DynaFilter® EcoWash™ System

Water Arabia 2011

February 2, 2011

DynaFilter® EcoWash™ System

Agenda

- Basic DynaFilter Operation
- EcoWash Improvements
- Operator Benefits
- Dollars and Sense
- Case Study

DynaFilter®

Basic Operation

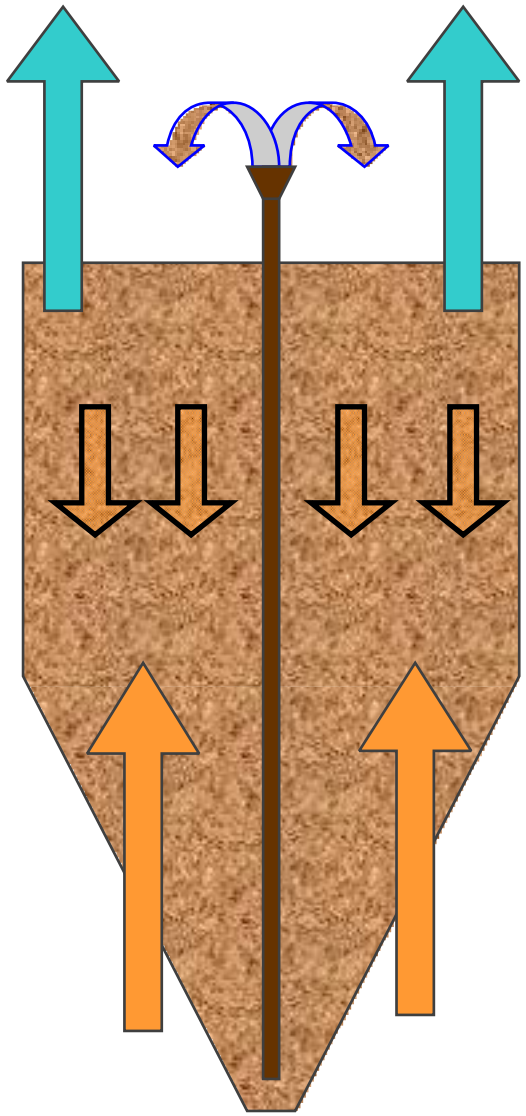
- Continuous backwash
- Up flow
- Deep bed
- Self-cleaning
- Granular media filter
- 30 years experience

Where to use the DynaFilter?

- Tertiary filtration of secondary clarifier effluent
- Reuse Quality Water
  - California Title 22 regulates the quality for water reuse plants
  - Requires a filtrate quality of 2 NTU
  - NTU – measure of turbidity units, or how light is scattered in a sample. More accurate measure of solids below 5 mg/L and capable of online measurement.
- Phosphorus Removal – Continuous Contact Filtration
- Denitrification

How does the DynaFilter work?

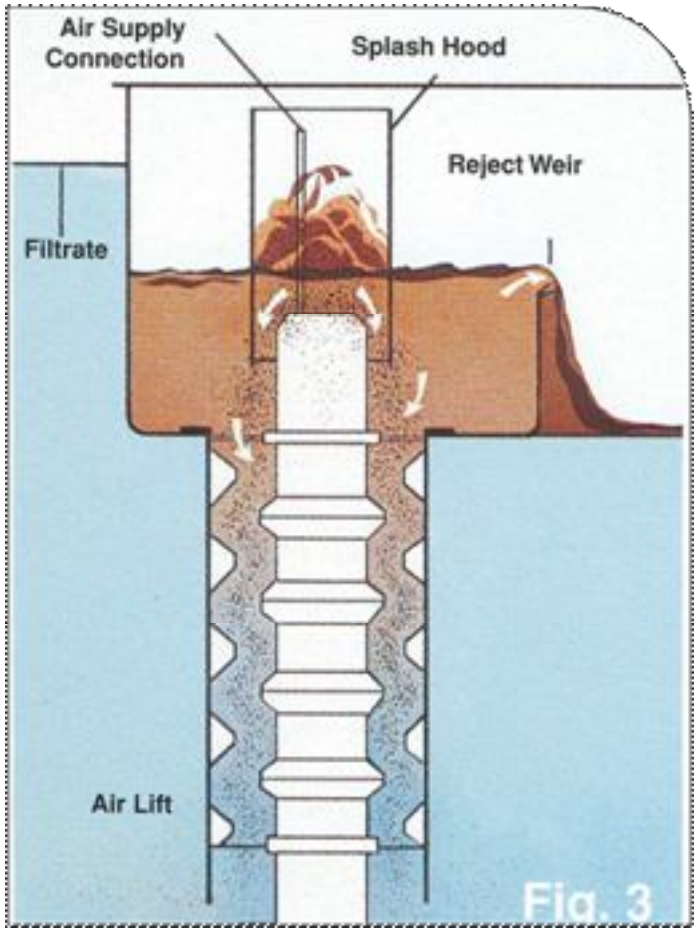
- Upflow Design – Filtrate leaves the media from the top.
- Air lift pumps media to Washer at top of filter & provides constant air scour.
- Countercurrent flow means feed water is always in contact with clean sand.
- Very forgiving to process upsets.



DynaFilter® Components

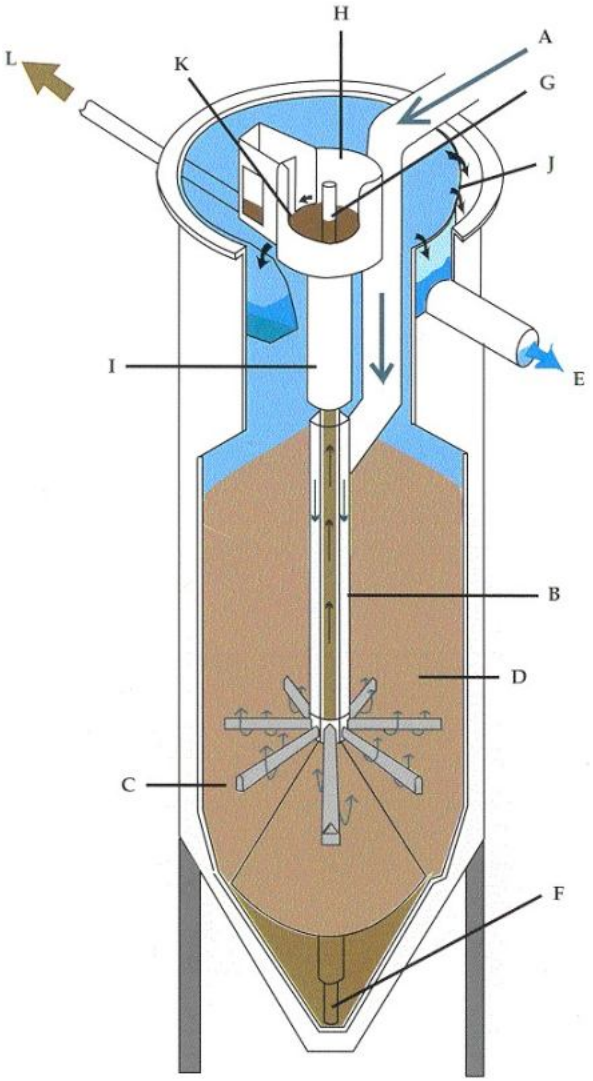
Airlift & Washer

- Heavier sand is washed and lighter floc is rejected
- Filtered water used for backwash
- Hydraulic differential creates barrier
- Average reject = 5%

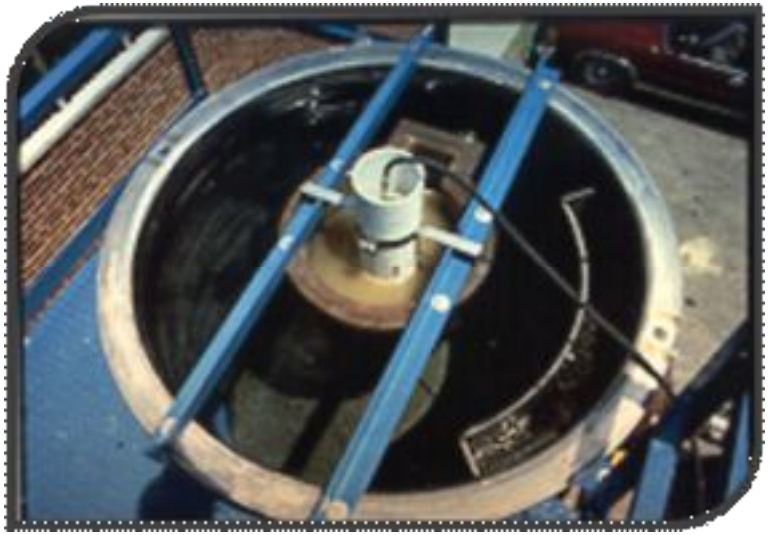


DynaFilter® Components

- A- Feed
- B- Feed assembly
- C- Distribution
- D- Sand bed
- E- Filtrate
- F- Airlift pump
- G- Airlift discharge
- H- Reject compartment
- I- Washer section
- J- Filtrate weir
- K- Reject weir
- L- Reject line



What does the DynaFilter look like when operating?

