

## D.03

# Wellhead Desander Cyclones

## Introduction

Sand & solids occur in many oil and gas well streams as a consequence of typical production techniques. The use of hydraulic fracturing of shale or tight oil and gas reservoirs increases the presence of loose solids in the formation, and many of these solids are carried to the surface in the well stream. Flowing wells operate under a wide variety of operating conditions and may include oil, gas and water in variable combinations.

These solids can be removed from different locations within the process train, although removing these solids at or near the Wellhead (upstream of the process facilities) offers a number of advantages:

- Protects equipment from erosion damage
- Prevents solids build up in vessels and pipelines
- Prevents sand damaging valve seats
- Overall risk reduction to on-going production
- Reduces the need for vessel entry

## Description

SUEZ's range of CYCLONIXX® Wellhead Desander Cyclones offers a solids-separation technology specifically aimed at multi-phase well streams. Our Wellhead Desanding technology is suitable for all Wellhead gas / liquid ratios from 100% liquid to 100% gas.

CYCLONIXX® Wellhead Desander Cyclones are custom engineered to fit each application, and provide a wide operating envelope to meet changing conditions common in multi-phase well streams.

## Operating Principles

Desander Cyclones are pressure-driven separators that require a pressure drop across the Desander Unit to cause separation of the solids from a gas, oil or water stream. The ratios of oil, water and gas can vary across a wide spectrum of operating conditions.

In gas streams, pressure drops across the Wellhead Desander Unit can be very low (eg:  $\leftarrow$ 5 psi / 0.35 Bar) and separation efficiencies can be very high due to the low gas viscosity (compared to liquids).



Shell Mangahewa CYCLONIXX® Wellhead Desander Package  
Location: New Zealand

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## Wellhead Desander Cyclones



The inlet stream (containing solids) enters the Desander Cyclone through a tangential inlet section under pressure, where it is forced into a spiral motion by the Cyclone's internal profile. The internal cone shape causes the spinning fluids to accelerate, which generates high centrifugal forces, causing the denser solids particles to move to the outer wall of the Cyclone, while the Water/Oil/Gas is displaced to the central core.

The de-sanded Water/Oil/Gas in the central core section reverses direction and is forced out through the central Vortex Finder at the top of the Cyclone.

Solids continue to spiral down along the outer wall of the conical section inside the Cyclone to the Underflow nozzle, where they exit into a collection chamber within the pressure containment vessel. The solids pass down into solids Accumulator vessel located underneath the Wellhead Desander Vessel.

The Wellhead Desander Cyclone remains on line at all times. Solids are batch dumped in a specific sequence from the Solids Accumulation Vessel into a collection bin.

### Technical

Factors influencing multiphase Desander Cyclone design and selection:

- Inlet solids (size range and concentration)
- Required particle size removal (micron)
- Temperature/Viscosity of the well fluids
- Liquid, Solids & Gas density
- Flowrates of the well streams
- Available pressure drop

### Product Range & Materials

#### Sizes

The CYCLONIXX range of Wellhead Desander Cyclones covers a wide range of Cyclone sizes to suit process requirements. These sizes (based on inlet diameter of the Desander Cyclone Liner section) typically range from 50 - 400 mm. Solids sizes are typically  $\leq 3$  mm diameter, but larger solids can be accommodated within our designs.

#### Materials

SUEZ has developed a range of specialised materials for the Desander Cyclone Liner that form part of our premium TUNGSTONE® range. Materials include Reaction Bonded Silicon Carbide and Tungsten Carbide.

The TUNGSTONE range of materials offer supreme erosion resistance in aggressively erosive environments, while operating across a wide range of pressures and temperatures.

#### Equipment Design

Where the solids are required to be removed at the wellhead, the Wellhead Desander must be designed to the same pressure rating as the wellhead. These are typically rated to 5,000 - 20,000 psi rated.

The Wellhead Desander Vessel and piping materials can be manufactured from a range of materials from Carbon Steel to Nickel Alloys to suit to process requirements.

#### Applications

CYCLONIXX Wellhead Desanding Cyclones are applicable for:

- Increasing production above previous limits
- Frac Sand/Proppant removal from Shale Gas/Oil
- Well clean-up operations
- Well start-up operations
- Under-balanced drilling operations

