Continuous Backwash Filters for Sidestream Filtration

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Overview

- Cooling Towers
- Side Stream Filtration
- How Sand Filtration Works
- Flow diagram of a Conventional Filtration System
- How the DynaSand Works
- DSF Components
- Packages vs. Modules
- Contact Filtration
Cooling Towers

- Inexpensive/dependable heat rejection device
- Evaporative coolers that cool water to near ambient temperature
- Make up water replenishes water lost to evaporation
- Water falls on fill material to increase contact time and heat transfer

Common applications include:

- Refineries, chemical industries, power and building cooling
Cooling Tower
Why we Need Sidestream Filtration?

- Cooling towers make excellent air scrubbers/washers
- Accumulate dirt, grit, sand, and chemical residues
- Solids can clog cooling tower spray nozzles and reduce operating efficiency (heat transfer)
- Critical in the Middle East during sand storms
Available Options

- Screen Strainers
- Centrifugal Separators
- Disc Filters
- Pressure Sand Filters
- DynaSand Filters
Suspended Solids Removal

- **Screen Strainers**: >50 µm
- **Disc Filters**: >50 µm
- **Centrifugal Separators**: >40 µm
- **Sand Filters**: >10 µm
Conventional Filtration

Physical barrier between influent and filtrate
Solids bind to media
Terminal headloss
Air scour to dislodge solids and backwash to flush solids from media
Conventional Filtration
Flow Sheet

DynaSand® Filter

Feed Pumps

Clean Water Source

Filter Vessel

dP

Backwash Tank

Vent

Filtrate

Air

Backwash Pumps
DynaSand® Filter

- Upflow
- Deep bed
- Continuous backwash
- Gravity sand filter
DynaSand® Filter

- 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
Continuous (moving bed) Backwash

Upflow Design – Filtrate leaves the media from the top.

Air lift pumps media to Washer at top of filter & provides constant air scour.

Head differential in Washer assembly provides constant backwash with filtrate.

Very forgiving to process upsets.
Bottom of Airlift Pump

- 2-3 scfm of air at a pressure of 15 – 20 psi (All utility required)
- Heavy scouring of sand (in excess of 150 scfm/sq.ft.)
Top of Airlift & Washer

- Heavier sand is washed and lighter floc is rejected
- Filtered water used for backwash
- Hydraulic differential creates barrier
- Backwash loading rate > 80 gpm/sq.ft
- Avg. reject rate = 5%
Top View of a Pilot Unit
Sand Return

- Clean sand returns to top of bed
- View through porthole
Benefits

- Continuously cleaned sand bed
- No moving parts
- Low pressure drop (36”-48”)
- High solids capacity (100 mg/L TSS)
- Elimination of ancillary equipment.
- Even flow distribution with multiple units.
- Can do routine maintenance with while filter still filtering
Package units

- All stainless steel and fiberglass parts
- Only one spare part
- Loading rates up to 10 gpm per square foot
- Packaged units are shipped totally assembled except for platforms/handrails
Package Units

- DSF-7
- DSF-12
- DSF-19
- DSF-38
- DSF-50
- DSF-64
- DSF-78
- DSF-100
Concrete Modules

- For larger flows, we install multiple 50 ft\(^2\) modules in concrete tanks by others
- Internals are shipped in easy-to-assemble sections
- Up to 12 modules per cell (600 ft\(^2\))
- Alternative materials of construction are available
- Each module takes 20 man-hrs to install
- Media shipped to jobsite in SuperSacks or pneumatic truck
Concrete Modules
Installation of Concrete Modules
Installation of Concrete Modules
Continuous Contact Filtration

- Process which combines coagulation, flocculation and filtration in one operation
- Flocculation and settling basins are eliminated ahead of the filters
- Floc forms quickly when pumping energy is dispersed in the sand bed
- Pin point flocs are formed
- Coagulant dosage reduced by 30%
Continuous Contact Filtration

DynaSand® Filter

Scaled Comparison

FLOCCULATION TANKS

CONVENTIONAL FILTRATION

SETTLING TANK

BACKWASH STORAGE

DYNASAND FILTERS

CHEM.
Continuous Contact Filtration

- Phosphorus removal
- Nitrogen removal
- Algae removal
- River water treatment
- Potable water production
- Ground water treatment (Fe & Mn removal)
- Arsenic