Natural Gas Conditioning Skids & Equipments

Nirmal™
INDUSTRIAL CONTROLS PVT. LTD.
Expertise that delivers

NATURAL GAS CONDITIONING SKIDS

NIRMAL has rich experience of supplying complete package of Natural Gas conditioning skids consisting of emergency shut down, Primary Scrubbers, Filtration, Metering, Preheating, Pressure Reduction, Final Filtration, coalescing and liquid separation, Drain Tank, Vent Stack along with control panel, Gas Chromatograph, Leak Detectors, Remote Monitoring & Control through SCADA & other necessary instruments & equipments required for safe operation of Power Plant. Nirmal has Expertise in Filtration & Gas Heating which helps ensuring effective performance of the Gas Turbine /Gas Engine etc

NATURAL GAS FILTRATION

NIRMAL is fully equipped to cater the requirement of Filtration systems which includes Knock Out Drum, Filter Separator / Colescers & Dry Gas Filters of various size & rating to cater the requirement in Fuel Gas Conditioning Skid used for the Power Plants / City Gas Distribution Company.

APPLICATION FOR NATURAL GAS FILTRATION

Some of the contaminants that are introduced into the natural gas supply as a result of the production and transportation processes are:

- Water and salt water
- Sand and clay
- Rust, iron sulfate, iron and copper sulfide
- Lubricating oil, wet scrubber oil, crude oil and hydrocarbon liquids
- Calcium carbonate
- Gas hydrates and ice
- Construction debris

RANGE OF SPECIFICATIONS & FEATURES:

Maximum Working Pressure: Up to 100 Barg*

Maximum Working Temperature: Up to 60 ºC*

Pressure Rating: Up to ANSI 600#

Filtration: Efficiency up to 0.3 microns can be achieved using special type of elements.

End Connection: As per ANSI B16.5

Connection Size: 1” NB to 24” NB (Higher Size Available on Request)

Shell Closure: Quick Opening or Bolted Closure

Installation Configuration: Vertical or Horizontal

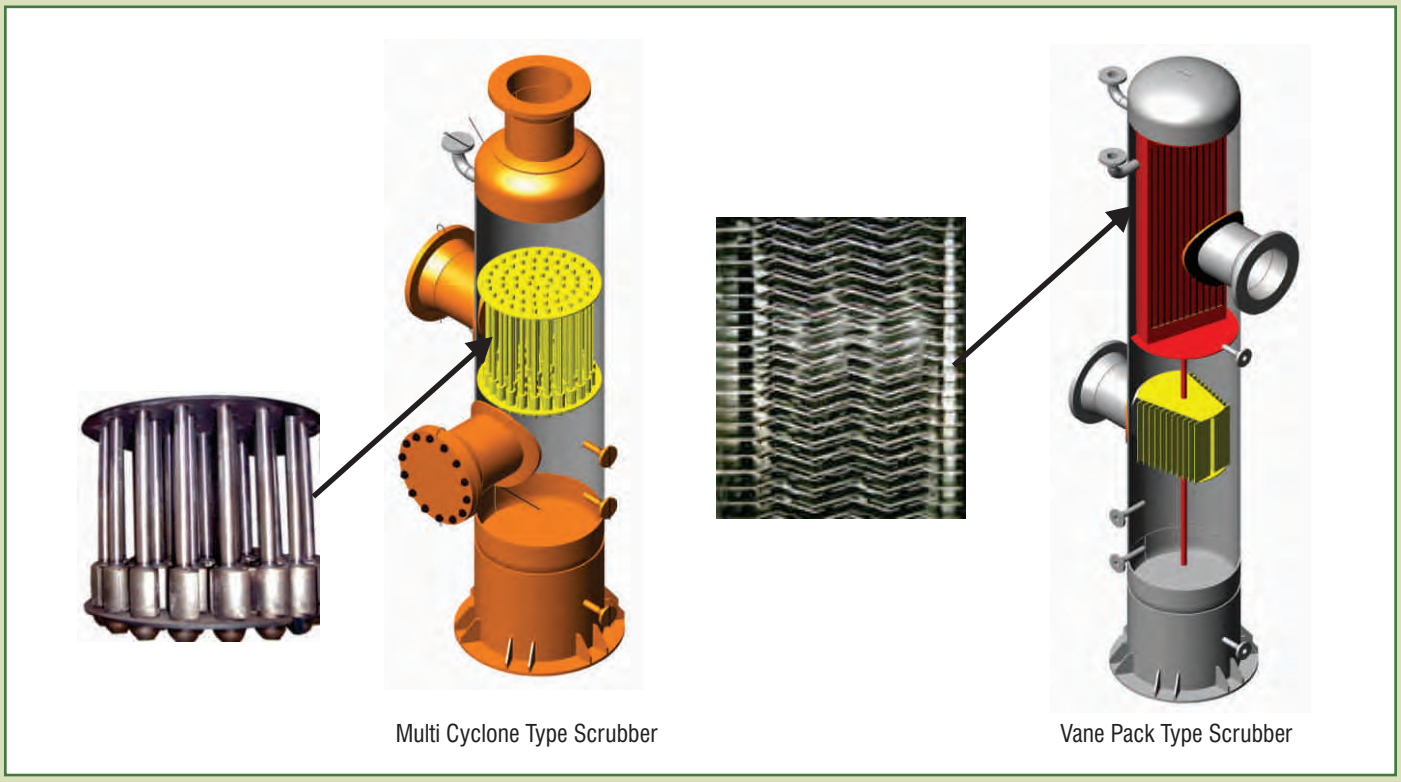
*Contact Nirmal for High Pressure & Temperature beyond above standard range.

