

BLACK POWDER SOLUTIONS®

Upstream ~ Midstream ~ Downstream



Corrosion & Erosion Management



F.A.Q.

- 1) What is Black Powder?
Black Powder is primarily iron oxides, iron sulfides and some silica which results from internal erosion and corrosion of carbon steel pipelines and operating equipment.
- 2) Why is Black Powder damaging to my system?
Black Powder causes many costly problems for the pipeline and processing industries. Problems such as: degradation of product supplied to the consumer, reduced production values from premature pumps, turbine/compressor component wear and tear, premature wear of transmission lines, plugging of meters and traditional filters, seizing of valves and reducing product quality.
- 3) Why is magnetic separation valuable?
Quality magnetic separators are capable of removing contamination to sub-micron levels without flow restriction and are reusable for 10+ years. Black Powder contamination is very damaging to oil, gas, chemical, and water transmission lines.
- 4) How do you collect non-ferrous contamination on a magnetic separator?
Through static adhesion caused by static charge build up with the high flow fluids and or gases. Also through entrainment which occurs when a particle of ferrous contamination gets embedded in the non-ferrous particle capturing the entire mass.
- 5) What are the advantages of BPS magnetic separators?
Our Black Powder separation technology will remove the Black Powder down to sub-micron levels improving gas or liquid hydrocarbon quality and reduce premature wear of the related components of the transmission line.
- 6) How do you clean a magnetic separator?
The BPS magnetic separator rod design has no magnetic field at the end thereby allowing you to slide the contamination down to the end and it falls off. Some of BPS technology is self-cleaning and thus this is not needed as the system cleans itself without human interaction.
- 7) What do you do with the collected contamination?
It is recommended that the trapped contamination be analyzed for wear debris identification. The magnetic separator becomes a predictive maintenance tool.
- 8) Can I purchase your product directly?
We have agents in most locations around the world and if we do not cover your area, yes we will supply direct.
- 9) Custom designs?
Yes we welcome custom designs.



Magnetic Filter Cores

A novel approach to proactive maintenance

By Christian Bauer, Pall Corporation and Roger Simonson, One Eye Industries

The generation of ferrous contaminants in most hydraulic and lube systems due to both normal and abnormal wear is a fact of life. Knowing the amount and type of wear particles in the fluid system is paramount to avoiding unscheduled outages. Standard filter elements will capture any type of particulate contamination, ferrous and non-ferrous, within their media matrix according to their micron rating. Identification of the contamination captured typically requires off-site laboratory analyses.

Built-in magnetic filter cores can capture ferrous contaminants in fluid systems, down to $< 1 \mu\text{m}$, before they reach the actual filter, thus providing an excellent diagnostic tool for contamination monitoring and proactive maintenance. Due to static adhesion, the cores can also retain some of the non-ferrous contaminants. By simply removing the magnetic core and examining the contamination retained on it under a microscope, reliability and maintenance engineers across many industries now have a valuable tool for identifying potential wear-related issues before they become a real problem.



Mission Statement

Black Powder Solutions is committed to continually improving its technology and business model to meet the needs of the oil and gas sector. It strives to be the leader in black powder management through strategic partnerships with quality companies around the world and in their own community to bring the industry cutting edge technologies.

Black Powder Solutions is dedicated to protecting the environment by reducing pipeline spills through the reduction of wear materials (Black Powder) that erode the pipeline therefore maintaining its structural integrity. With a dedicated effort, increase the application of our separation solutions to improve industry efficiency and increase pipeline operational life.

About Us

Black Powder Solutions LLC is an emerging international company dedicated to the design and manufacture of Black Powder Separators for the purpose of removing Black Powder (BP) from natural gas and hydrocarbon fluid transmission pipelines while in operation. Employing patented long life magnetic separation technology that removes BP to sub-micron levels and capable of handling all flow volumes and pressure requirements the industry offers.

