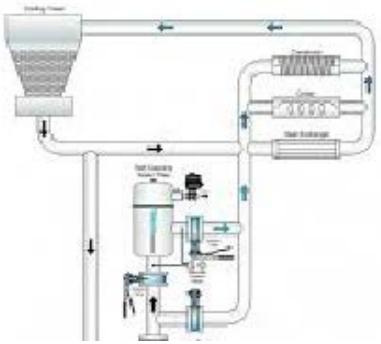
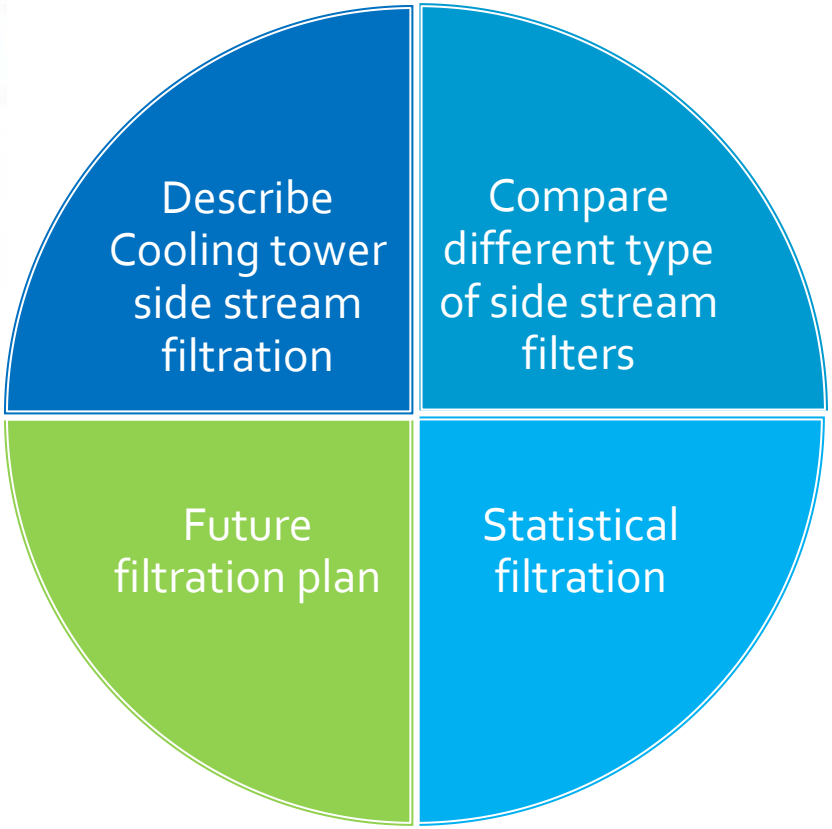
Nouf Sultan
Empower Energy Solutions
Dubai, UAE

Cooling Tower Filtration Systems Comparative Study

Objective




Describe Cooling tower side stream filtration
Compare different type of side stream filters
Future filtration plan
Statistical filtration

