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Cyclonic Separation

JCI Cyclonics Ltd.

Cyclonic Separation

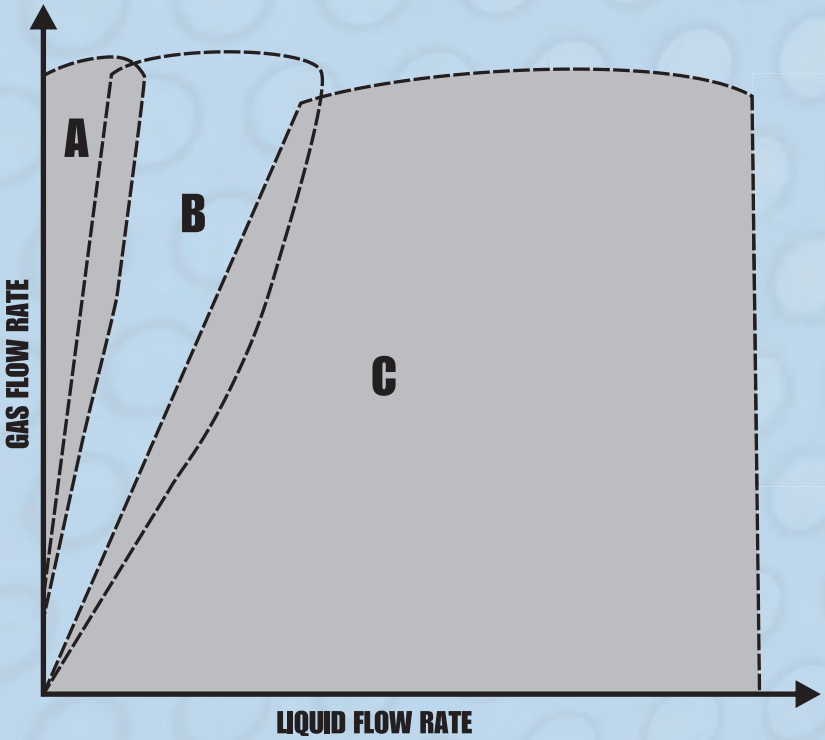
Product Summary and Selection

Region A – Horizontal Inline Recycling Separators

Horizontal Inline Recycling Separators (Shown above) are designed to separate liquid and solid contaminants from a gas dominant flow with low to moderate liquids.

Region B – Vertical Recycling Separators

Vertical Recycling Separators (Shown right) are designed to separate liquid and solid contaminants from a gas dominant flow with moderate to high liquids.



Region C – Inlet Device

Cyclone Vortex Tube Inlet Device (Shown above) is an inlet device designed to eliminate foam, improve separation, and break the momentum of the process fluid.

Cyclonic Separation

Overview

JCI Cyclonics Ltd. offers a full line of cyclonic separators and internals to meet any gas / liquid separation requirement.

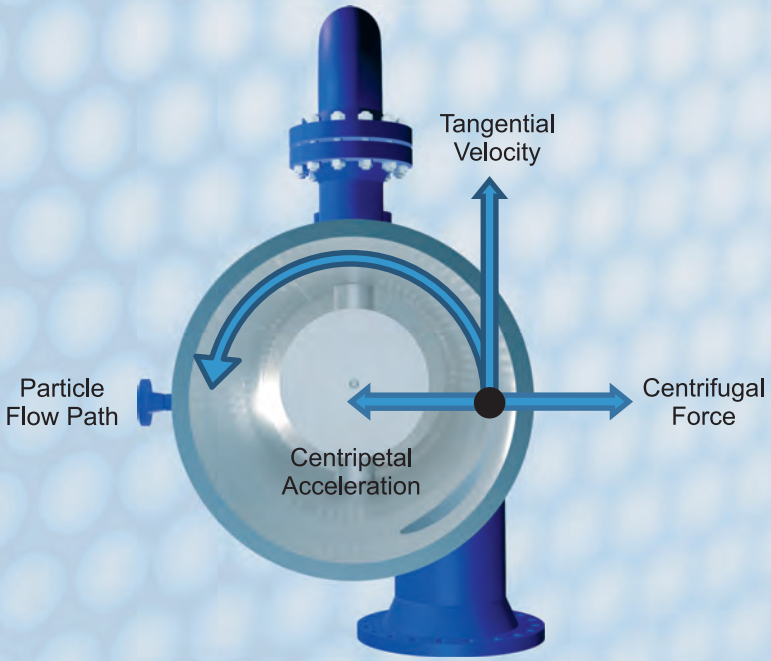
Cyclonic separation has been a fixture in the oil and gas industry for decades, providing reliable, efficient separation with no moving parts.