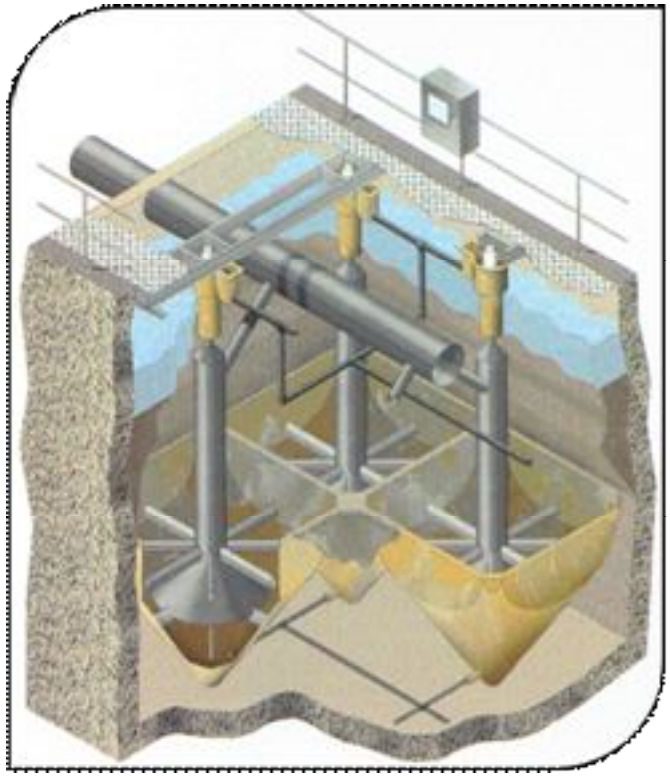


- Solids confined and exiting with reject
- Cleaned sand is returned to top of bed

Different Designs

Packaged Units

Concrete Units



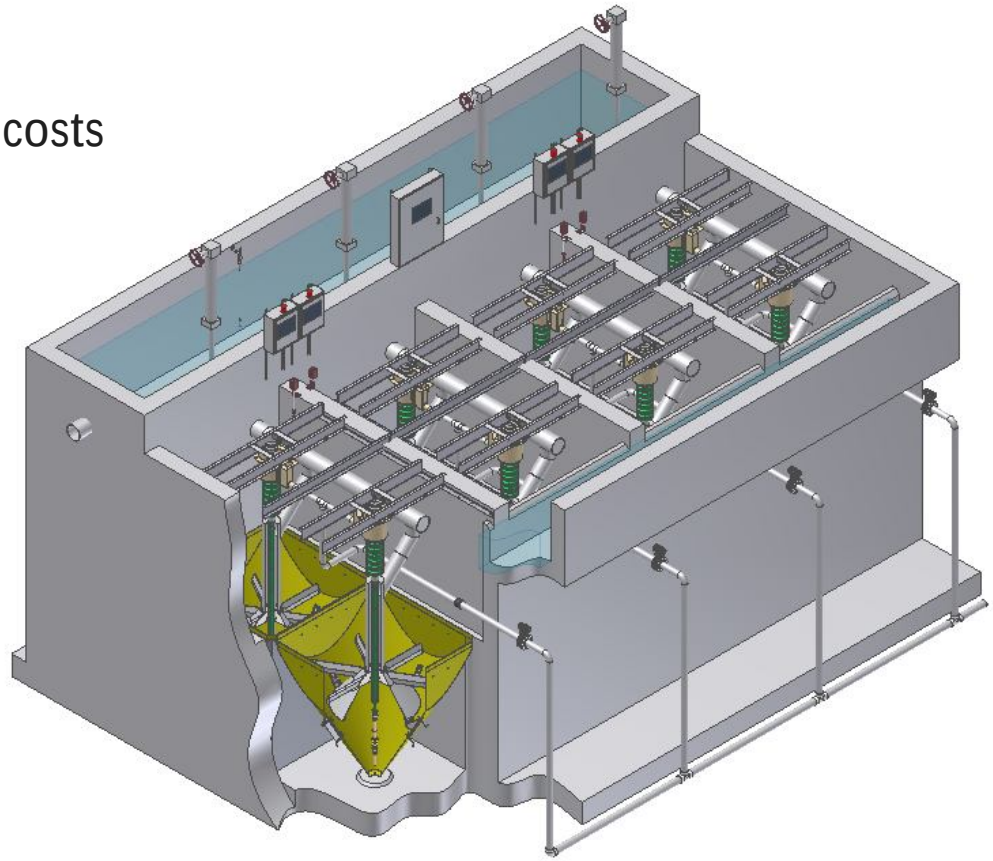
Key Benefits

- Continuously cleaned sand bed
- No moving parts
- Low pressure drop
- High solids capacity – able to handle shock loads
- Single media
- Elimination of ancillary equipment
- Even flow distribution with multiple units
- No submerged parts requiring maintenance
- Can perform routine maintenance while the unit is still filtering

DynaFilter® EcoWash™

Why has this been developed

- Reduce operation and maintenance costs
- Improve filtrate quality
- Reduce reject/ backwash rate
- Improve energy efficiency



DynaFilter® EcoWash™

How the EcoWash™ works

- Discontinuous sand movement
- Sand movement verification system
- Differential pressure monitoring
- Improved air lift design
- Flexible/programmable control
- Remote monitoring capability

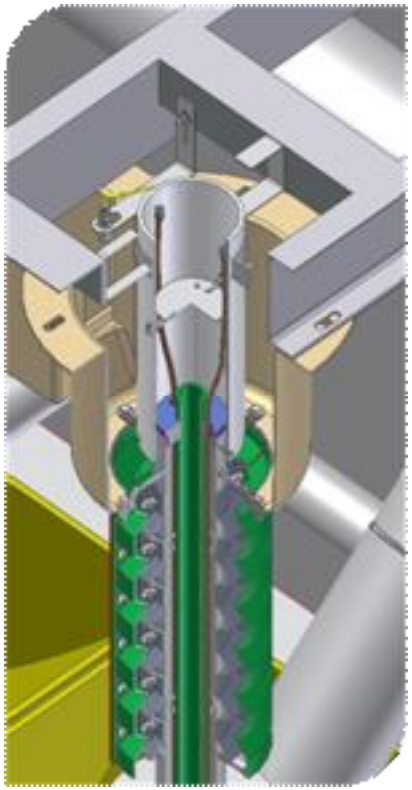
Product Components
Sand Movement Verification System

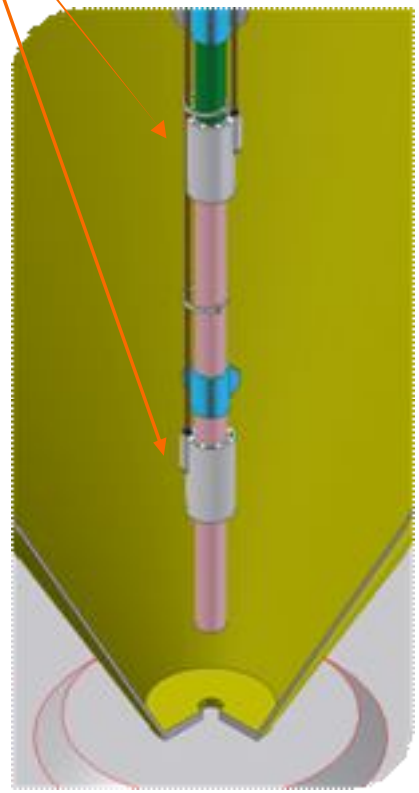
- Continuously monitors sand movement
- Provides alarm if ANY airlift stops moving sand
- Reduces operator attention
- Can be monitored from control room or integrated to SCADA

Product Components
Improved Airlift Design

- On/ off operation
- Low-point air burst
- Bottom air burst
- Programmed automatic or standard operation
- Normal air operation when operating