COOLING TOWER – SIDESTREAM FILTER SYSTEM

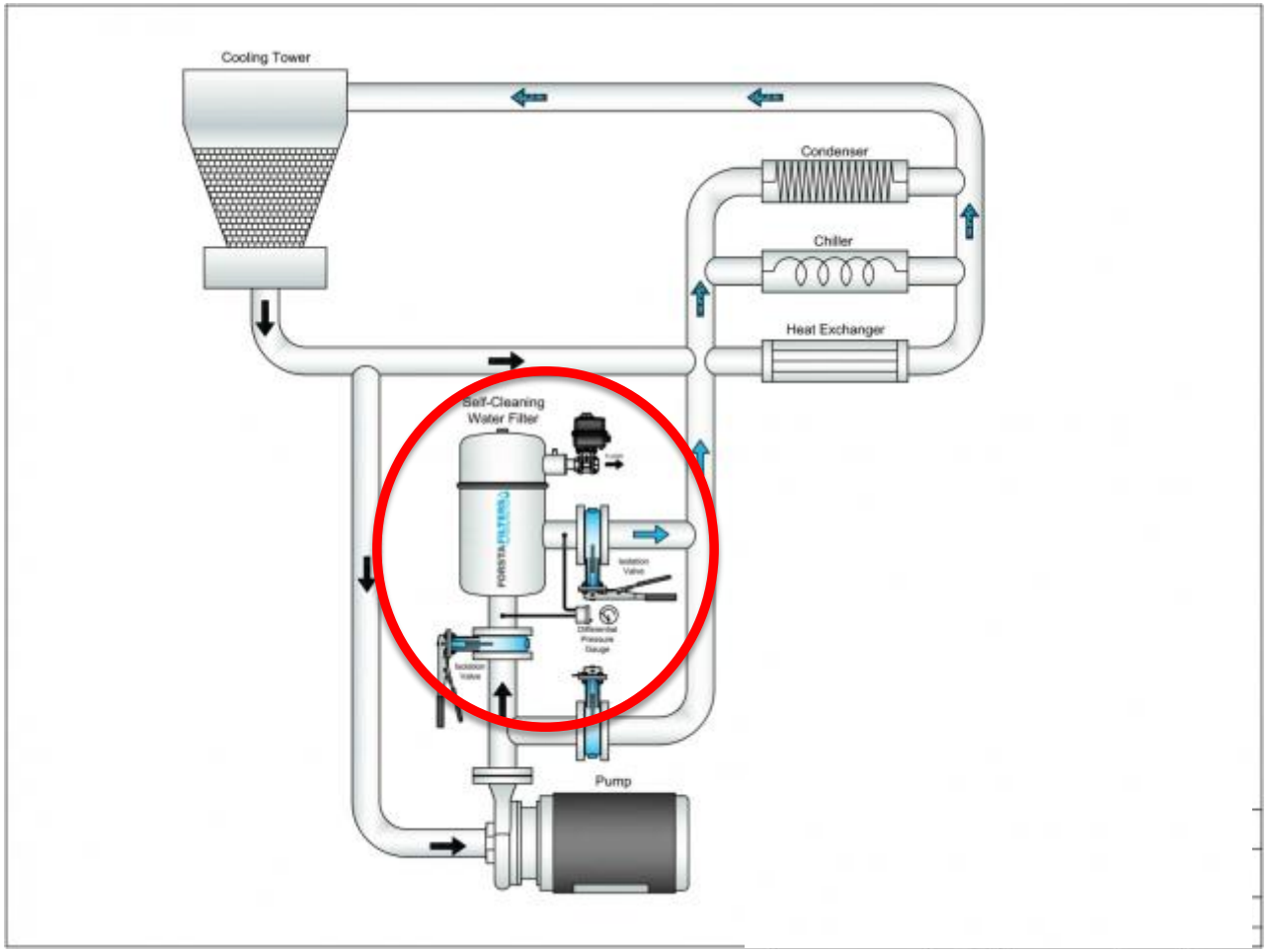


Figure 1.1. Cooling Tower Side stream Schematic

COOLING TOWER – SIDESTREAM FILTER SYSTEM

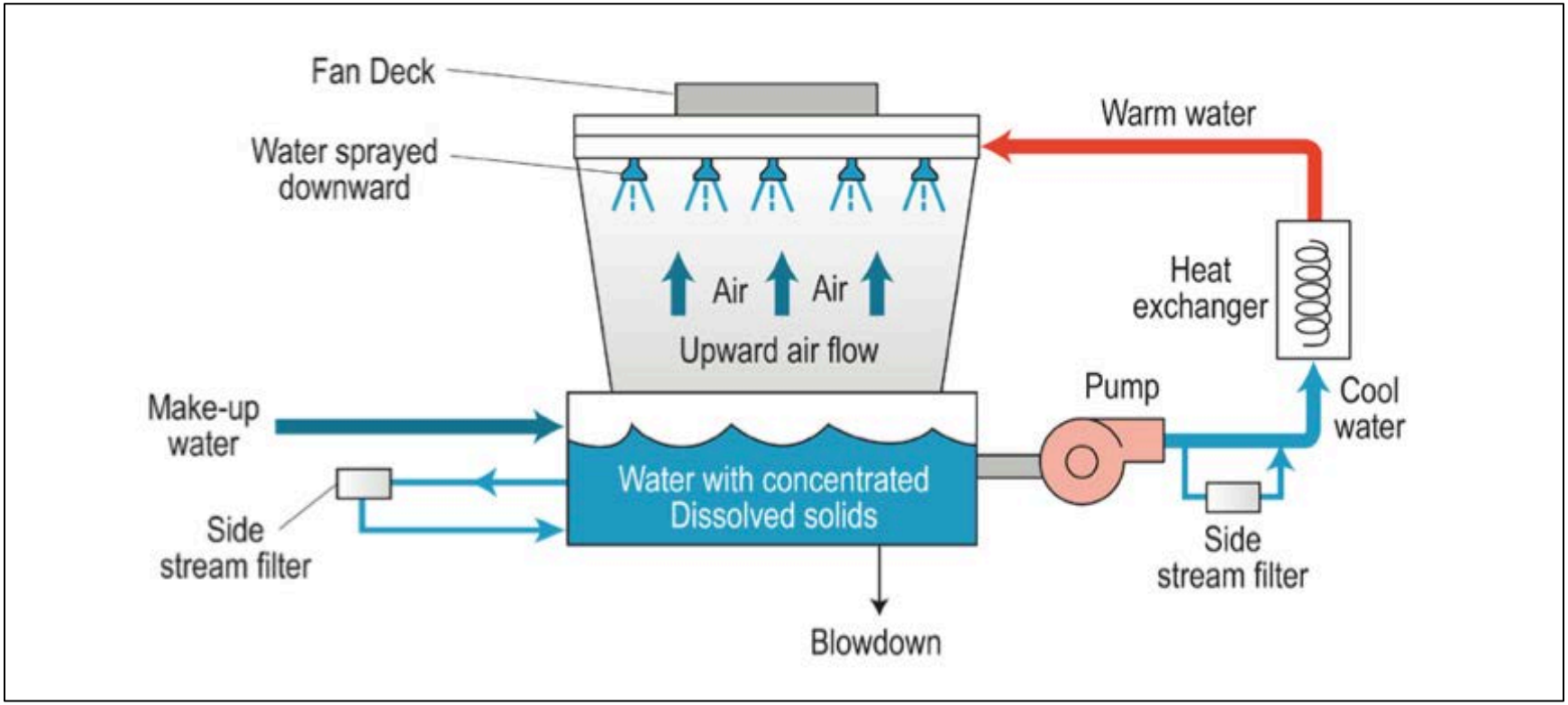
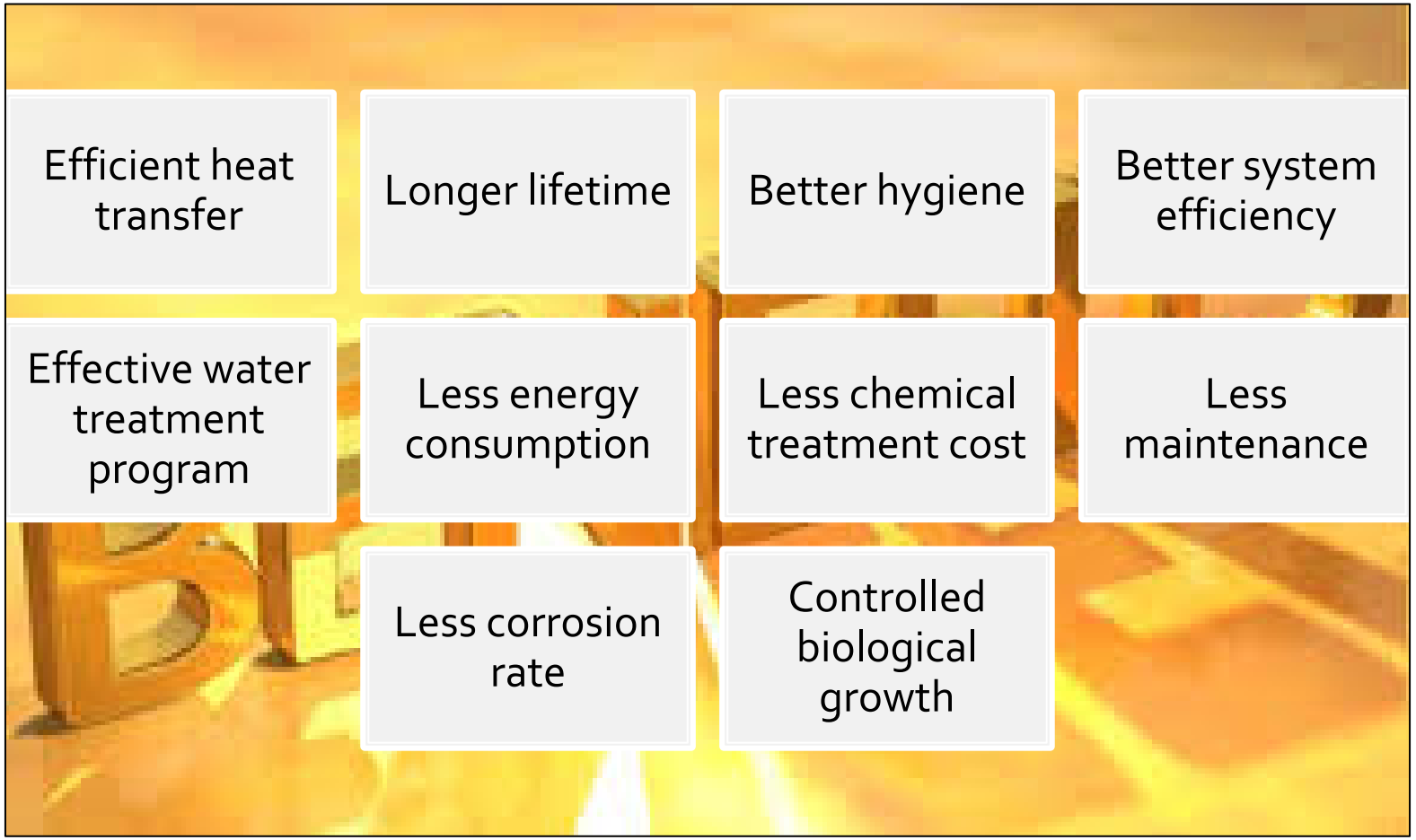
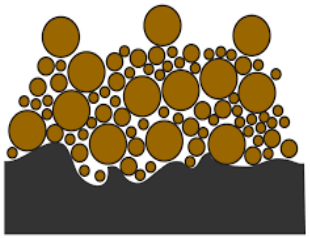