Consult a JCI specialist to receive an engineered solution for your specific application.

Shown above is a Cyclone Vortex Tube Inlet Device, which significantly improves separation in three distinct ways:

1. **Eliminates Foam.**
2. **Breaks Momentum of Process Fluid.**
3. **Enhances Gas/Liquid and Liquid/Liquid Separation.**

How Cyclonic Separation Works

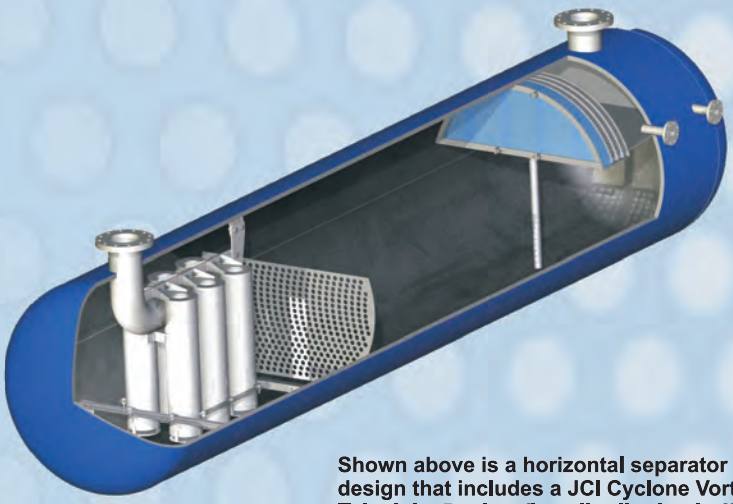


Process fluid experiences significant centripetal acceleration by flowing either through a tangential inlet or over an axial swirl generator. The centrifugal force exerted on the process fluid overcomes buoyancy and drag forces, resulting in the heavier particles (liquids/solids) migrating to the wall of the cyclonic device and the lighter particles (gas) to the central axis where they are separated.

At design conditions, the acceleration experienced by individual particles can be up to several hundred times the acceleration due to gravity, allowing reduced retention times in comparison with conventional separation.

Cyclone Vortex Tube Inlet Device

The **JCI Cyclone Vortex Tube Inlet Device** is a cyclonic inlet device that utilizes a tangential entry to create centrifugal acceleration. The device can be used in vertical or horizontal vessels intended for gas or liquid dominant flow. The device provides improvement in three important aspects of separation:

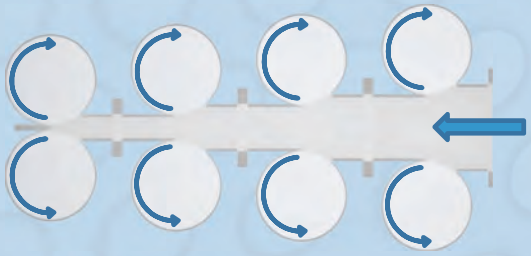


Shown above is a horizontal separator design that includes a JCI Cyclone Vortex Tube Inlet Device, flow distribution baffle, and JCI mesh/vane demister.