EK SERIES KNOCK-OUT DRUM / SCRUBBER / LIQUID SEPERATOR:

Type:

1. Demister Pad
2. Vane Pack
3. Multi-cyclone

Scrubber or Knock out Drum (KOD) is used to remove solid & liquid particles. Two main applications of Scrubber are at wellhead & at compressor skid inlet. Other than these two, scrubber is used in many other industrial applications. It gives high efficiency even at varying pressure & flow conditions. These are low maintenance equipments.



Multi Cyclone Type Scrubber

Vane Pack Type Scrubber

PRINCIPLE OF OPERATION:

Scrubber consists of tube bundles assembled with multiple small diameter cyclone tubes. Gas enters through the tubes causing a circular motion of Inflow, which in turn throw solid & liquid particles against wall of cyclone tubes. Clean gas rises out through the tubes. Impurities being heavier fall down & collected in drain area. Filtration efficiency up to 8 microns for solid as well as liquid can be achieved.

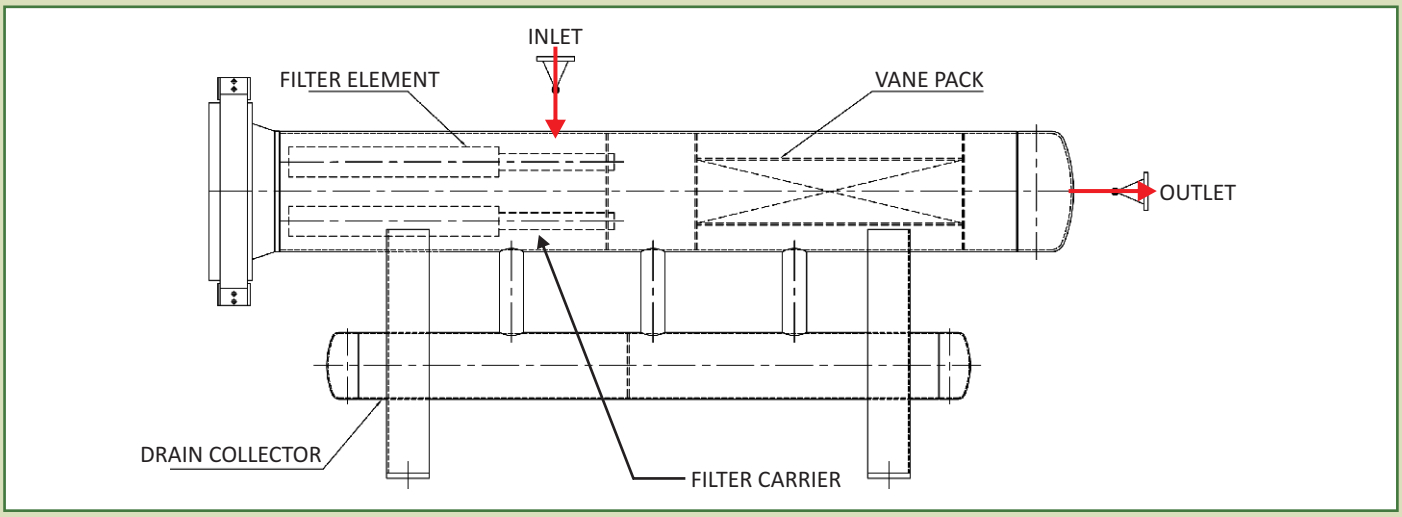
EK SERIES KNOCK-OUT DRUM / SCRUBBER / LIQUID SEPARATOR MODEL CONFIGURATION

EKV- A - EE - 1 - A - C - B - 1 - X - D - X

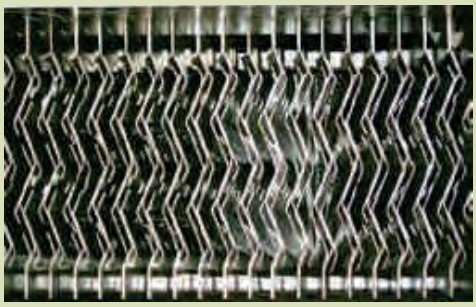
SHELL SIZE- REFER TABLE 2	ELEMENT SIZE- REFER TABLE 11
INLET OUTLET CONNECTION- REFER TABLE 3	NUMBER OF CYCLONES- REFER TABLE 10
PRESSURE RATING- REFER TABLE 4	ELEMENT MOC- REFER TABLE 9
SHELL MOC- REFER TABLE 5	KOD INTERNAL MOC- REFER TABLE 8
INTERNALS- REFER TABLE 6	CYCLONE SIZE- REFER TABLE 7

ES SERIES FILTER SEPERATOR

Filter Separators are used to eliminate very fine dust or liquid particles. This is used where application demands for high efficiency. These are also used to remove oil traces if any from the Gas flow.



Filter Elements



Vane Pack

PRINCIPLE OF OPERATION:

In filter separators solid particles are removed in 1st stage & liquid particles are removed in 2nd stage. Primarily larger solid particles are removed by gravity, since the velocity of incoming gas decreases. In 1st stage of filtration, smaller size solid particles are removed by means of filter elements. Then gas enters the vane pack arrangement i.e. 2nd stage filtration where liquid particles are removed. The contaminants generally are collected in a separate storage vessel which remains connected to the filter separator. Filtration efficiency up to 3 microns for solid & liquid particles can be achieved and for special applications, filtration up to 0.3 microns can be achieved with special type of elements.

