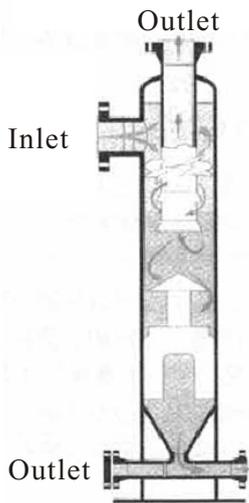




Cyclotube Separator

Structure And Principles



Our cyclotube separator system separation is a compactly structured separation equipment with high separation capability. It is able to efficiently remove large amount of unwanted solid/liquid particle from the gas at a relatively low pressure. It also work effectively at high pressure or ultra-high pressure when the gas contain viscous wax or abrasive solid particles at a low maintenance cost. For maintenance purpose, it is necessary to regularly blow off the collected solid/liquid particles. (instead of replacing the separation elements)

The gas which contains particulates enters the gas distribution chamber through the inlet of multi-cyclotube separator, and then into multiple cyclonic tubes. At this time, the centrifugal force in a single cyclonic tube allows heavy phase to separate from multiphase mixture and to collect on the inner wall of the cyclonic tube, and finally exhausted from the dump tank together with other separated phases in other cyclonic tubes. The purified gas then enters from the ascension tube into the shell collector, which leads to the outlet .

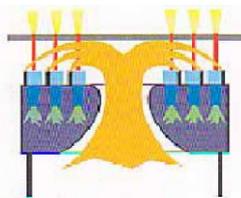
Design Features

Targeting at improving common flaws in conventional multi-cyclotube separator's design such as low efficiency, imprecise design of the gas inlet section; With great efforts and intensive research, our company ,has made improvements on the design of cyclotube separator in many aspects based on our accumulated professional knowledge and rich experience in the field of filtration/separation and natural gas production.

Compared with conventional multi-cyclotube separators, our highly-efficient cyclotube separator has the following features in structure design:

◆ Special design of gas distribution

The core of our cyclotube separator is an assembly of several cyclonic tubes. However, in a conventional design, single cyclonic tube design often contributes to phenomenon such as uneven gas distribution, which inturn affects the overall separation efficiency of the cyclotube separator.

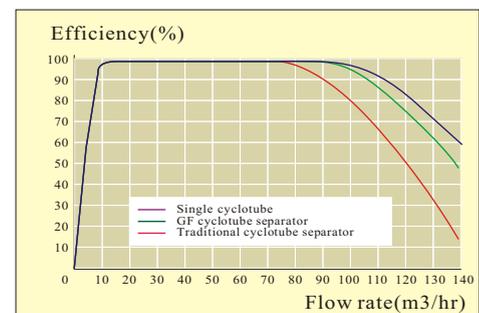


Our answer to this problem is to annularly distribute the cyclonic tube. Optimal annular distribution of cyclotube on a ring allows the gas to enter from the middle part so that it is evenly distributed.

◆ Optimization design of gas inlet section

This is another important part of a cyclotube separator which is related to the primary separation of fuel that has yet to be burned out completely. It is used to prevent the dust collector from overload with liquid particles. Improper design of this part will lead to the entry of scattered droplets into the separator.

Our company has tackled this problem by using an American designed advanced inlet fluid director.