- Eliminates Foam
- Breaks Momentum of Process Fluid
- Enhances Gas/Liquid Separation (degassing)

The Cyclone Vortex Tube Inlet Device consists of a series of cylindrical tubes internally mounted on a manifold that is either welded or flanged to the inlet nozzle of the vessel. Retrofit designs are available for existing vessels where welding to the vessel wall is not an option.

Process fluid enters The Cyclone Vortex Tube Inlet Device through common header specifically engineered to evenly distribute the flow to each tube. The flow is then directed into the vertical tubes through a tangential opening at the top of each tube, which causes the process fluid to undergo centripetal acceleration. This acceleration imparts significant forces on the process fluid, separating heavier particles (liquid/solids) from gas.



Profile of Cyclone Vortex Tube Inlet Device showing flow path into each tube.

Due to the extremely high forces exerted on the fluid, separation occurs at a faster rate than it would in a conventional vessel, significantly reducing the retention time required to separate a given droplet size. The advantages of decreasing retention time include a reduction of separator size or an increase in throughput.

Do you have high operating expenses due to expensive defoaming chemicals?
JCI's Cyclone Vortex Tube Inlet Device can eliminate foam and the resulting expenses providing a significant return on investment (ROI).

Recycling Separators – Inline

The inline recycling separator is ideal for process streams with high gas/liquid ratios. High separation efficiencies are achievable, commonly 99.99% removal of 10 micron and larger liquid droplets. JCI Cyclonics Ltd. offers standard tube sizes up to 8" NPS.

Inline recycling separators can utilize single tube designs such as the Model JCH1, or multiple tube designs such as models JCH2 or JCH3. Multiple tube designs are required when the desired capacity exceeds the capability of a single tube design. Contact JCI to determine which design is suitable for your application.

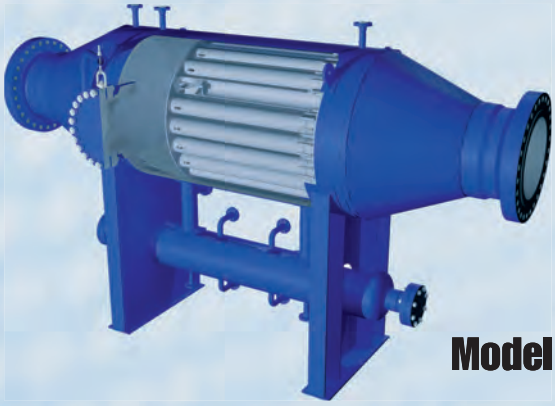
The process fluid enters the inline tubes where a vaned hub spins the flow. Heavier particles such as liquids or solids are forced to the outer edge of the tube where it is removed through a gap and drained.

Model JCH1

A horizontal recycling separator capable of processing high volumes of gas and low to moderate amount of liquids. The JCH1 includes a single tube and liquid sump.

Model JCH2

A horizontal recycling separator capable of processing high volumes of gas and low to moderate amount of liquids. The JCH2 includes multiple tubes and single liquid sump.



Model JCH3

The Model JCH3 is a horizontal recycling separator capable of processing high volumes of gas and low to moderate amount of liquids. The Model JCH3 includes multiple tubes and two liquid sumps.

Cyclonic Separation

Recycling Separators – Vertical

Vertical Recycling Cyclone Separators use two stages of separation to remove liquid and solid contaminants and achieve high separation efficiency. A tangential inlet on the separator creates centrifugal force that causes the heavier liquid and solid particles to migrate toward the vessel wall, thus forcing the lighter particles such as gas, into the center of the vessel. This gas enters the cyclone tube, while the liquid and solid contaminant continues toward the bottom of the vessel. The gas stream is still spinning as it enters the cyclone tube, where liquid droplets still entrained in the gas are forced to the inside wall of the tube.

This liquid, along with a small percentage of the gas, exit the cyclone tube and are forced through a recycling system where it is reintroduced to the inlet of the cyclone tube. This recycling system gives the smaller entrained droplets a second chance at separation, which increases the efficiency approximately 10% over a conventional cyclone separator.