Dual Injection Airlift



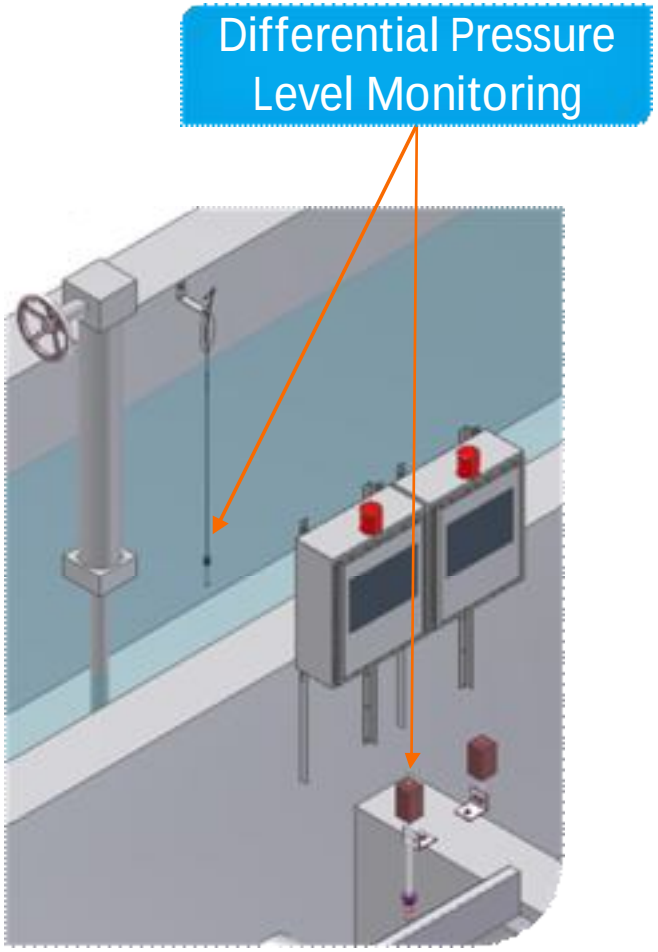


Product Components
Reject Water Reduction Control Valve

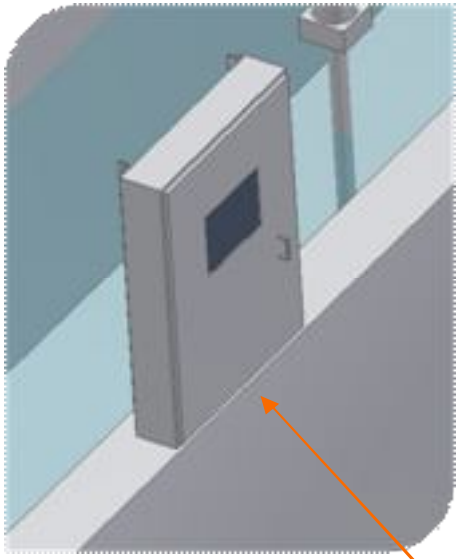
- Automated pneumatic reject valve
- Programmed to operate based on sand movement sensing
- Fail safe to normal operation

Product Components
Differential Pressure Monitoring

- Continuous monitoring of differential pressure in filter cells
- Option to operate filters based on differential pressure
- Provides signal for programmed time control backwash with headloss override



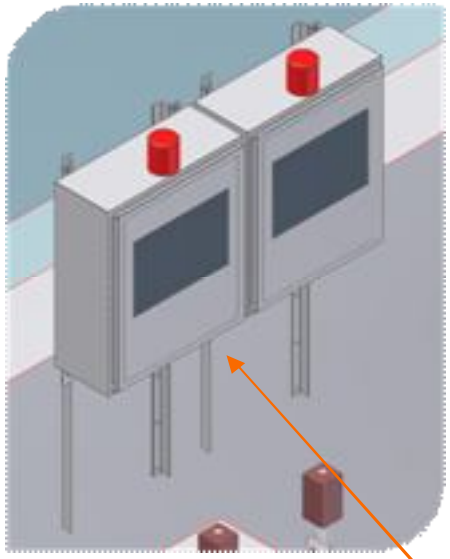
Product Components
Flexible/Programmable Control



Central control panel

- PLC based electrical control panel
- Touch screen HMI
- Ethernet Communication with plant SCADA system
- Ethernet TCP/IP to communicate with other plant PLCs over network
- HMI with data logger and remote monitoring capability

Product Components
Flexible/Programmable Control

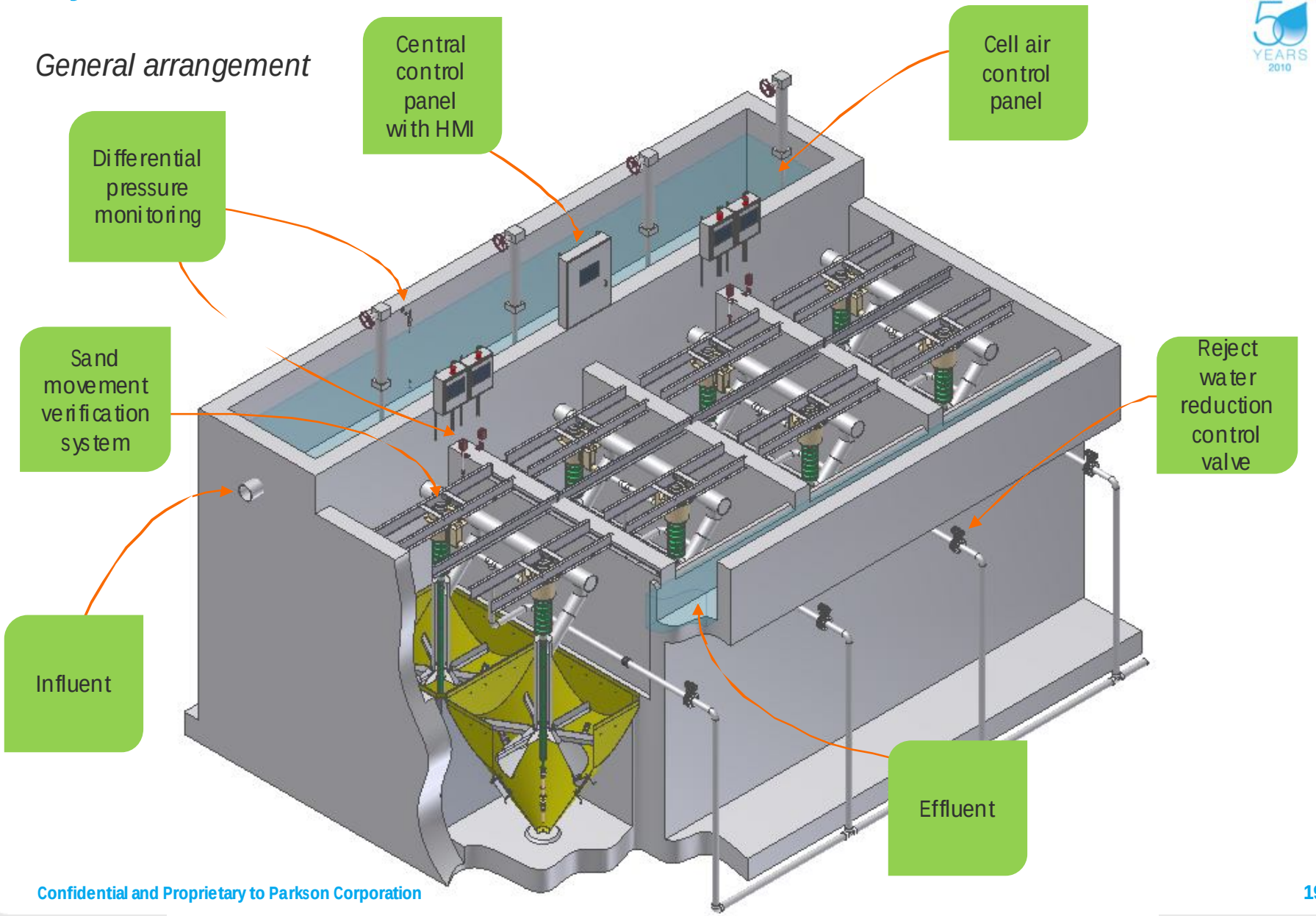


Cell Air Control Panel

- Solenoids to control dual airbust, and normal airlift operation
- Solenoid to control reject valve
- Air pressure regulator and pressure gauge
- Back pressure gauge, and airflow meter
- No sand movement visual alarm or remote monitoring ability