Our systems are self-cleaning with minimal maintenance, negligible consumables and do not require increased horse power to maintain flow values. Our BP systems operate as redundant systems in isolated locations and managed with electronic communication capabilities. Recommended for employment before compressor, metering, pumping stations, chemical & gas plants and refineries. By managing BP with a pro-active mandate our technology offers will result in increased operational time, reduced maintenance costs and clean product for your customers.







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Black Powder Solutions Assures:

- ~ Consistent Quality (ISO 9000)
- ~ Leading Technical Innovation
- ~ Premier Customer Service

BPS manufactures environmentally friendly separation systems with proprietary magnetic technology. Reusable long life separators that allow extended maintenance schedules, increased fluid and equipment component life.

From Consumer to Industrial

BPS provides solutions to retail consumers and to industrial users in the Oil & Gas industry to effectively remove ferrous and nonferrous contamination from oil, gas, water and chemicals.

Why Remove Black Powder Contamination

Removal of black powder contamination (iron, silica, etc) will dramatically reduce the damaging wear cycle, extending the life of fluids and equipment. These contaminants, if not removed, are carried into high pressure contact areas causing damage to softer metals and seals and reducing product quality.

The use of extremely strong magnetic fields is required to trap these particles especially in “high flow” and or high viscous fluids.

BPS's patented magnetic technology traps ferrous and nonferrous contaminants to sub-micron in size. In many cases this is the first time credible separation has been achieved to this level.



8000 Series Black Powder Separator Systems

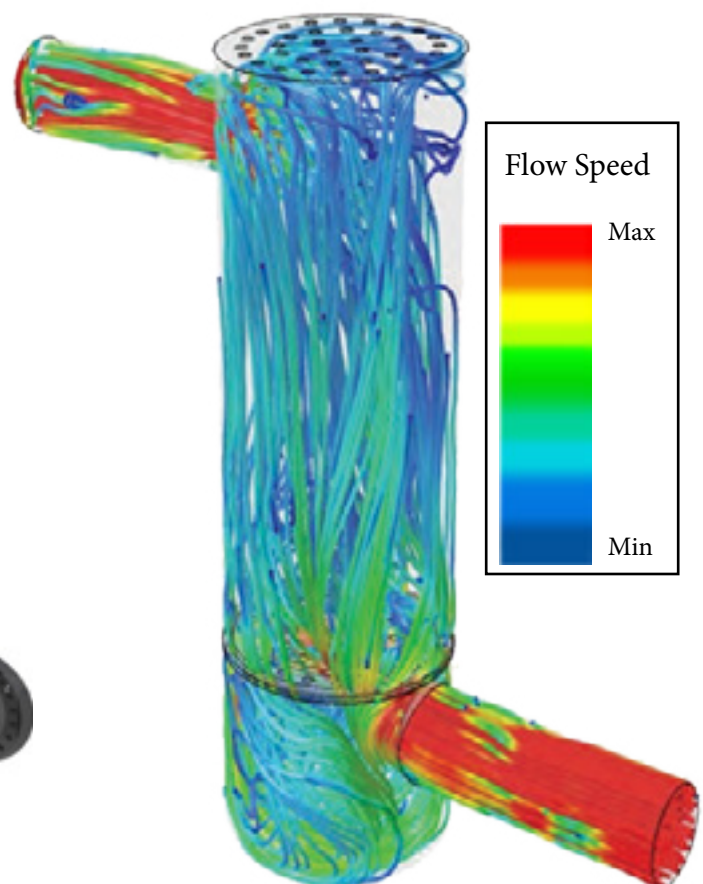
BPS has developed Dry Natural Gas and Crude Oil specific filtration technologies using radial static magnetic fields capable of removing ferrous and non-ferrous contamination to sub-micron levels with minimal flow restriction in most applications.

Designed using patented Magnetic Separators, a large magnetic surface area is created with the ability to trap and hold contamination larger than 100 microns to sub-micron level particles under high flow and viscosity conditions, to ISO levels exceeding industry standards.

