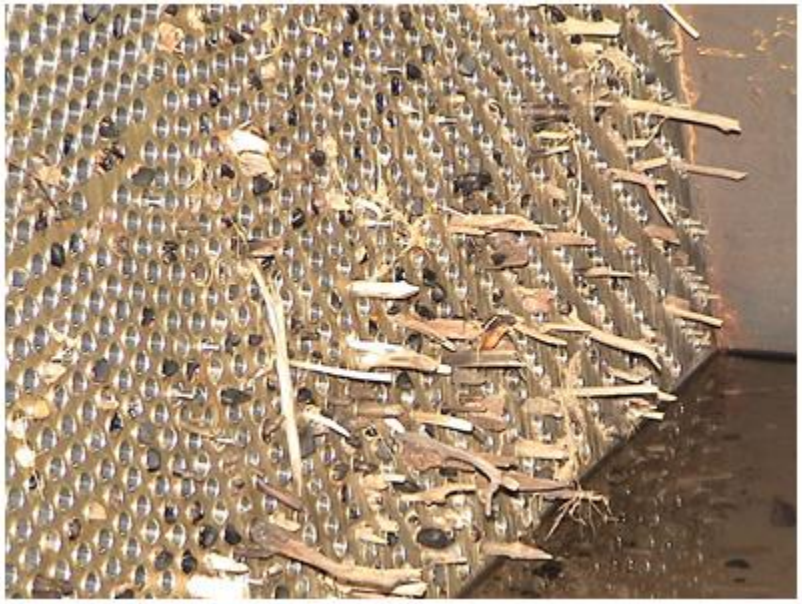


Dual Flow Screen

Dirty Water

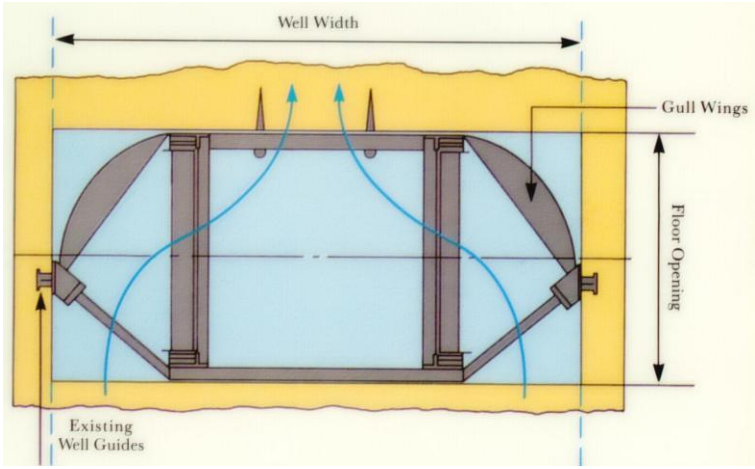
Clean Water

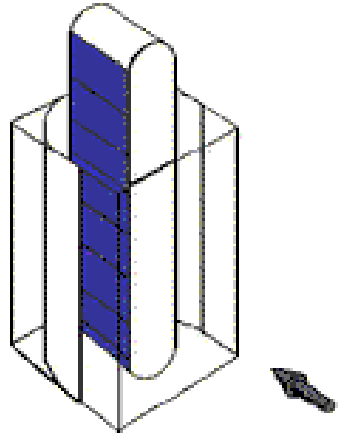
Carry over with Thru Flow



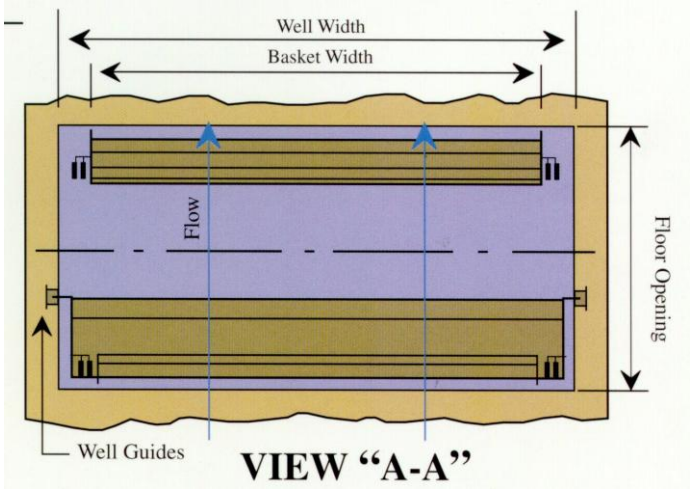
Debris in condenser from typical “thru flow screen” due to debris carry-over

Ovivo developed the Dual Flow Conversion from existing technology that addresses virtually every aspect of screen reliability, operation and maintenance. This has been the driving force in the application of Dual Flow and Dual Flow Conversion Band Screens.