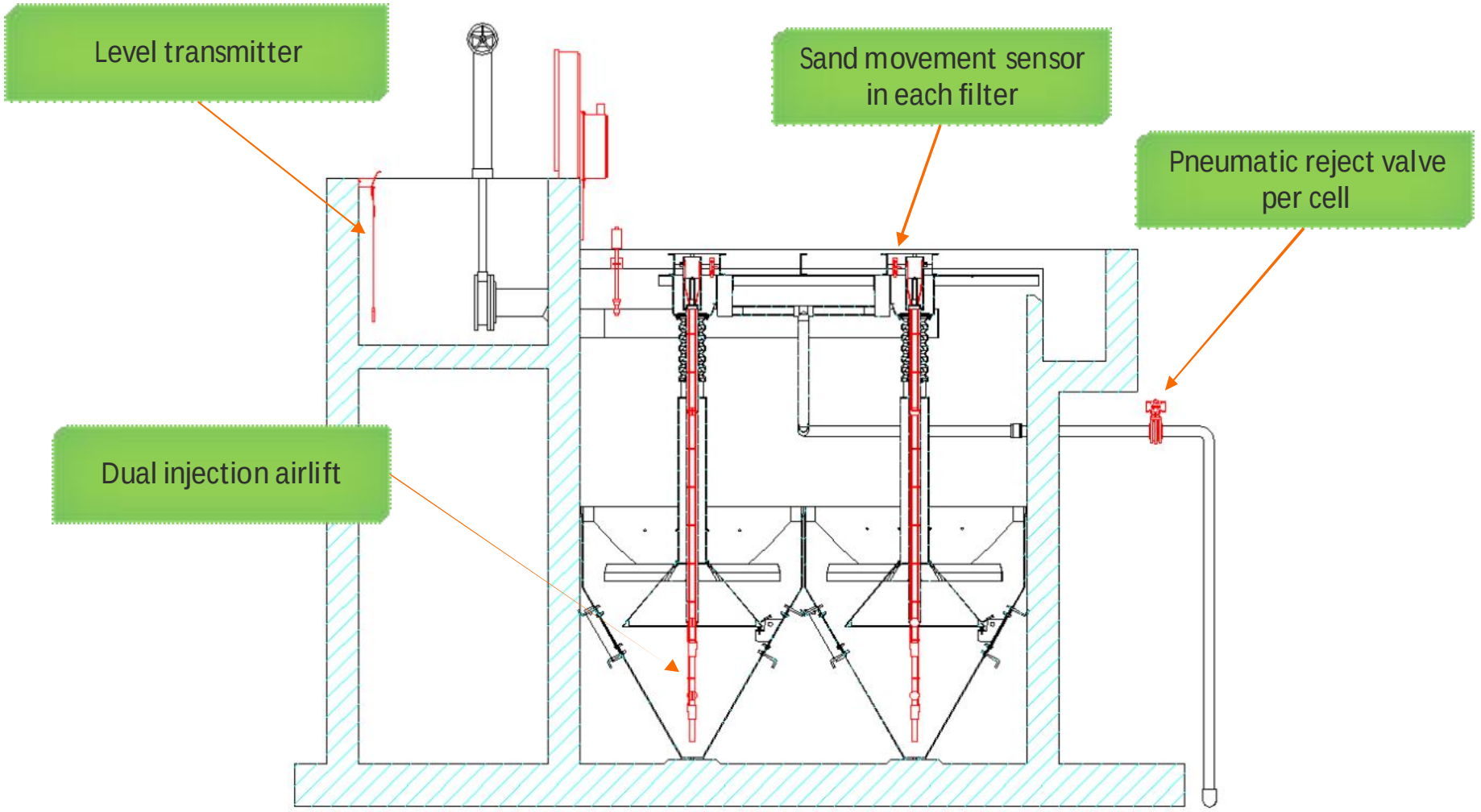
DynaFilter® EcoWash™

General arrangement



DynaFilter® EcoWash™

General arrangement



EcoWash™ Operation
Flexible/Programmable Control

Operation

Normal Operation

- Airlift is operating
- Sand sensor monitoring sand movement
- Reject valve is open

No Sand Movement Operation

- Air to airlift is off
- Reject valve is closed
- Sand Sensor assures no reject

Control Strategies

Differential Pressure Controlled

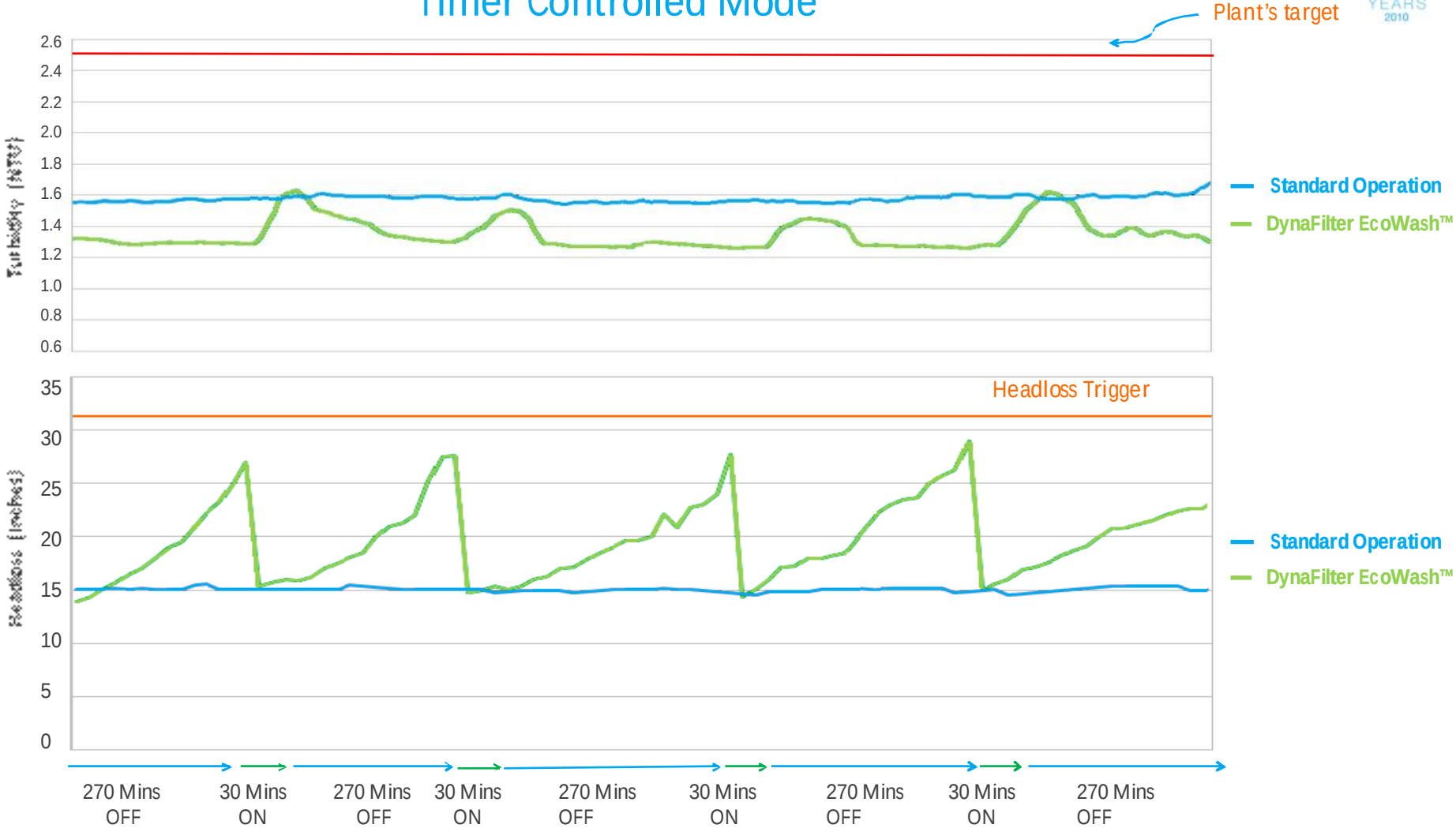
- Inlet/outlet levels measured
- Airlift/reject starts at programmed point
- Operates until differential is reduced to minimum point
- Timer override to assure periodic sand washing

Timer Controlled

- Timer initiates sand washing
- Differential pressure overrides timer
- Operator programs timer