Figure 1.2. Cooling Tower with Side Stream Filtration

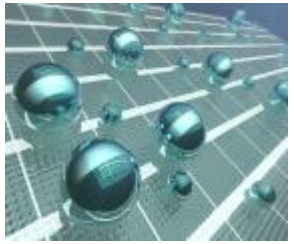
SIDE STREAM FILTERS BENEFITS



KEY ELEMENTS

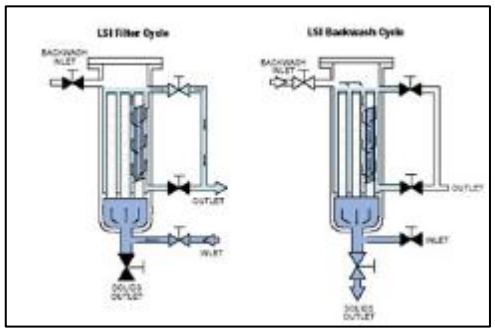


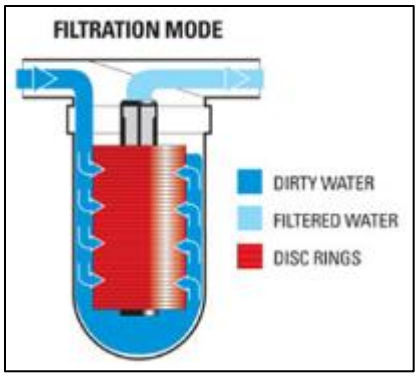
Particle removal level	Self-cleaning function
Outlet (water loss)	Ease of operation