Separator Module



CFD of Flow Streamlines Through Separator Module



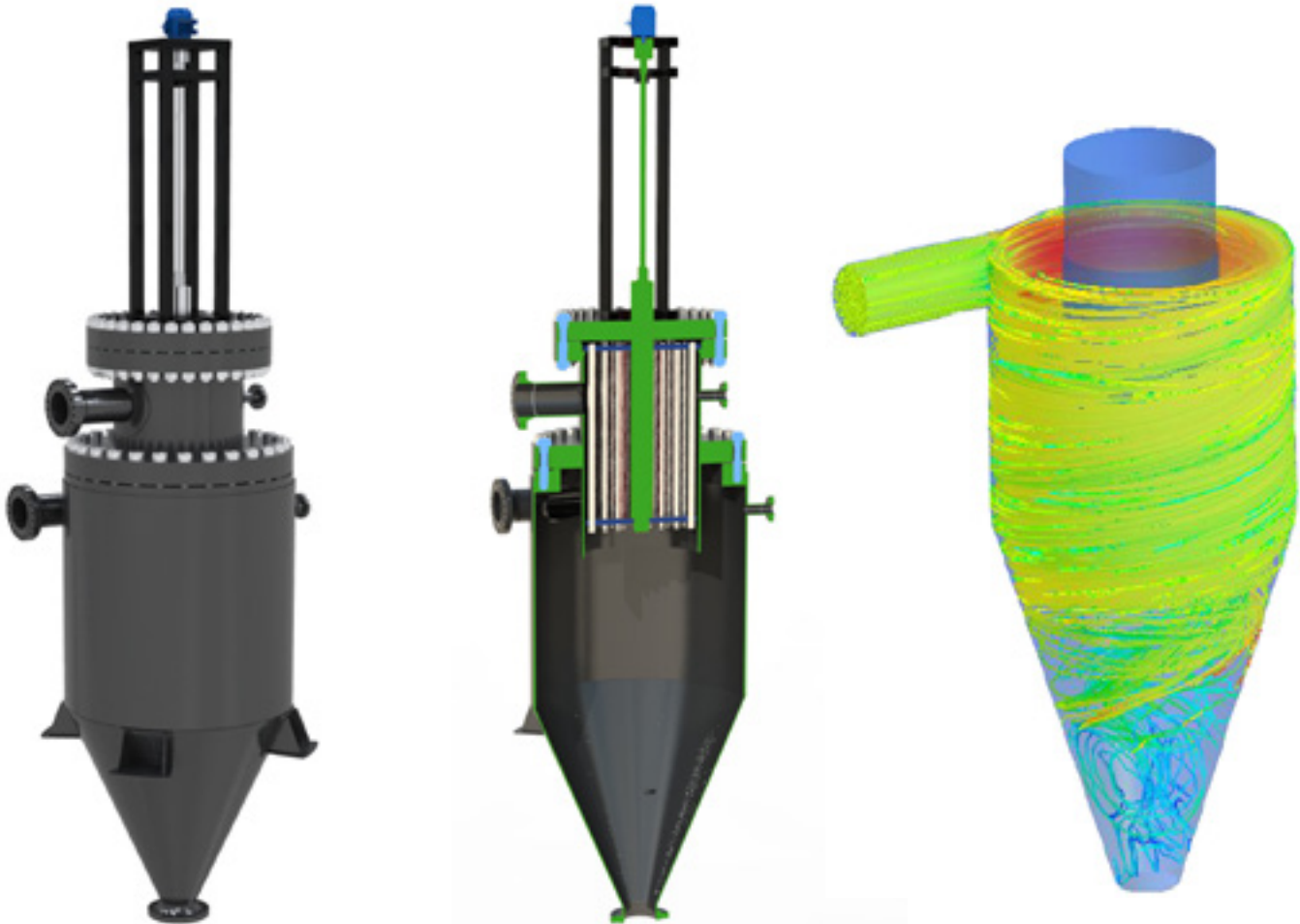


8000 Series Cyclone Separator for Gas Applications

BPS has designed a Black Powder Cyclone Separator specifically for Natural Gas with entrained liquids.