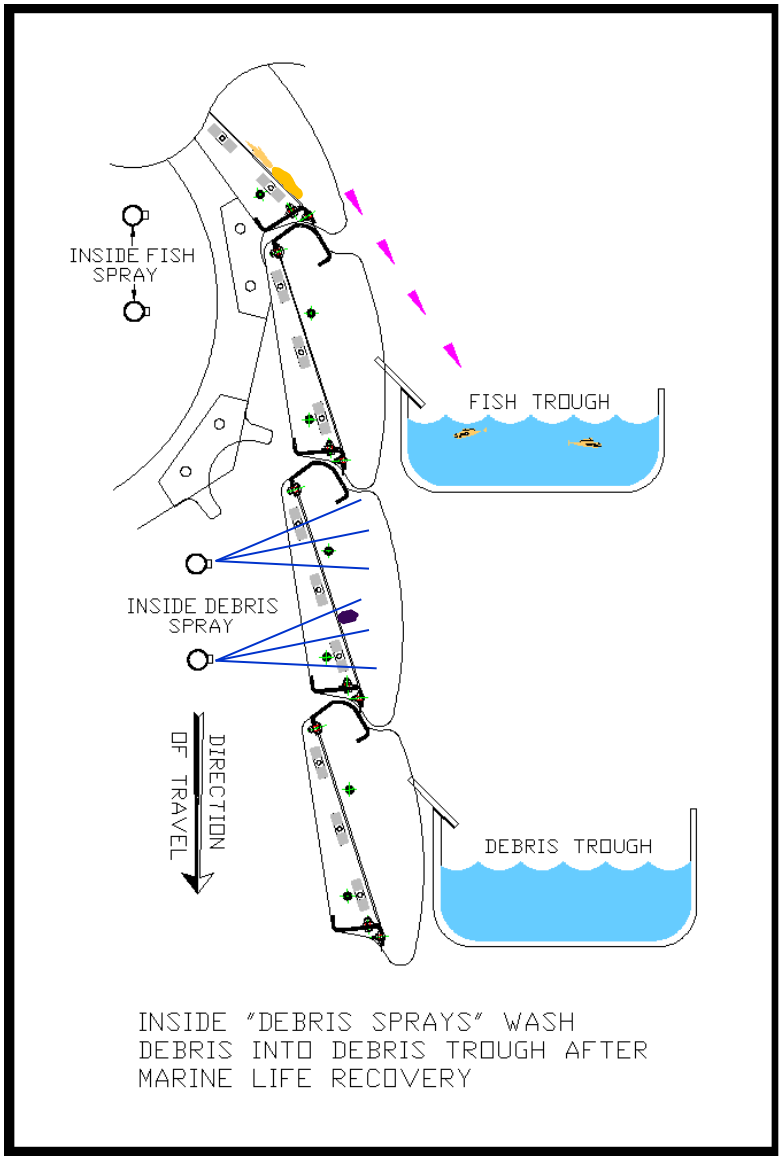


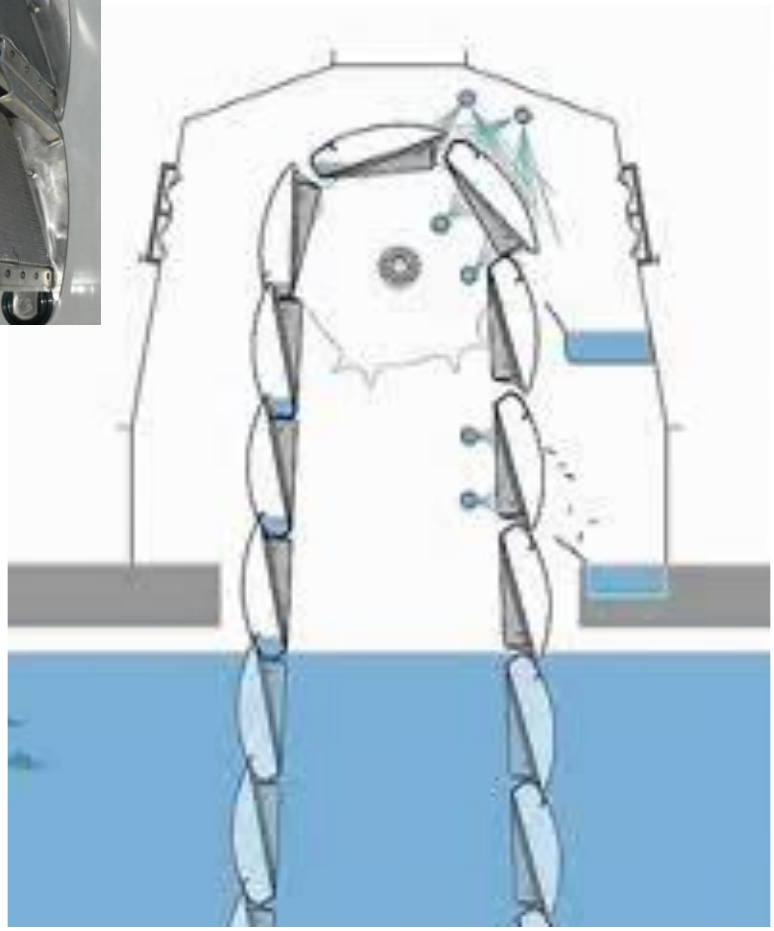


Dual Flow Screen



Clean Water





Fish handling screens are available to meet 316(b).
Debris and fish are returned in separate troughs.

Fish Return Troughing - Distance

Some plants may have to discharge up to 1 km away which can affect the height of the screen and return flow

THANK YOU
FOR THE
OPPORTUNITY
TO PRESENT
OVIVO PRODUCTS
AND CAPABILITIES