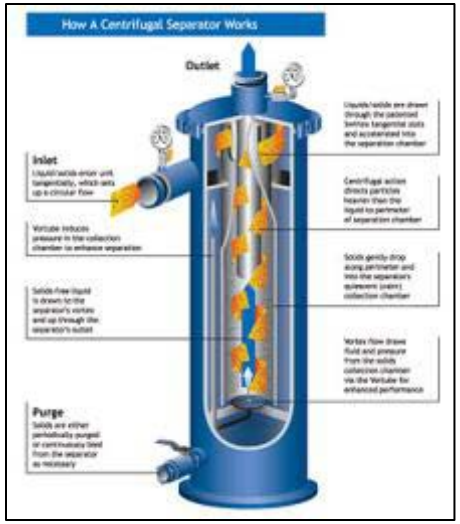


SIDE STRAM FILTERS TYPES

- Centrifugal separators
- Bag filters
- Screen filters
- Disc filters







CENTRIFUGAL SEPERATORS

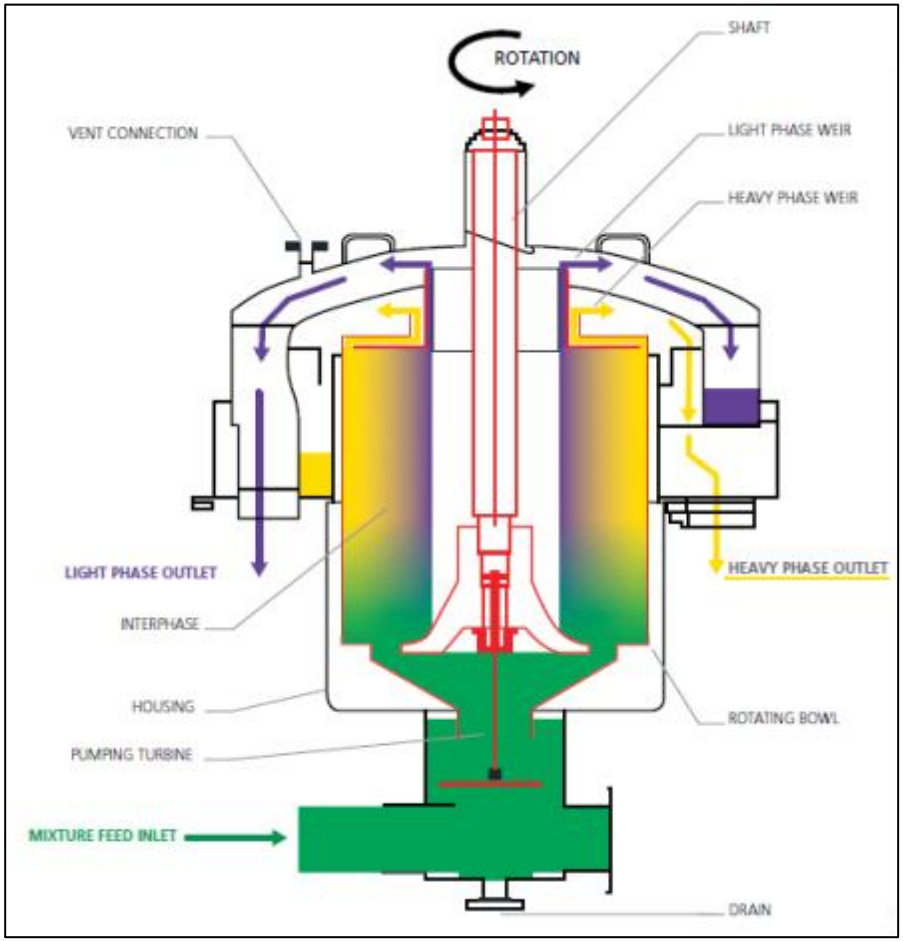


Figure 2. Liquid centrifugal separator , https://commons.wikimedia.org/wiki

A filter that removes solids from water by the centrifugal force developed as water passes through the device.

Advantages :

- Less maintenance & Replacement
- Virtually zero water discharge

Disadvantages :

- Longer to discharge tiny particles.

BAG FILTER

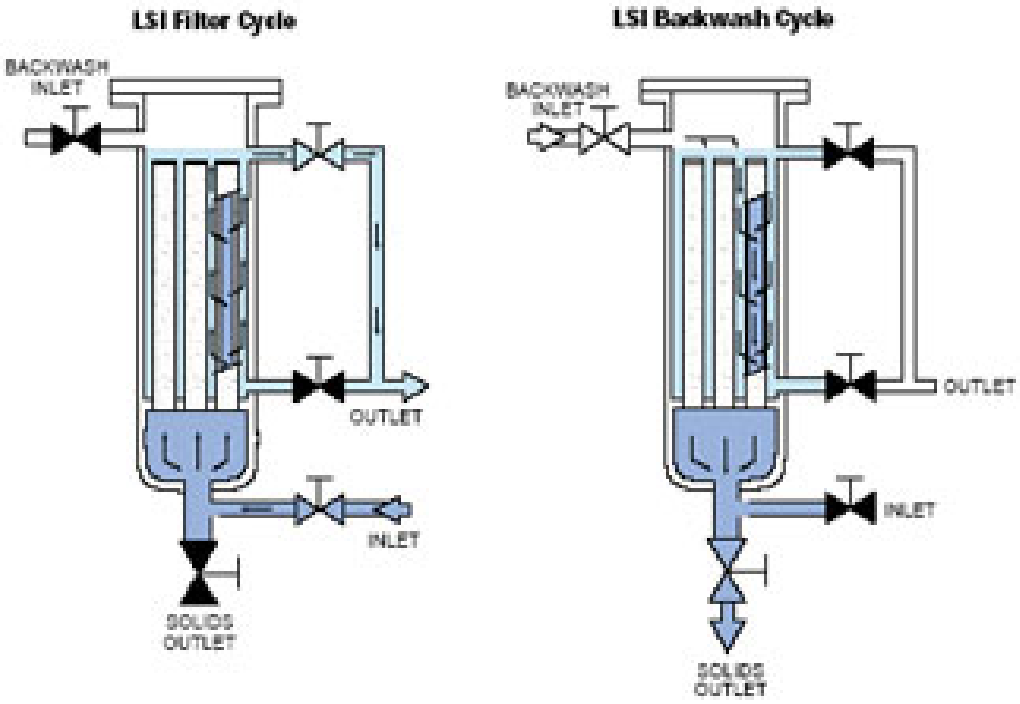


Figure 5. Bag Filter

A type of filter that works by the principle of microfiltration where it purifies the liquid in bags by passing small permeable pores.

