Desanding and Sand Management

A General Introduction
Summary

- Why do solids need to be removed?
- Where to remove solids
- Multiphase Desanders
- Sand Fluidising Cyclones
- Desanding Hydrocyclones
- Sand Washing Hydrocyclones
- Solids collection
- Solids disposal
- Questions
Produced Water Treatment
Types of Solids

Natural Solids

- Sand, Clay, and Drilling Chips from Well Flow
- Failed or Non-Existent Gravel Pack And/Or Screen
- Clay and silt (typical <40 microns), granules (>1,000 microns)
- Sand (fine 40-125, medium 150-250, coarse 300-1000)
- Typical Size: 3 to 250 microns
- Typical Concentration: 10 – 100 ppm

Artificial Solids

- Drilling Mud, Frac Sand, Corrosion Prod. and Scale
- Typical Size: up to 1,000 microns
- Typical Concentration: up to 10,000 ppm (1%)
Problems Caused by Solids

**Erosion**

Wear of Choke, Piping, Valves, Deoilers, etc.

**Collection**

Fill Vessels, Tanks, etc. Causes reduction in production.

**Corrosion**

Creates corrosion zones (bacteria growth or activity due to stagnation)

**Interference**

Instrumentation and equipment problems
1. Before choke – Wellhead desanders
2. After choke – Wellstream desanders
3. From separator – Sand fluidising cyclones
4. After separator – Desanding hydrocyclones
Multiphase Desanding Hydrocyclones

- Used to remove suspended solids from multiphase streams.
- Can be installed upstream (wellhead desander) or downstream (wellstream desander) of choke valve
- Proven over many years
- Compact
- Simple operation
- Cost reduction compared to current techniques
- Eliminates downhole sand control measures
- Increases production rates
Principle of Operation

- Fluid fed tangentially into cyclone
- Geometry causes fluid to spin
- Spinning motion creates centrifugal force
- Solid particles migrate to wall of cyclone
- Solids exit the tail of the cyclone to solids accumulator
- Water (oil & gas if multiphase) is forced in opposite direction to the separator
Flow Pattern
Wellhead Desanders

- Installed upstream of choke valve
- Operate under high pressures
- Can remove suspended solids from multiphase fluid
- Solids do not require cleaning after removal
Wellhead Desanders

Influent → Desander → Drain
Flush Water → Desander → Drain
Gas → Desander
Oil → Desander
Water → Desander
Solids → Drain
Wellstream Desanders

- Installed downstream of choke valve
- Operate at lower pressures than wellhead desanders
- Can remove suspended solids from multiphase fluid
- Solids do not require cleaning after removal
Wellstream Desanders
AIES Sand Fluidizing Cyclone

- Sand removal devise
- FLS gRAY cyclones
- New projects
- Retrofitted into existing vessels
- High sand slurry rates
- Can easily be automated to ensure devices run regularly
gRAY Sand Removal Cyclone Video
Sand Fluidising Cyclones

Solids can be removed from vessels through the use of Sand Fluidising Cyclones (SFCs).

Motive water is used to create a vortex of solids at the bottom of the vessel.

The internal pressure of the vessel (or use of an eductor) will result in the solids flowing out of the discharge nozzle as a slurry.

Can remove solids from vessels at a concentration of up to 70% by weight.
Principle of Operation

Internal pressure forces slurry into discharge

Motive Feed Water creates cyclonic effect at the base of the SFC

Vortex lifts and fluidises solids

--- one meter ----

area of influence
Principle of Operation

Manifolds are installed to cover the vessel floor. The number of SFCs required depends on the area to be treated.
AIES - Separators

- Two and Three phases separators
- Internal are tailored to the duty with inlet distributors, plate pack, demisters and solid removal manifolds.
- High pressures and exotic MOC can be accommodated
AIES - Sand Fluidizing Cyclone

- FLS gRAY cyclonic sand removal device
- Retrofitted into existing vessels
- High sand slurry rates
- Can easily be automated to ensure devices run regularly
Sand removal - Retrofit into Separators

- Pre assembled and tested gRAY manifold
- No HOT work required on many existing separators – installed through manways.
- Can be used to upgrade old jetting system (drastically reducing the water consumption).
- Allows for uninterrupted operation of separators
Advantages

Lower Turbulence
Eliminate instrument fouling
Minimize sand carryover problems
Minimize re-entrainment and emulsions

Higher Discharge Concentration (20-40%v vs. 2-5%v)
Smaller Feed Pump
Smaller downstream handling equipment
Faster removal

Lower Feed Pressure (8-10 psi vs. 50-150 psi)
Eliminates vessel wall erosion
Eliminates nozzle plugging

Reliability and Ease of Use
Can operate frequently with no upset to operations
Economical solution for replacement of sand jetting systems
Desanding Hydrocyclones

Influent

Gas

Oil

Water

Drain

Flush Water

Solids
Multiple liners are housed in a pressure vessel to treat the large flowrates.

The number of liners required is dependent on total flowrate and available pressure.
Desanding Hydrocyclones
AIES offers turndown designs when the flowrate is expected to fluctuate or increase significantly over time.

Liners are compartmentalised so that a number of liners can be switched off if the flowrate decreases. This ensures optimum performance despite flow variation.
Turndown

Influent

40,000 BPD

Water

Drain

Flush Water

LS

Solids

17th May 13

We Design, We Develop, We Deliver.
Collection
Cleaning

The amount of oil associated with produced solids can be significant (up to 15% weight).

Solids must contain less than 1% weight oil to be suitable for disposal.

Sand washing involves passes the solids through a desanding cyclone to scrub the oil from the solids. The solids are turned over a number of times until suitably clean.
Disposal
Disposal

- Direct input from accumulator
- Replaceable porous bulk bag
- Liquids to process/slops
- Solids dried to 95%wt
- Simple
- Rugged
- Inexpensive