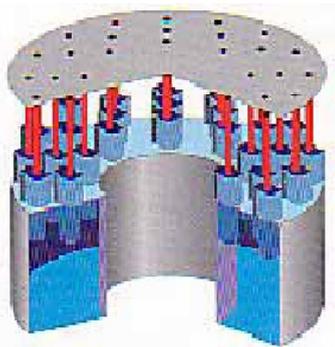




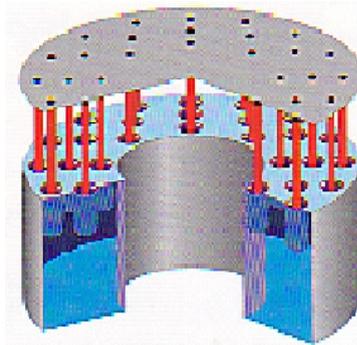
Cyclotube Separator

Cyclotube Separator Types

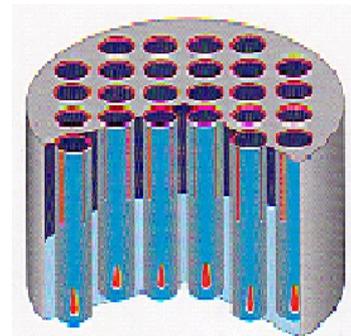
We produce internal components of cyclotube separator in the three classifications as follows:



GF-1



GF-2



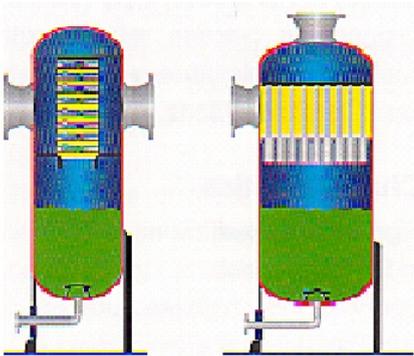
GF-3

| Internal components | Operational characteristics | Application fields |
|---------------------|---|---|
| GF-1 type | <ul style="list-style-type: none"> • High efficient separation • High operation pressure • Separation of solid and wax • High flow rate treatment | <ul style="list-style-type: none"> • Where there is dirt and high pressure • Separator at well head • Mass transportation and distribution of natural gas • Chemical industry |
| GF-2 type | <ul style="list-style-type: none"> • High efficient separation • High operation pressure • Separation of solid and wax (limitation on maximum treatment amount) • low differential pressure | <ul style="list-style-type: none"> • Gas treatment/desiccation • Pollution collection • Chemical industry |
| GF-3 type | <ul style="list-style-type: none"> • High efficient separation • Extremely small differential pressure • Large production capacity • High operation pressure | <ul style="list-style-type: none"> • Gas treatment/desiccation • Chemical industry • Gas desiccation • Device alteration |



Cyclotube Separator

Cyclotube Separator Types

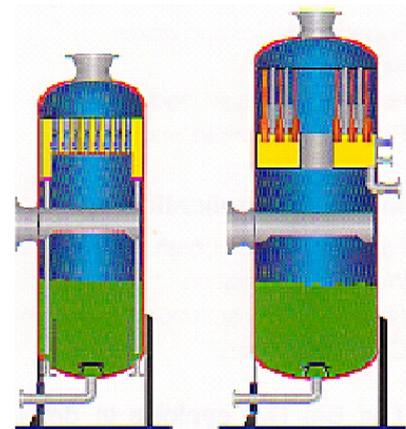


Single-stage separator

This separator design is most suitable to directly clean gas that does not contain large amount of liquid.

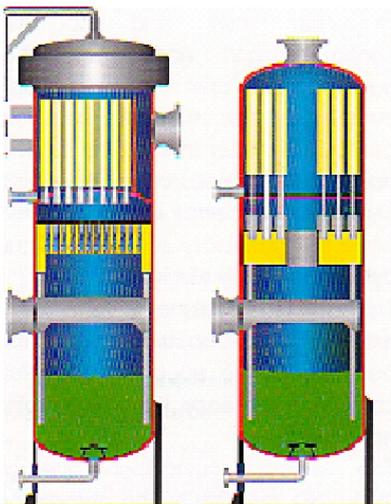
Two-stage separator

When treating gas that contains high liquid content, inlet stage or pollution collector is used: solid particles or larger droplets are screened out before reaching the assembled structure of cyclotube separator to prevent plugging or liquid floodings.