DynaFilter® EcoWash™

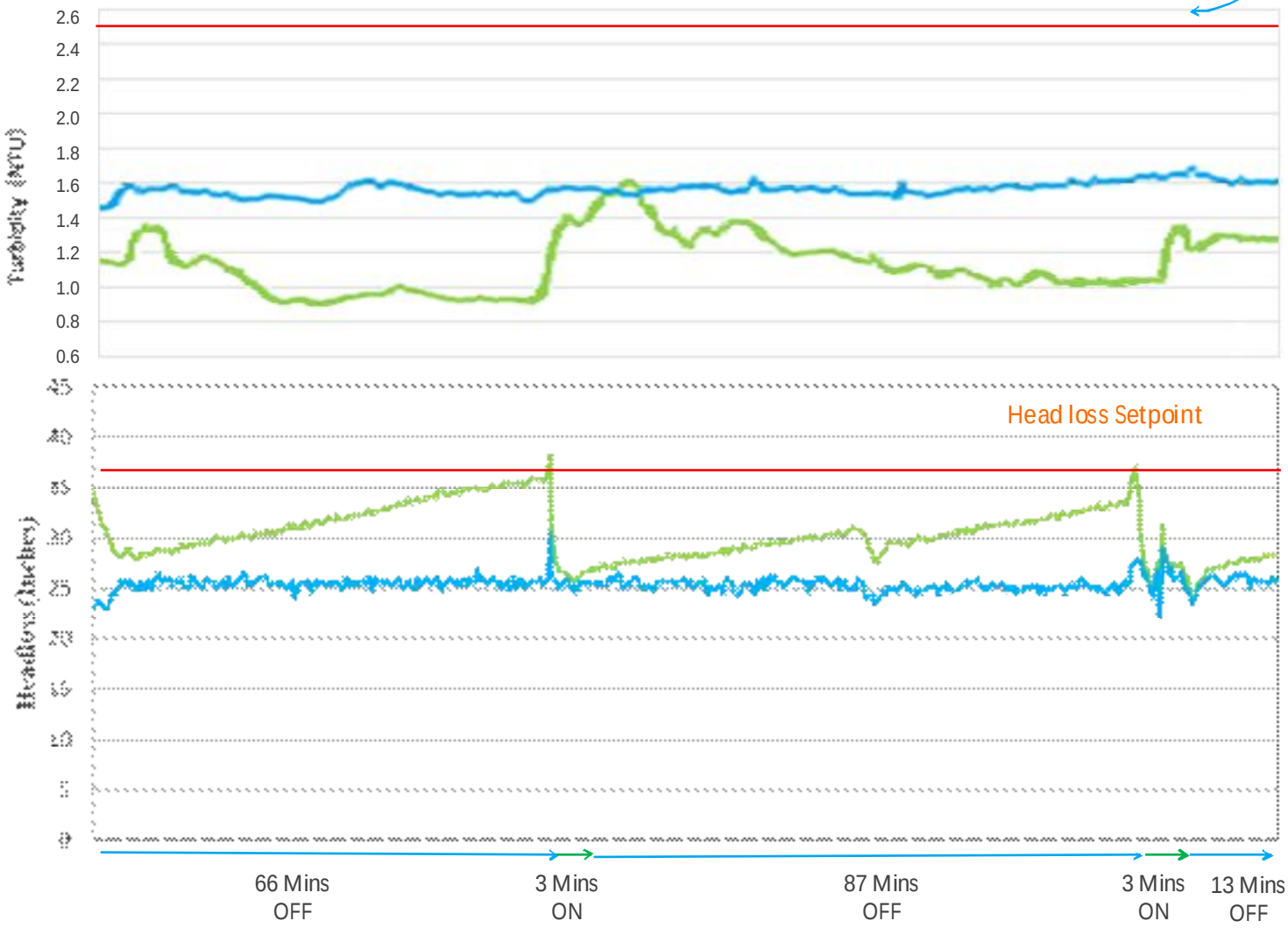
Typical Turbidity and Headloss Profile
Timer Controlled Mode



Programmed Time Control Backwash

DynaFilter® EcoWash™

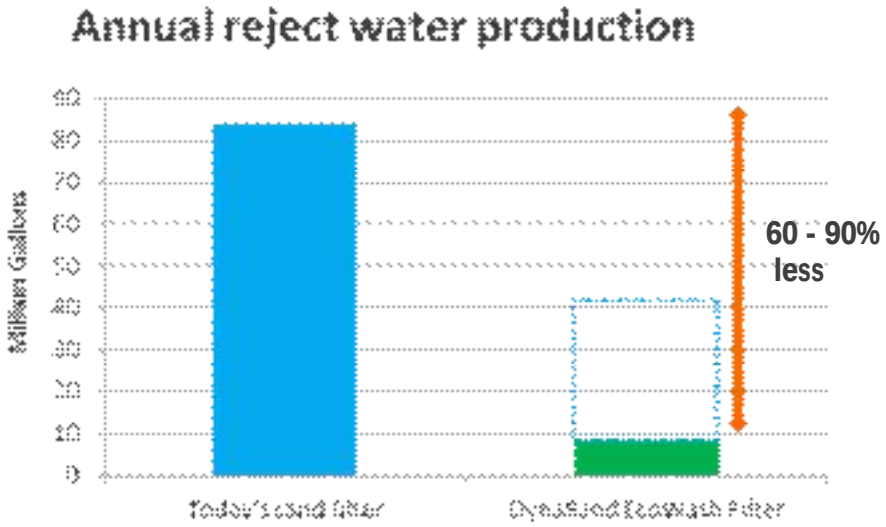
Typical Turbidity and Headloss Profile
Differential Pressure Mode



DynaFilter® EcoWash™ Benefits

Customer Benefits

- Reduces reject production 60-90%
- Reduces energy requirement 60-90%
- Better performance – Increases filtrate quality
- Increases airlift life
- Reduces maintenance on air compressor system
- Reduces pretreatment chemical usage
- Minimal maintenance & operator attention



16 Filters (50 sqft) - 5.76 MGD facility, typical reject 10 gpm/filter.

Annual Cost Savings

Operation:

- *5.76 MGD Plant (22,000 m3/day)*
- *24 hours per day in operation*

Annual savings for (16), 50 sqft module plant operating 24 hours a day	
Size	800 Ft2 (74.3 m2)
Loading rate	3.5 gpm/Ft2
Total Flow, gallons	1472 million
Reject flow actual gallons	84 million*
90% reject savings flow, gallons	75.6 million
Reprocessing savings @ $2.77/1000 gallons	$209,512
Additional revenue from Increased filtrate sales at $1.69/1000 gallons	$127,764
Total Value/year	**$337,276**

*10 gpm/filter

Annual Air Compressor Cost Savings

Operation:

- *5.76 MGD Plant (22,000 m3/day)*
- *24 hours per day in operation*

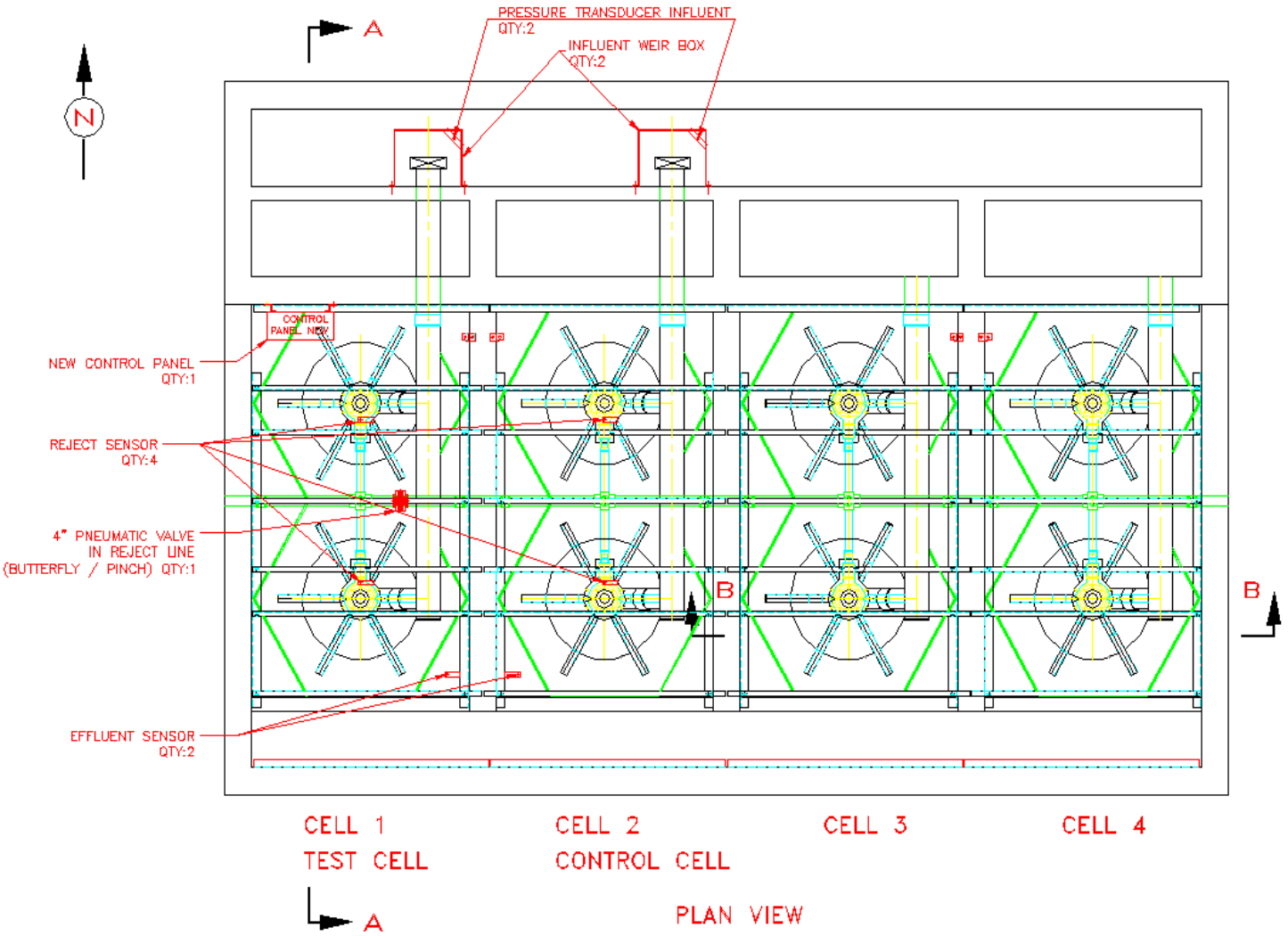
	DynaFilter® EcoWash™ Cell	Standard Operation Cell
Flow Rate	3.5 GPM/sqft	3.5 GPM/sqft
Air Flow/Pressure	80 SCFH @ 8 PSI	80 SCFH @ 8 PSI
Average Reject Flow	1.8 gpm/50 sqft filter	18.0 gpm/50 sqft filter
Annual Power Consumption	13,140 kW·h *	131,400 kW·h *
Annual Power Consumption Cost	$985 **	$9,850 **