The liquid chamber in the bottom of the vessel contains vortex breakers to dissipate energy and prevent re-entrainment. The liquid section can be sized as large or as small as necessary to accommodate proper retention times, and may be constructed for gravity separation of immiscible liquids such as oil and water to meet the customer's specific requirements. Vertical recycling separators are used in applications with medium to high liquid / gas ratios and moderate liquid slugs. Variations are available for increased gas or liquid handling capacity, depending on your process requirements. Contact JCI to determine which design is suitable for your application.

Model JCV1

The Model JCV1 is a vertical recycling separator capable of processing high volumes of gas and moderate amount of liquids when compared to conventional separation technologies.

Model JCV2

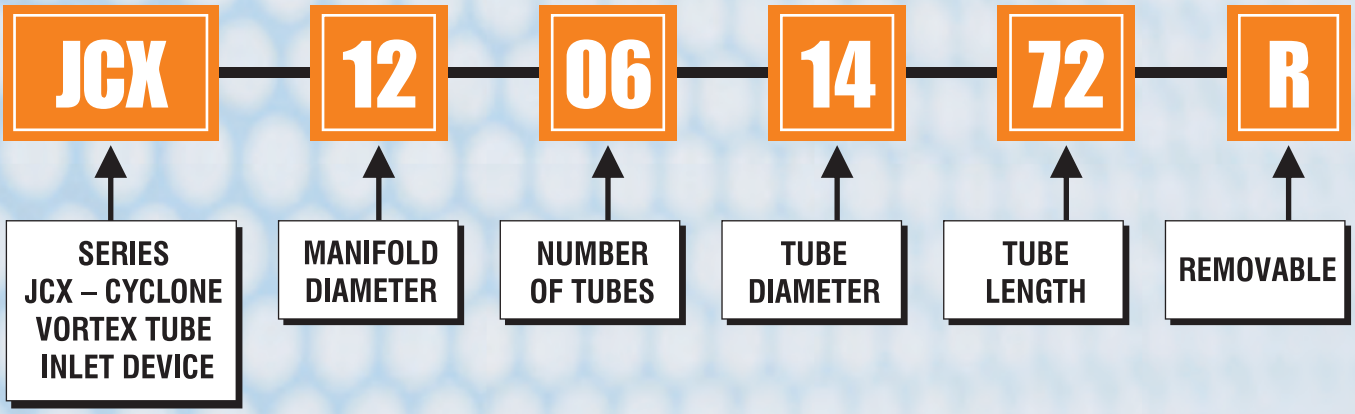
When additional liquid handling capacity is required, a vertical recycling separator (either a Model JCV1 or JCV3) can be equipped with an enlarged sump. The size and shape of the sump will be optimized

Model JCV3

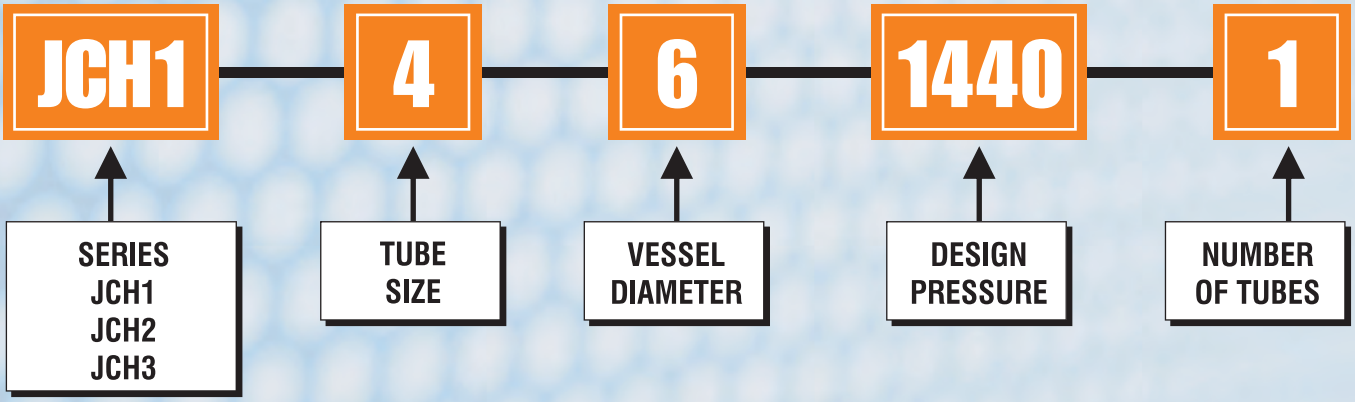
The JCV3 is designed specifically to process higher gas/liquid ratios when compared to the equivalent size JCV1.