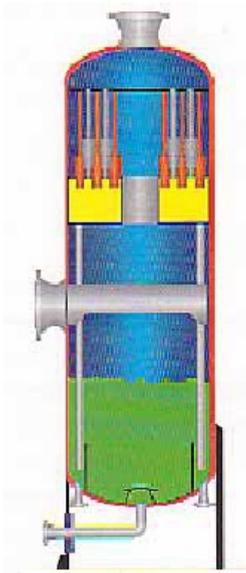
Multistage separator

When high separation efficiency is required, the separation efficiency can be improved by adding filter separation section so that the extremely tiny liquid sprayed leaked from the cyclonic tube can be collected and separated in the filter core through the filter separation section.





Cyclotube Separator



GF-1 highly-efficient cyclotube separator

Characteristics:

- High separation efficiency
- High operation pressure
- Wide flow rate range or high turndown ratio The separation efficiency is higher than 99% when the flow is 15~95m³/h/tube
- Separation of solid and wax
- Self-cleaning
- Treatment of gas that contains high content of liquid
- Low maintenance cost

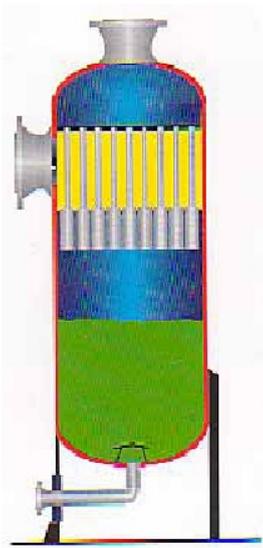
Application:

It is applied to where there is high dirt content and high pressure, such as mass transportation and distribution of natural gas separated at the mouth of well and



Structure mode:

GF-1 cyclone separator tube consists of two tangential inlets and an optimized design gas/liquid outlets. The inlet design generate great centrifugal force to separate particles even under high operation pressure so as to effectively prevent the cyclotube separator from dirt formation while ensuring high separation efficiency. Due to its unique design of the conical section, the cyclotube separator has high wearability also.



GF-2 vertical gas separator

Characteristics:

- High separation efficiency and operation pressure
- Wide operation flow rate range or high turndown ratio
- Separation of solid and wax
- Self-cleaning and low pressure drop
- Compact design of multi- cyclotube separation

Application:

It is most commonly used in gas treatment/desiccation, pollution collection and chemical industry.



Cyclotube Separator



Structure mode:

The main difference between GF-2 and GF-1 lies in the design of the cyclotube inlet. GF-2 has a axial cyclotube designed in accordance with aerodynamics principles, which can generate strong centrifugal force while the pressure drop is largely reduced. This makes the design of multistage cyclotube separator more compact. GF-2 cyclotube separator is recommended when the flow rate is high and the size of solid particulate required to be separated is small.



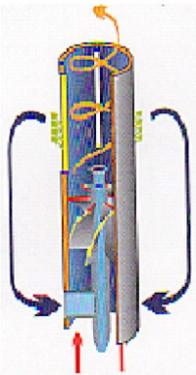
GF-3 cyclotube filter separator

Characteristics:

- High separation efficiency and operation pressure
- Extremely small differential pressure and large production capacity
- Wide operation flow rate range
- Maximum production capacity or turndown ratio not affected by operation pressure
- Particle separation

Application:

It can be applied to gas treatment/desiccation, steam dryness and chemical industry.



Structure mode:

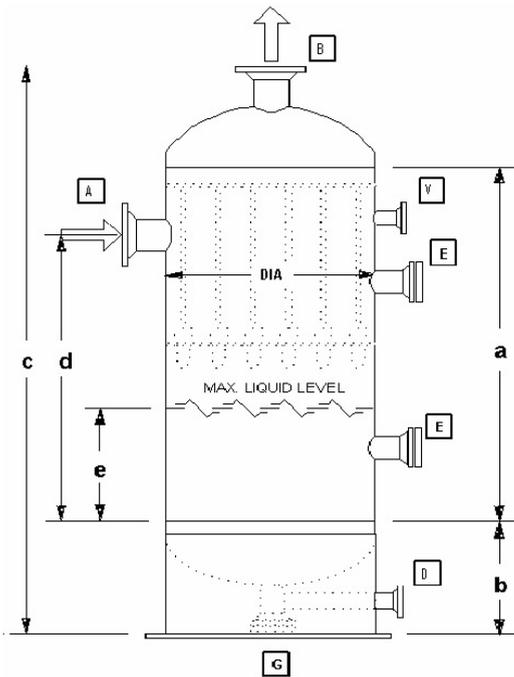
GF-3 is a type of straight cyclotube separator and there is no change in direction of air flow inside, which is, air leaves and enters the cyclotube separator in the same direction. This cyclotube separator is characterised by low pressure drop and compact structure. The working principle is to separate liquid and dust particles by using centrifugal force after the gas enters into the cyclonic tube through vortex component.

The cyclonic air current generated at the low pressure part of central axis in the cyclotube separator aims the exhaust of separated matters through the outlet. This cyclonic flow eliminates the possibility of turboseparator formation at the outlet and the inner cyclone. Owing to the optimized geometric design of turboseparator, the design of the cyclonic tubes ensure equal inlet air amount in each cyclonic tube. Therefore, uneven air distribution problem is eliminated.



Cyclotube Separator

Structure Drawing



Notes:

- a- Tank height
- b- Bracket height
- c- Total height
- d- Distance between the central line of the flange at the inlet and the base of the tank
- e- Distance between the highest allowable liquid level and the lower end of the tank
- A-Inlet
- B-Outlet
- D-Valve-controlled pollution discharge outlet
- E-hand hole
- G-Manual pollutant discharge outlet
- V-Waste gas vent

| Model | Gas amount | Structural dimension(mm) | | | | | | Tube size(mm) | | | | | |
|-------------|-------------------|--------------------------|------|-----|------|------|-----|---------------|-----|-----|-----|-----|-----|
| | M ³ /h | diameter | a | b | c | d | e | A | B | D | E | G | V |
| FS1210-60 | 600 | 300 | 2438 | 550 | 3250 | 1830 | 457 | 100 | 100 | 40 | 150 | 80 | 40 |
| FS1210-80 | 800 | 400 | 2438 | 570 | 3310 | 1830 | 457 | 150 | 150 | 40 | 150 | 80 | 40 |
| FS1210-140 | 1400 | 500 | 2438 | 590 | 3400 | 1830 | 457 | 200 | 200 | 50 | 150 | 100 | 50 |
| FS1210-280 | 2800 | 600 | 2438 | 610 | 3450 | 1830 | 457 | 250 | 250 | 50 | 150 | 100 | 50 |
| FS1210-420 | 4200 | 800 | 2438 | 610 | 3500 | 1830 | 457 | 300 | 300 | 80 | 150 | 150 | 80 |
| FS1210-560 | 5600 | 900 | 2438 | 635 | 3650 | 1830 | 457 | 350 | 350 | 80 | 150 | 150 | 80 |
| FS1210-700 | 7000 | 1000 | 2438 | 760 | 3800 | 1830 | 457 | 400 | 400 | 100 | 150 | 200 | 100 |
| FS1210-800 | 8000 | 1000 | 2438 | 760 | 3800 | 1830 | 457 | 400 | 400 | 100 | 150 | 200 | 100 |
| FS1210-900 | 9000 | 1100 | 2438 | 780 | 3830 | 1830 | 457 | 450 | 450 | 100 | 150 | 200 | 100 |
| FS1210-1000 | 10000 | 1200 | 2438 | 800 | 3900 | 1830 | 457 | 500 | 500 | 100 | 150 | 200 | 100 |
| FS1210-1200 | 12000 | 1300 | 2438 | 850 | 4000 | 1830 | 457 | 500 | 500 | 150 | 150 | 300 | 150 |
| FS1210-1400 | 14000 | 1400 | 2438 | 870 | 4030 | 1830 | 457 | 550 | 550 | 150 | 150 | 300 | 150 |