Advantages :

- Less expensive
- Flexible adjustment
- Increased available surface area that can effectively remove larger amounts of corrosion debris
- Handling higher flow rates
- Reduced energy costs

Disadvantages :

- Required regular replacement
- Higher running cost

SCREEN FILTER (Self-Cleaning)

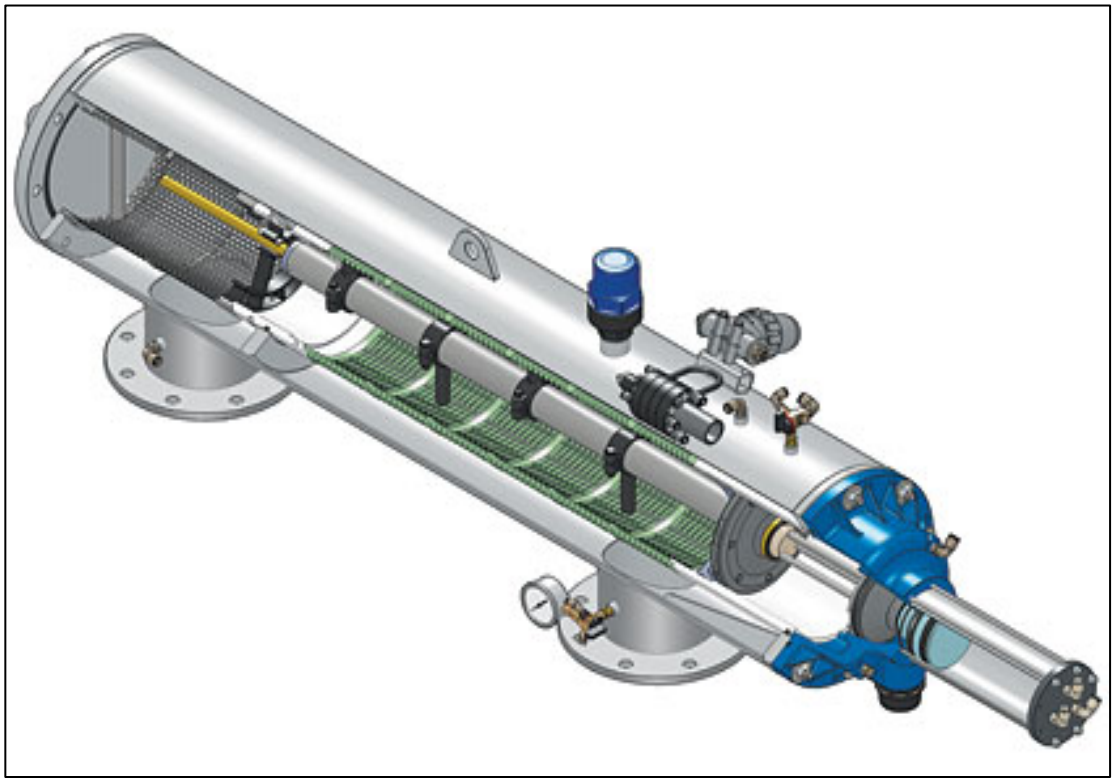


Figure 4. Screen Filter

A type of filter that uses a flexible screen to separate sand and other fine particles out of water for irrigation or industrial application

Advantages :

- Relatively inexpensive.
- High removal effeciency

Disadvantages :