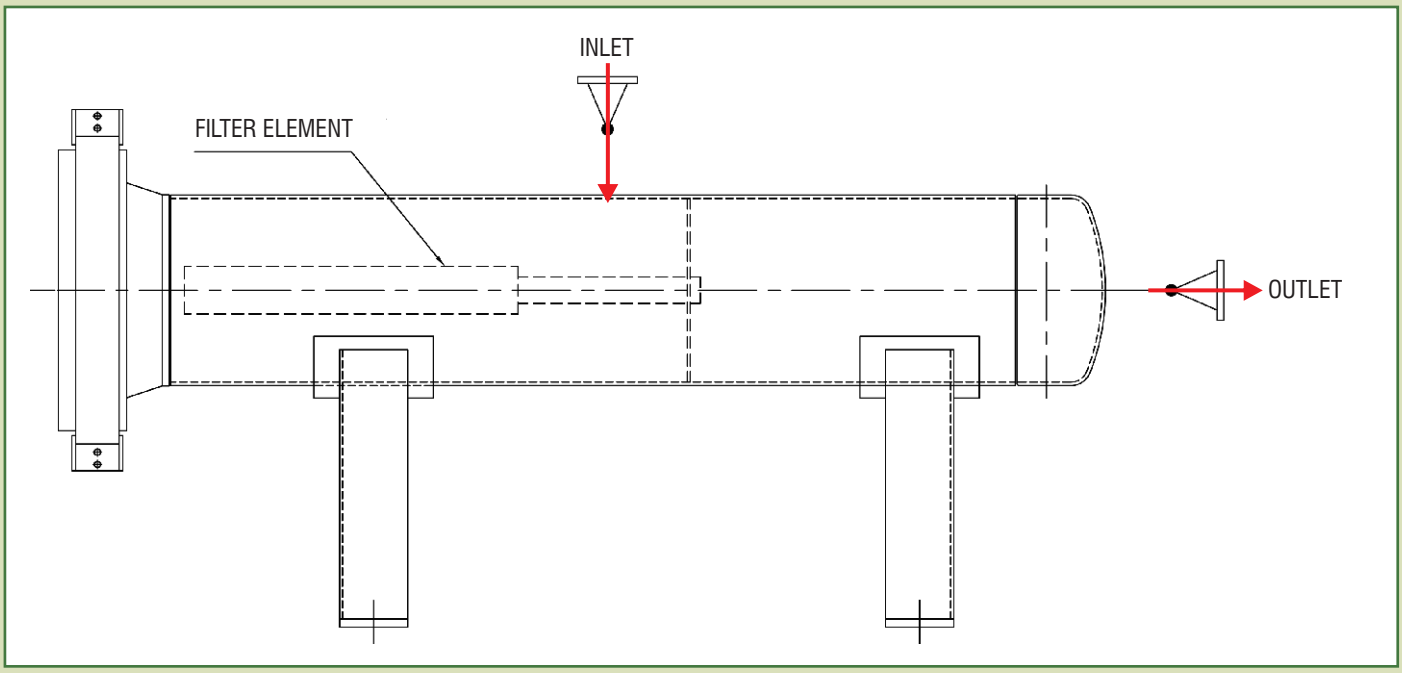
ES SERIES FILTER SEPARATOR/WET GAS FILTER MODEL CONFIGURATION

ES - V - A - EE - 1 - A - V - X - 1 - X - X - X

- ORIENTATION- REFER TABLE 1
- SHELL SIZE- REFER TABLE 2
- INLET OUTLET CONNECTION- REFER TABLE 3
- PRESSURE RATING- REFER TABLE 4
- SHELL MOC- REFER TABLE 5
- INTERNALS- REFER TABLE 6
- ELEMENT TYPE- REFER TABLE 11
- NUMBER OF CYCLONES- REFER TABLE 10
- ELEMENT MOC- REFER TABLE 9
- KOD INTERNAL RATING- REFER TABLE 8
- CYCLONE SIZE- REFER TABLE 7

EF SERIES DRY GAS FILTER

Dry Gas Filters are used to remove very small solid particles. Dry Gas filters remove the solid particles from Gas at any working condition, by designing the suitable filter elements. Decision of suitable no. of elements & elements with suitable filtration efficiency depend on various factors such as client's requirement of filtration efficiency grade, pressure drop, quantity of solid particles etc.



PRINCIPLE OF OPERATION:

As Natural Gas gets into the filter its velocity decreases & heavy particles drop out of the main stream. Then gas flows through the fiber elements & solid particles are trapped in the fibers. Clean gas goes through the elements & to the filter outlet. Design of Cartridge Elements used is such that it causes coalescence effect. Free liquid in gas lay on the elements & form heavier liquid droplets. These get removed by gravity itself. Filtration efficiency up to 3 microns can be achieved.

EF SERIES DRY GAS FILTER MODEL CONFIGURATION

EF - V - A - EE - 1 - A - V - X - 1 - X - X - X

- ORIENTATION- REFER TABLE 1
- SHELL SIZE- REFER TABLE 2
- INLET OUTLET CONNECTION- REFER TABLE 3
- PRESSURE RATING- REFER TABLE 4
- SHELL MOC- REFER TABLE 5
- INTERNALS- REFER TABLE 6
- CYCLONE SIZE- REFER TABLE 7
- KOD INTERNAL MOC- REFER TABLE 8
- ELEMENT MOC- REFER TABLE 9
- NUMBER OF CYCLONES- REFER TABLE 10
- ELEMENT SIZE- REFER TABLE 11

