Optimizing Filtration Sulphur burning acid plants

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Parker
TWIN FILTER

ENGINEERING YOUR SUCCESS.
Agenda

• Need for liquid sulphur filtration
• Main Filters (pressure leaf)
  • Product design
  • Process Settings
• Polishing Filters
• Trouble shooting
• Cooling water
Sulphur filtration? Some key drivers

• Protection of sulphur burner nozzles
• Protection of catalyst
   ➢ Reduce number of shutdows
• Good working main filters reach in optimum situation 10 ppm in filtrate.
• How well do your main filters work?
• Tendency: solid content after filtration < 5ppm.
   ➢ polish/safety filtration is a must!
Main sulphur filter (design)

- Heated Cover Flange
- Retractable shell
- Inflatable gasket
- No disconnection of filtrate outlet
- Completely steam jacketed
- Easy changeout of head gasket
- Many more, contact us!
Design of the main filter: Heated cover- and tank flange (close-up)
Design of the main filter: Heated Bayonet closure or not?
Design of the main filter: Central steam inlet
Design of the main filter:
Steam hose guide / carrier
Design of the main filter: Safety pin
Design of the main filter: inflatable gasket

Wedge edge type

Inflatable Gasket
Design of the main filter: vibrator supported cake release

- Support cake release before sulphur petrifies
- Easier to work with for operators
- Less exposure to hot sulphur for those who clean the filter
Design of the main filter: vibrator supported cake release cont´d
Design of filter elements (1)

• High quality 5 ply filter elements
• Production in own workshop (Uitgeest, the Netherlands)
• Range of filter mesh for different applications like:
  • 60 mesh
  • 24 x 110 mesh
  • PZ80
• Only high quality materials
  • Binding, nozzle 316
  • Drain- and support mesh 316
  • Rivets 316
  • Filter mesh suitable for application, 316 or 904(1.4539)
Design of filter elements (2)

• Optimum flow and low differential pressure resulting in equal process results between small and large elements.
• High flow nozzle
  • Better precoating
  • Better cake drying
  • Better cake discharge
• Less forces on profile
Operation

- Use high quality filter leaves (5 ply).
- Proper pre-coating procedure.
- Proper pre-coating speed
- Correct dosage of precoat filter aid
- Low speed gives unstable pre-coat layer.
  - Results in collapsing of bridges.
- Valve sequence (valve out precoat loop, valve in filtration loop) to keep pressure on filter cake
Operation

- Proper Filtration Speed
- Proper inspection and maintenance of the leaves and gaskets
- Cleaning of essential parts of the filter (bayonet ring for example)
- Choice of filteraid
Choice of filter aid

- Organic (cellulose) vs. traditional inorganics (DE, Celite 503, Perlite, etc)

- Much easier cake release
- Better protection of the filter leaves (longer life time)
- Selection of product pumps
- Filtrate quality (no carry over of precoat material), hence lower concentrations of solids
- Handling (WHO Statement)
- Disposal of filter cake (combustion, landfilling ?)
Filter cake mineral products

Cake Formation

During start-up, smaller particles will pass the filter cake.

A solid cake build up will start only once stable 'bridges' have been established.

Problems

- It takes time to establish a good pre-coat layer (filter cake).
- Larger particles can block (blind) the filter cake.
- At higher ΔP, particles may pass through the filter cake.
Filtercake – Organic fibers

Advantages

- Quicker pre-coating
- Fleece-alike structure reduces risk for blinding of the filtercake
- No bypass at higher Δp

Bridges are established quickly

Fibers create a 3D network. Smaller particles are efficiently captured.
Working with Sulphur Aid Fine
Easy Cake release
Types of polishing/police filters

Pressure leaf

- Mainly Police filter
- Still use precoat material that may bypass the mesh

Cartridge Filter

- True Polishing filter reducing ash levels further to < 5ppm
- Dead-end filtration
- No precoating
Sulphur Polish Filter (cartridge type)
Working principle

Filtration $\Rightarrow$ outside to inside.

Feed

Filtrate
Working principle

- Draining
  - By gratify
  - Sometimes steam supported

Steam

Back to feed tank
Working principle

- Cleaning
- Glass fiber
  - Changing cartridges
- Ceramic
  - Back flushing with steam
- Sintered steel (SS-316L)
  - Back flushable (steam)
Choice of filter cartridge
Cleanable cartridges

+ High efficiency
+ High dirt holding capacity
+ Proven technology
+ Chemical resistance
+ Abrasion resistant

- Difficult to clean
- Cleaning efficiency
- Expansion deviation with steel
Filters for Cooling water

Twin-O-Matic in service

Ready for packaging
Process-water and prefiltration RO

Project Sydney (Veolia)  Project Kazakhstan

Cartridge type (pre-RO)
Thank you!