** Based on typical 16 module plant with 20 HP Air Compressor operating 24 hours per day*

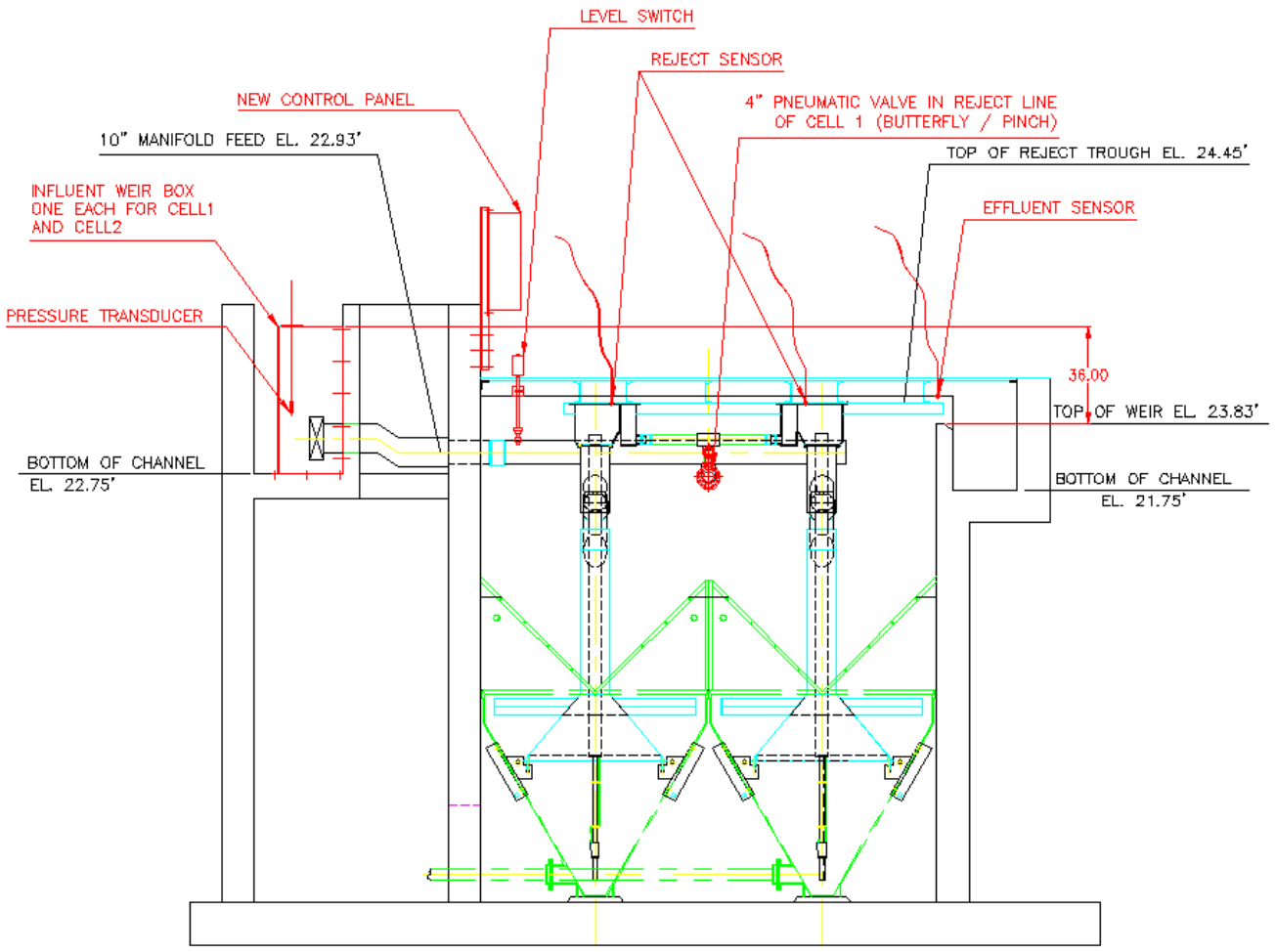
***Average Florida Industry Cost - $.075 per kW·h*

Case Study
City of Pompano Beach, FL *(Full Scale Test Site)*

DynaFilter® EcoWash™ System Full Scale Test



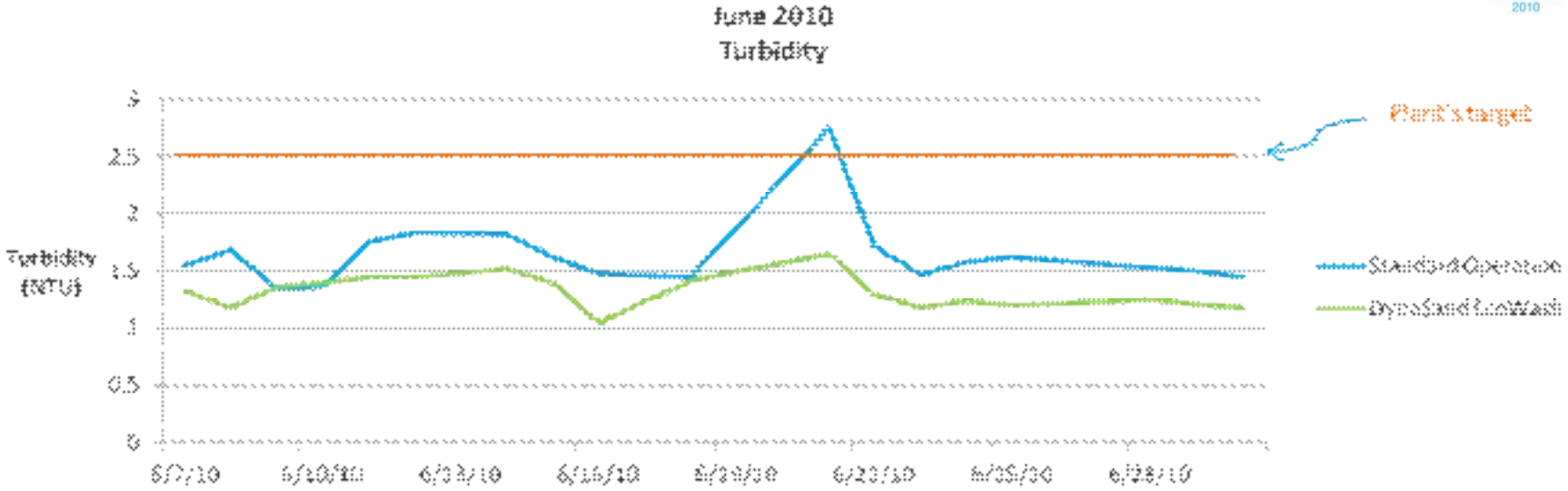
DynaFilter® EcoWash™ System Full Scale Test