TABLES

TABLE 1	
H	Horizontal
V	Vertical

TABLE 2	
A	4”
B	6”
C	8”
D	10”
E	12”
F	14”
G	16”
H	18”
I	20”
J	24”
O	Others

TABLE 3	
A	¼"
B	3/8"
C	½"
D	¾"
E	1”
F	1½"
G	2”
H	2½"
I	3”
J	4”
K	6”
L	8”
M	10”
N	12”
P	14”
Q	16”
R	18”
S	20”
T	24”
O	Others

TABLE 4	
1	150
2	300
3	600
O	Other

TABLE 5	
A	A 106 Gr. B
B	A 516 Gr, 70
C	A 516 Gr, 60
D	A 515 Gr, 70
E	A 515 Gr, 60
F	A 312 TP 304
G	A 312 TP 316
H	A 240 Gr. 304
I	A 240 Gr. 316
O	Other

TABLE 6	
C	Cyclone
D	Damister Pad
B	Both
V	Vane Pack
O	Other
X	NA

TABLE 7	
A	1
B	2
C	3
D	4
E	5
F	6
G	7
H	8
I	9
J	10
K	11
L	12
M	13
N	14
O	15
P	16
Q	17
R	18
S	19
T	20
U	22
V	24
W	26
Y	28
Z	30
X	NA

TABLE 8	
1	CS
2	SS304
3	SS316
4	SS410
0	Other
X	NA

TABLE 9	
B	Borosilicate Fiber Glass
P	Polypropelene/ Synthetic Fiber
O	Other
X	NA

TABLE 10	
A	1
B	2
C	3
D	4
E	5
F	6
G	7
H	8
I	9
J	10
K	11
L	12
M	13
N	14
O	15
P	16
Q	17
R	18
S	19
T	20
U	22
V	24
W	26
Y	28
Z	30
X	NA

TABLE 11	
A	NG 75-40-200
B	NG 75-40-250
C	NG 75-40-300
D	NG 100-65-300
E	NG 100-65-400
F	NG 100-65-500
G	NG 145-106-300
H	NG 145-106-400
I	NG 145-106-500
J	NG 145-106-600
K	NG 95-54-984
L	NG-75-30-250
M	NG-75-30-500
N	NG-75-30-750
P	NG-3312
Q	NG-3324
R	NG-3336
S	NG-3536
T	NG-3738-.45
U	NG-3738-.3
V	NG-3738-10
W	NG-3738-30
X	NG-3738-50
Y	PN-14-338
O	Other
X	NA

APPLICATION FOR NATURAL GAS HEATING

Heater is required to avoid the liquid condensate formation in the main line due to pressure reduction & surrounding temperature drop.

NEED FOR HEATER IS DICTATED BY FOLLOWING PARAMETERS -

- Minimum temperature of gas supplied
- Temperature reduction due to Joule-Thomson effect in the PRS
- Hydrocarbon and Moisture Dew Point of the Gas
- Degree of superheat as recommended by Utility OEM like Gas Turbine, Gas Engine etc. (Temperature above Dew Point)

TYPE OF HEATERS USED IN NATURAL GAS APPLICATION -

- Electric Heater
- Natural Gas fired Water Bath Heater
- Shell & Tube Steam Heat Exchanges

EH SERIES HEATER

EH SERIES ELECTRIC HEATER

- Used for lower capacity heaters up to 150 KW.
- Heating media used-electricity
- Type of Control Panel 1. On-Off 2. Thyristor
- Low O & M Cost

PRINCIPLE OF OPERATION:

This is direct type of heating. It consists of high resistance Nickel-Chromium wire coated with Magnesium Oxide. These elements are covered with material having high temperature co-efficient like Stainless Steel. Natural gas is made to pass from the surface of these elements & gets heated. Necessary instruments are provided to protect the equipments from overheating & over pressure.

EH SERIES FIRED INDIRECT WATER BATH HEATER

- Used when capacity is higher than 150 KW
- Heating Media-Natural Gas in the line.
- Type of Burner- 1. Natural Draft 2. Forced Draft
- Type of Control - 1. Pneumatic 2. Electronic
- Suitable for hazardous area with pneumatic control /electronic control with ex-proof instruments

PRINCIPLE OF OPERATION:

This is indirect type of heating. Natural Gas is taken from main line & is fed to burner at suitable pressure. The gas is fired & fired gas heat water bath. Coil is immersed in the water bath through which gas is passing. Gas temperature is controlled by controlling the gas fed to burner. Necessary instruments provided to ensure required water level & water temperature inside the water bath, along with burner sequence controls and flame failure safety interlocks.