- Required frequent maintenance
- Higher back wash

DISC FILTER

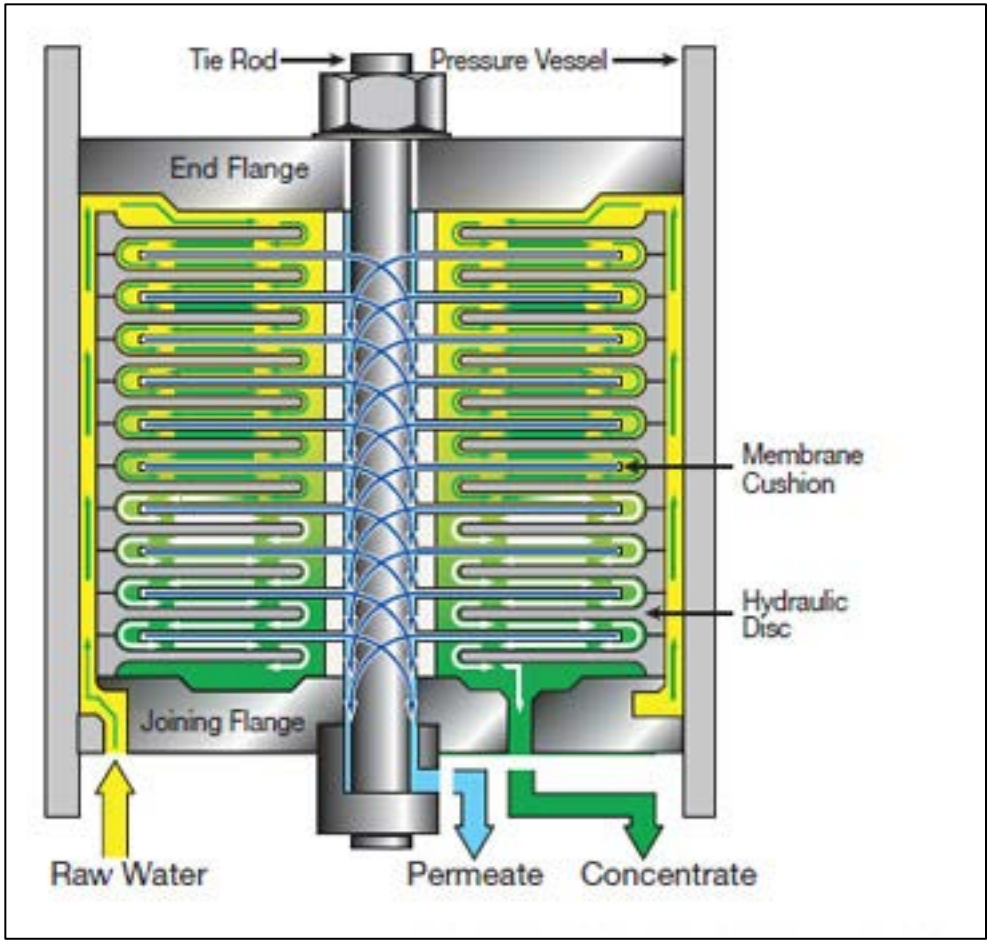


Figure 3. Disk Filter model

A technology that uses plastic discs made of polypropylene that are stacked together under pressure and grooved to filter particles of specific micron sizes.

Advantages :

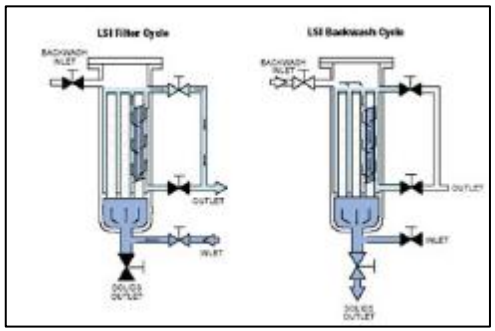
- Less maintenance
- Automatic Self-cleaning
- Remove both solids & organic effectively
- Lower operating cost

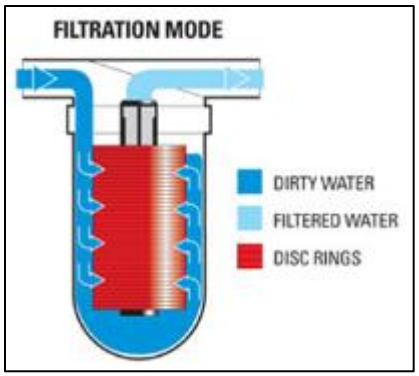
Disadvantages :

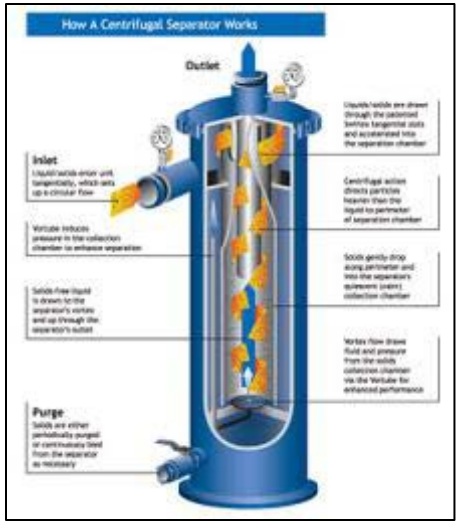
- Moderate Filtration performance

Case Study

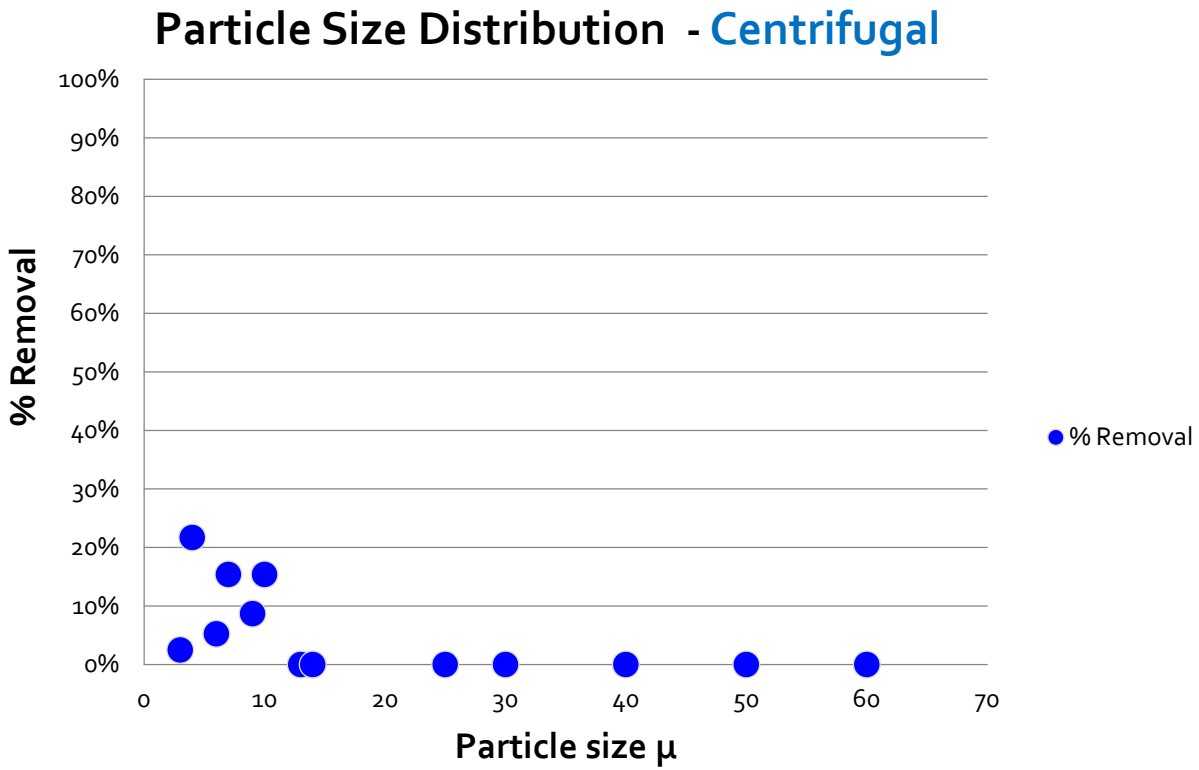
- Centrifugal separators
- Bag filters
- Screen filters
- Disc filters