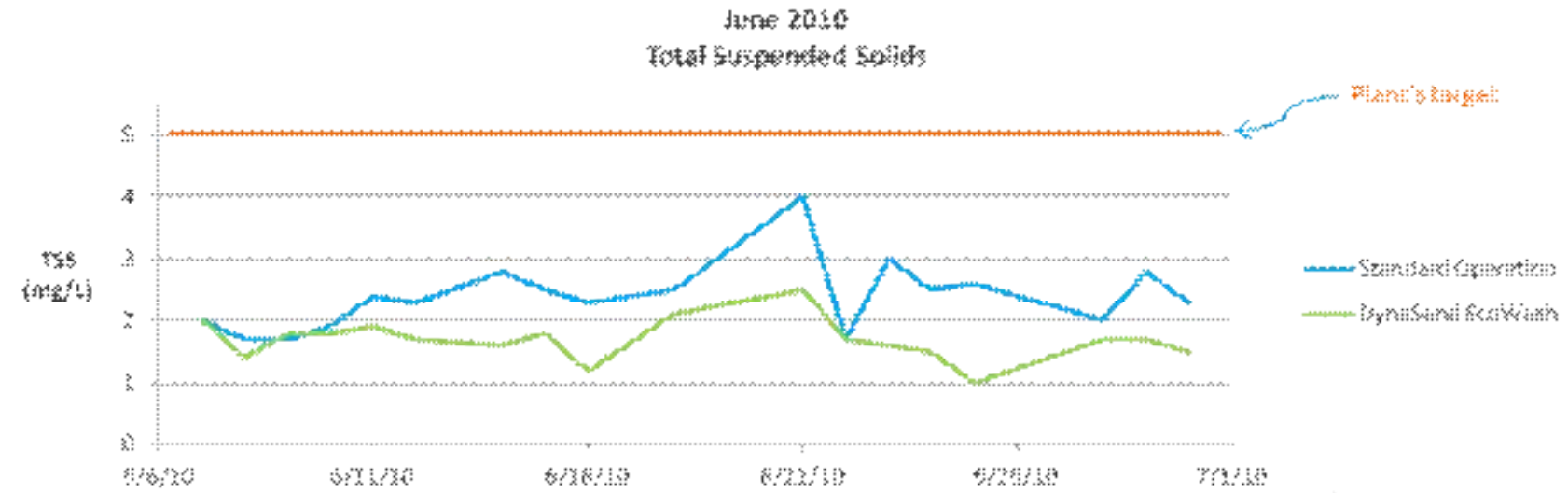


SECTION A–A

DynaFilter® EcoWash™ Full Scale Test Result

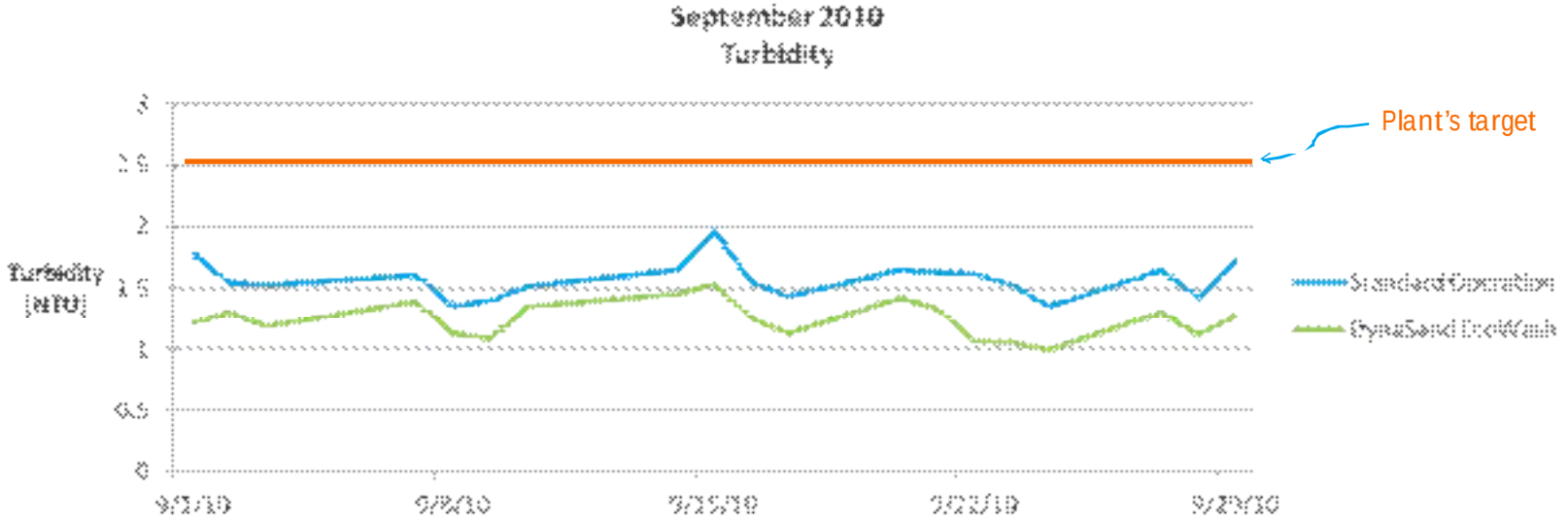
Turbidity and TSS Comparision – June 2010
Timer Controlled Mode

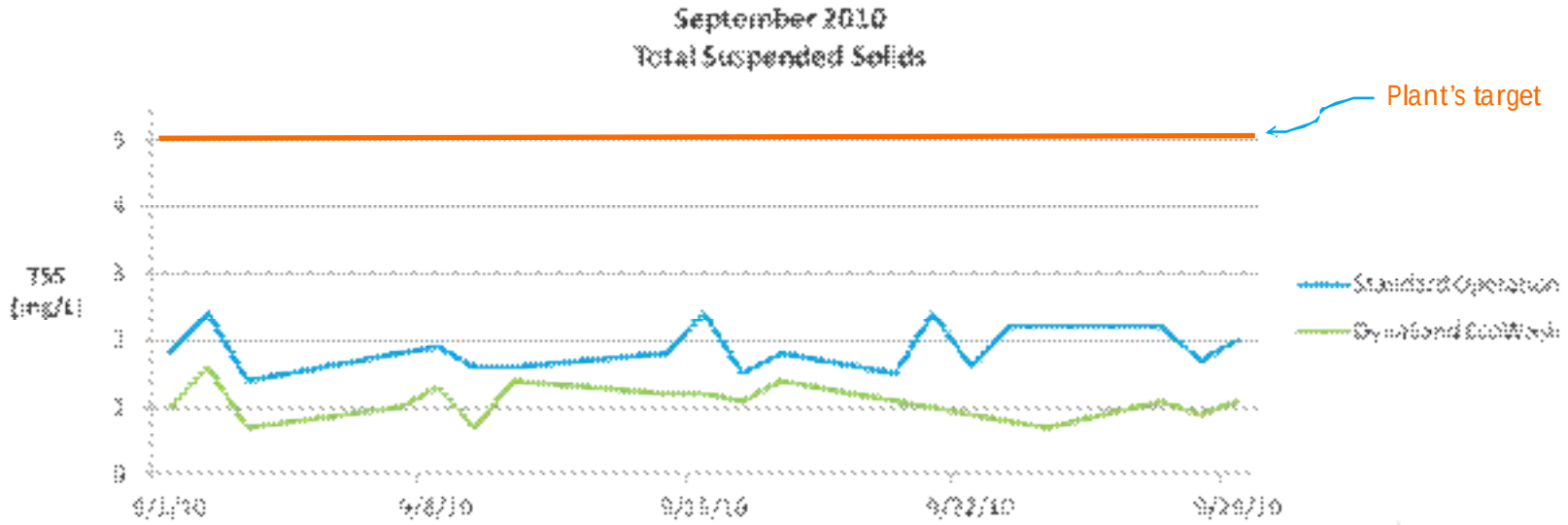




DynaFilter® EcoWash™ Full Scale Test Result

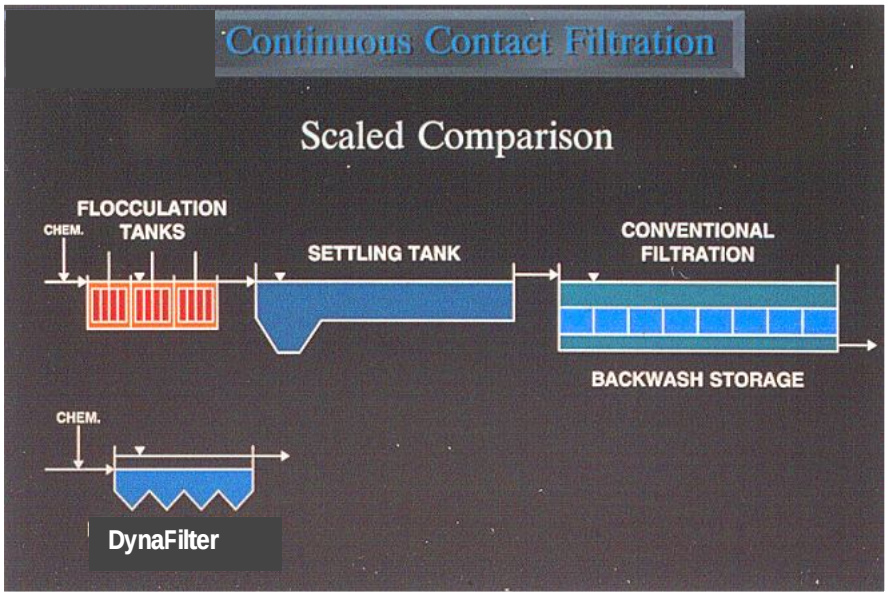
Turbidity and TSS Comparision – September 2010
Differential Pressure Mode