EH SERIES SHELL & TUBE STEAM HEAT EXCHANGER:

- Low operating cost.
- Heating media-steam.
- Economical option where steam is easily available like fertilizer plant.

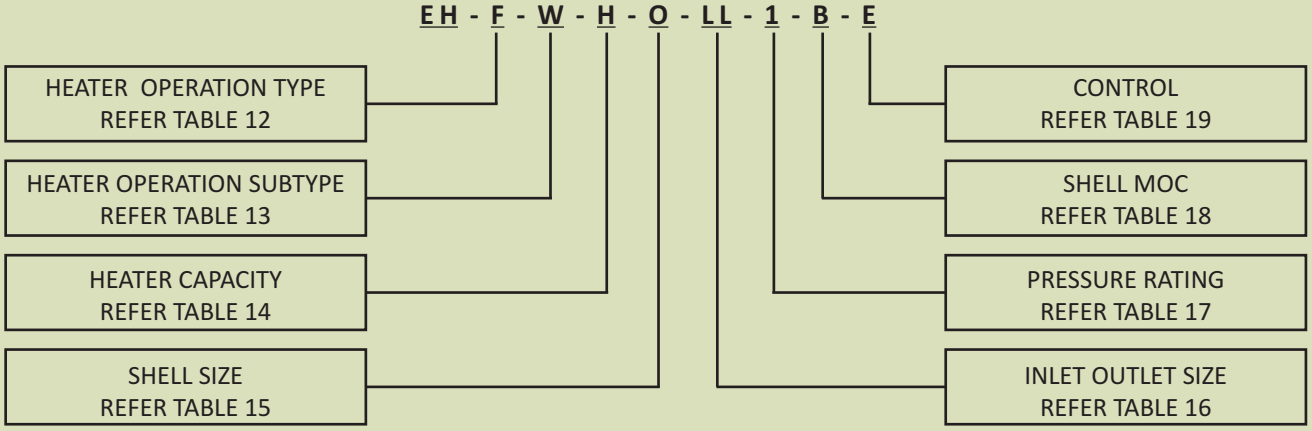
PRINCIPLE OF OPERATION:

This is direct type of heating. Steam is passed in shell side & Natural Gas is passed through tubes. Necessary Baffles are provided to increase heat transfer.

HEATER TYPE & CAPACITY DEPENDS ON FOLLOWING PARAMETERS:

- Mass flow of the gas to be heated
- Required temperature rise
- Gas composition
- Availability of heating media.
- Hazardous area

EH SERIES HEATER MODEL CONFIGURATION



TABLES

TABLE 12	
S	STEAM PERATED
E	ELECTRICAL OPERATED
F	GAS FIRED
C	CATALYTIC HEATER
O	OTHER
X	NA

TABLE 13	
W	WATER BATH
E	OIL BATH
T	TEMA (SHELL & TUBE TYPE)
O	OTHER
X	NA

TABLE 14	
A	5-20
B	21-40
C	41-60
D	61-80
E	81-100
F	101-150
G	151-200
H	201-300
I	301-500
J	501-700
K	701-1000
L	1001-1500
O	OTHERS
X	NA

TABLE 15	
A	4”
B	6”
C	8”
D	10”
E	12”
F	14”
G	16”
H	18”
I	20”
J	24”
O	OTHER

TABLE 16	
A	1/4 "
B	3/8"
C	1/2"
D	3/4"
E	1”
F	1 1/2"
G	2”
H	2 1/2"
I	3”
J	4”
K	6”
L	8”
M	10”
N	12”
P	14”
Q	16”
R	18”
S	20”
T	24”
O	OTHERS

TABLE 17	
1	150
2	300
3	600
O	Other

TABLE 18	
A	A 106 Gr. B
B	A 516 Gr, 70
C	A 516 Gr, 60
D	A 515 Gr, 70
E	A 515 Gr, 60
O	OTHER

TABLE 19	
F	ON/OFF
P	PNEUMATIC
E	ELECTRICAL/ELECTRONICS
T	THYRISTOR
O	OTHER
X	NA

Represented by

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