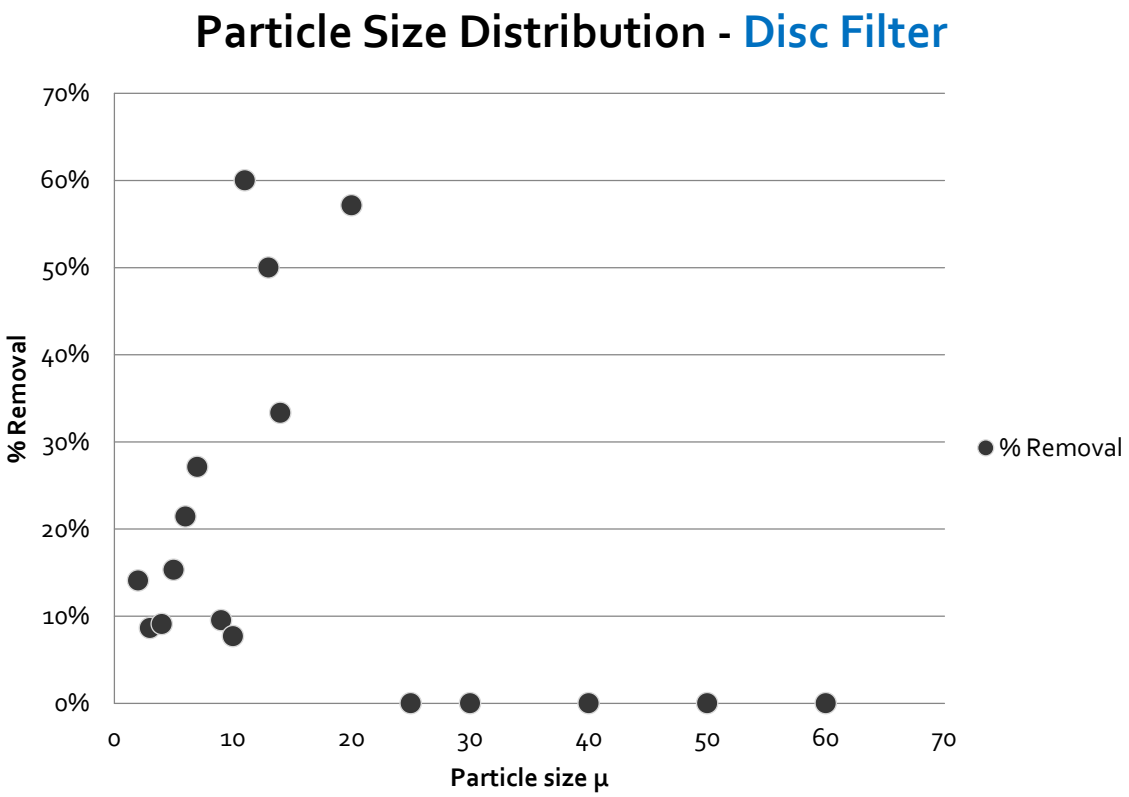


CENTRIFUGAL SEPERATOR (40-75 microns)