Other DynaFilter EcoWash Applications

Continous Contact Filtration



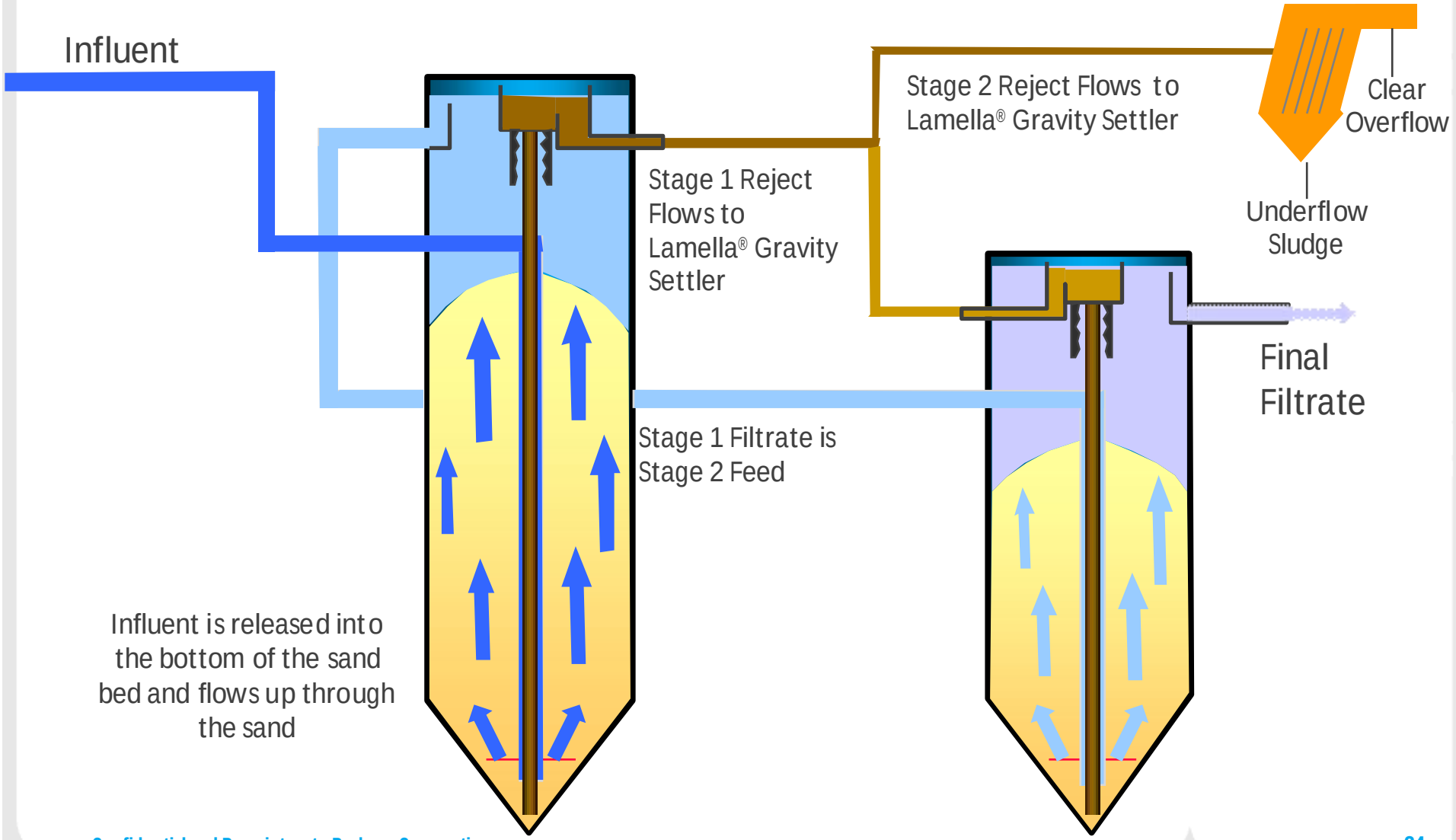
- Contact Filtration
  - Process where a coagulant and/or a flocculant is added ahead of the filter to improve filtrate quality.
  - Deep Bed design gives enough contact time to eliminate the need for flocculators.
- Applications:
  - Algae Removal
  - Surface water (industrial mostly)
  - Iron and Manganese Removal
  - Product Recovery (industrial only)
  - RO pretreatment
  - Phosphorus Removal
  - Denitrification

Enhanced Nutrient Reduction (ENR)

Phosphorus and Nitrogen Removal in one step

- Major initiative in the US (i.e.Chesapeake Bay Watershed)
  - Requires 3 mg/L TN, 0.3 mg/L TP
    - TN = Total Nitrogen
    - TP = Total Phosphorus
- Other states & provinces (ON) have phosphorus requirements under 0.1 mg/L – 0.3 mg/L
- Parkson has a 20 year history with this application

D2™ Configuration



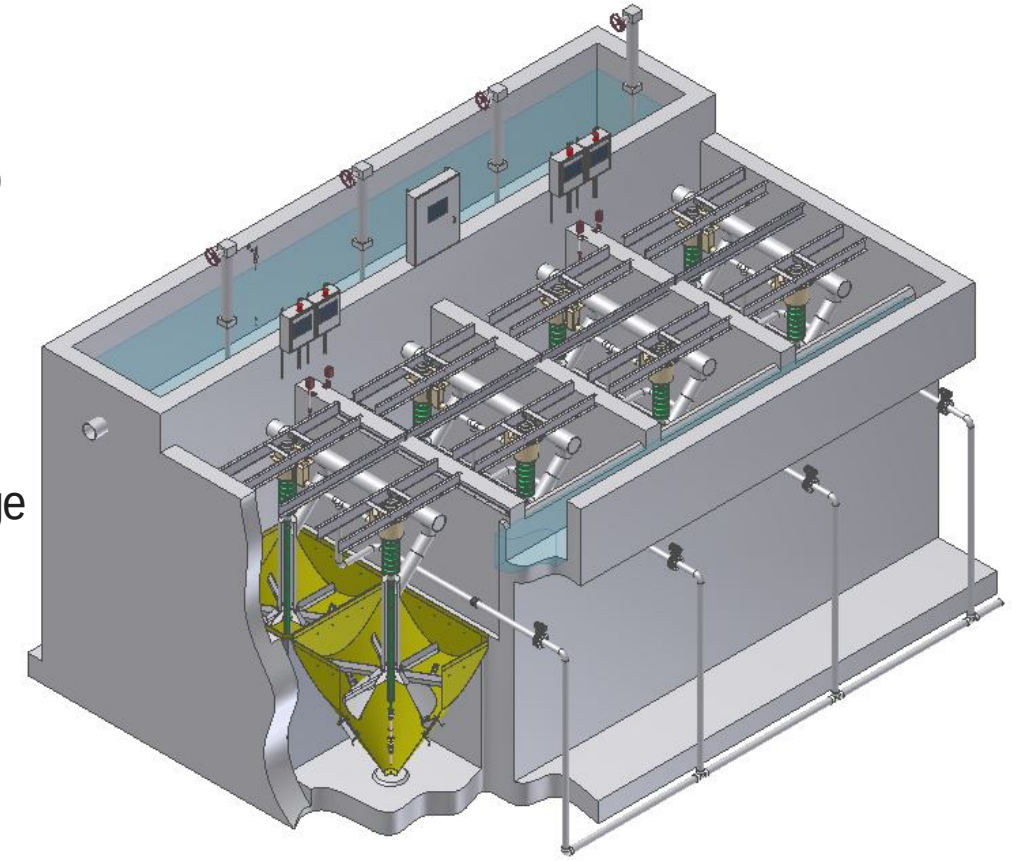
Typical D2 Wastewater Filtrate Quality

Example: Stamford WWTP, NY

- 0.05 - 0.10 NTU
- 0.015 – 0.050 Total P
- < 1 mg/L Total N
- BOD < 3
- 7 log Removal of Crypto and Giardia

DynaFilter® EcoWash™ System Summary

- Improves filtrate quality
- Reduces reject production 60-90%
- Reduces energy requirement 60-90%
- Increases airlift life
- Reduces maintenance on air compressor system
- Reduces pretreatment chemical usage
- Minimal maintenance & operator attention



Thank You

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Questions?