Cyclonic Separation

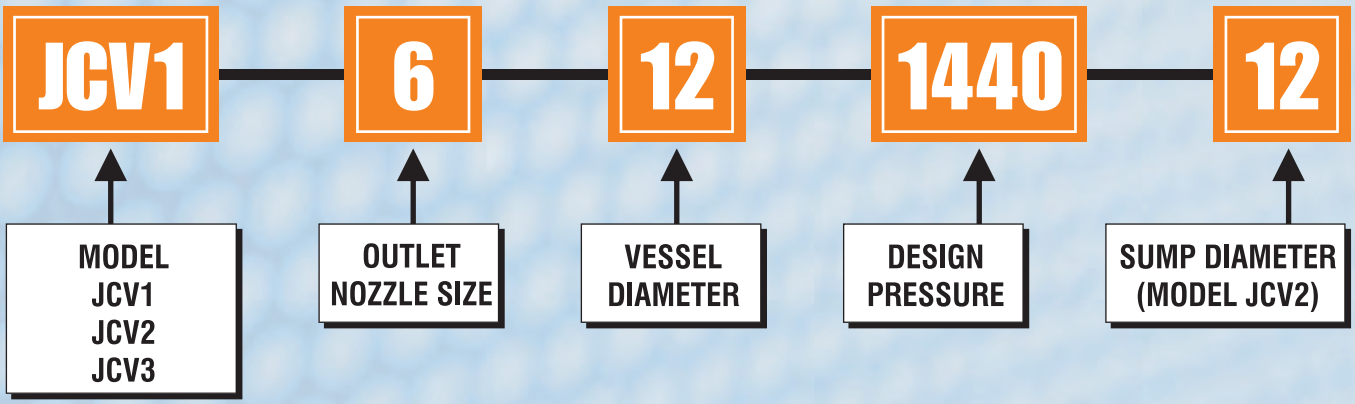
Nomenclature – Cyclone Vortex Tube Inlet Device



Nomenclature – Horizontal Inline Recycling Separators



Nomenclature – Vertical Recycling Separators



Inquiry Information

As a minimum, the following information is required for Cyclonic Separation sizing and pricing inquiries. If the request is for a full pressure vessel, please attach the relevant design information and specifications.

Cyclone Inlet Device:

Gas Flow Rate: _____ S.G.: _____
Gas Analysis Attached: ❑ YES ❑ NO
Oil Flow Rate: _____ S.G.: _____
Oil Viscosity: _____
Oil Surface Tension: _____
Water Flow Rate: _____ S.G.: _____
Water Viscosity: _____
Water Surface Tension: _____
Operating Pressure (Range): _____
Operating Temperature (Range): _____
New or Existing Vessel: _____

Horizontal Inline or Vertical Recycling Separator:

Gas Flow Rate: _____ S.G.: _____
Gas Analysis Attached: ❑ YES ❑ NO
Oil Flow Rate: _____ S.G.: _____
Oil Viscosity: _____
Oil Surface Tension: _____
Water Flow Rate: _____ S.G.: _____
Water Viscosity: _____
Water Surface Tension: _____
Operating Pressure (Range): _____
Operating Temperature (Range): _____
Allowable Pressure Drop: _____

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JCI Cyclonics Ltd.