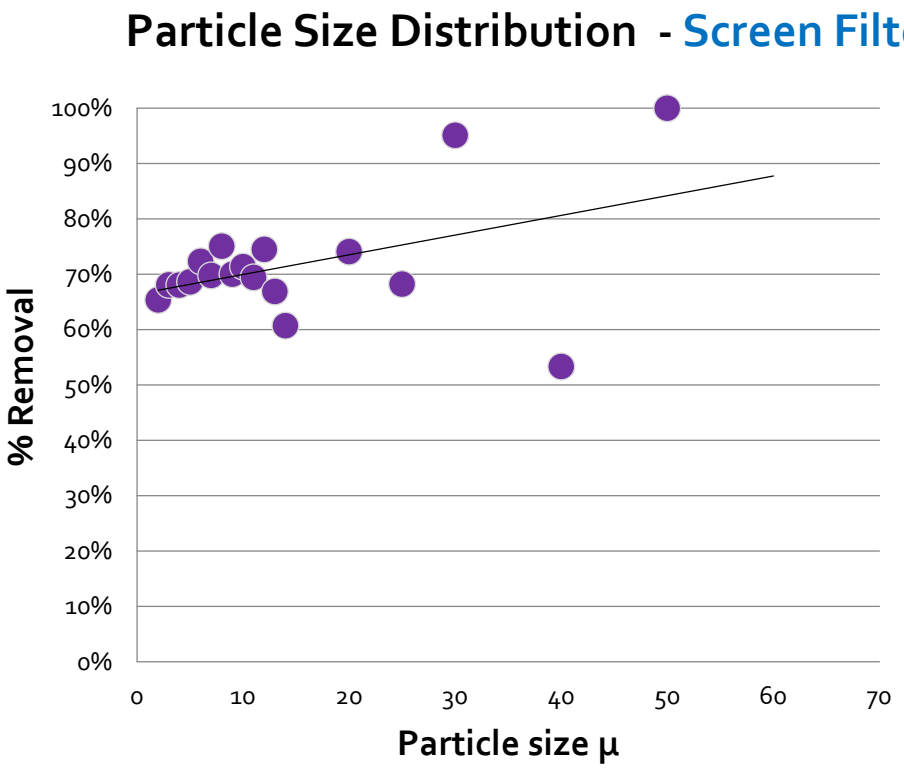
- Less efficiency at lower particle size
- Almost negligible backwash

DISC FILTER (50 microns)



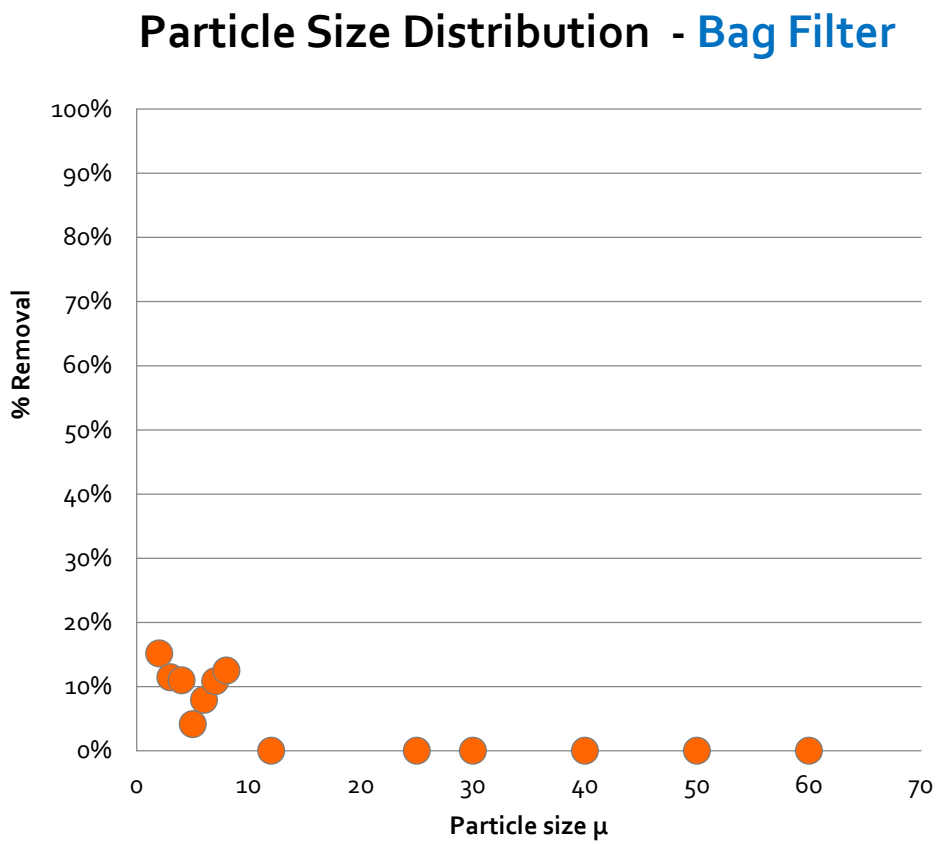
- Higher efficiency than Centrifugal
- Removal up to 60% of particle lower than filter rating
- Has moderate backwash rate

SCREEN FILTER (50 microns)



- Highly efficient
- Removal up to 100% of particle at the filter rating.
- High back wash quantities

BAG FILTER (10 micron)

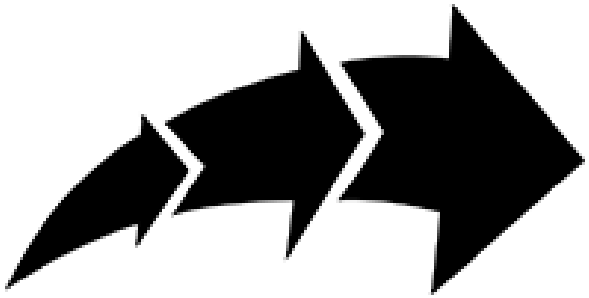


- Low efficiency
- No Backwash , but high running cost (consumables)

CONCLUSION

FILTER TYPE	PARTICLE REMOVAL %	ADVANTAGES & DISADVANTAGES
Centrifugal separator	15%	Not suitable for removing lower size particles, less efficiency
Bag filter	20%	High running Cost (consumable)
Screen Filter	100%	Water consuming
Disc Filter	60%	Extremely efficiency, balanced back wash

RECOMMENDATION



Future Plans

Kindly don't hesitate to contact me for sharing experience related to the same subject.

Email: Nouf.Sultan@empower.ae
Tel: 04-3759649