The Cyclone Separator is designed with dual separation featuring cyclone technology as the primary design and BPS magnetic filtration as the secondary system. It is designed to be installed in conjunction with the BPS Modules in order to remove contamination effectively.

Primarily, the cyclone removes black powder 8 microns and higher as well as the entrained liquids from the gas. The Black Powder Separator continues to remove contamination down to sub-micron levels with no flow restriction; protecting pipeline walls, valves, meters, compressors and turbine components while providing the most efficient filtration on the market.



Magnetic Separator Specifications

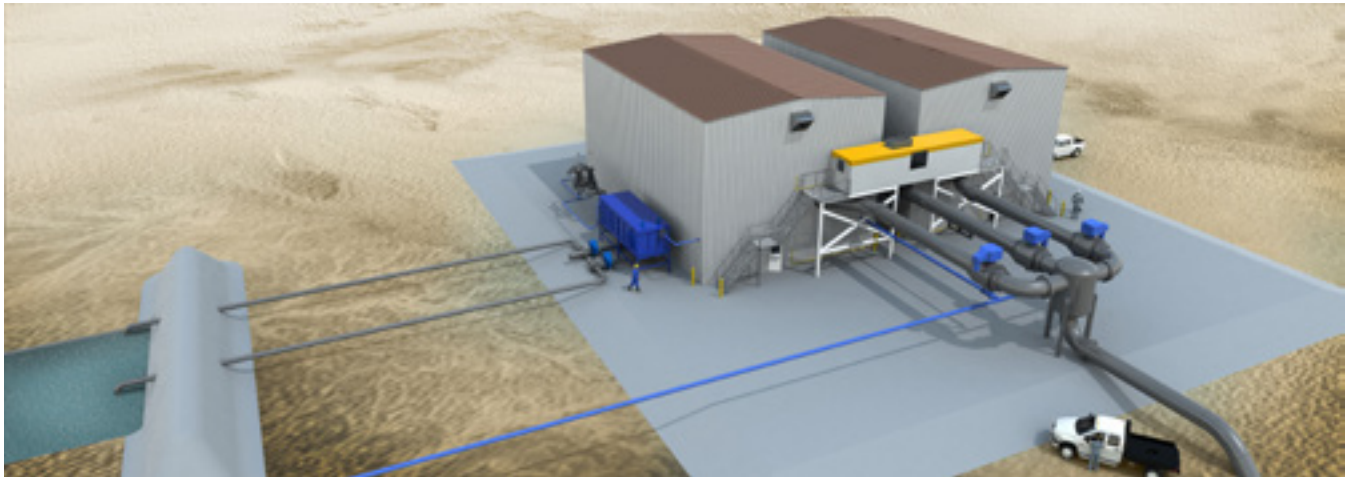
Material: 316 Stainless Steel
Holding Strength: 650 lbs/lft
Vibration Resistant: Yes
Clean & Inspect: Automatic Self-Cleaning

Filtration Capability (Ferrous): Submicron to 200+ Micron
Maximum Pressure: All Standard Operating Pressures
Maximum Temperature: 300°F Continuous
Inlet/Outlet Port Sizes: Custom Sizing to Order



Natural Gas Application

The BPS system is designed to knock out liquid from the gas at each separator module before and during exposure to the Magnetic Separators. All BP and moisture content is flushed through a waste handling system and discharged directly to a settling tank or other waste water facility.



BPS In-line with Pipe Lines



BPS System Lower Floor



BPS System Cross Section





Crude Oil Application

This fully automated system for crude oil separation is enclosed in a structure. These separators remove contamination down to sub-micron levels protecting pumps, turbines, pipelines and other components.



All contaminants are flushed through a waste handling system and discharged directly to a settling tank or other waste water facility.

Pipe Lines to BPS



BPS System Lower Floor



Exterior Section of Crude Plant

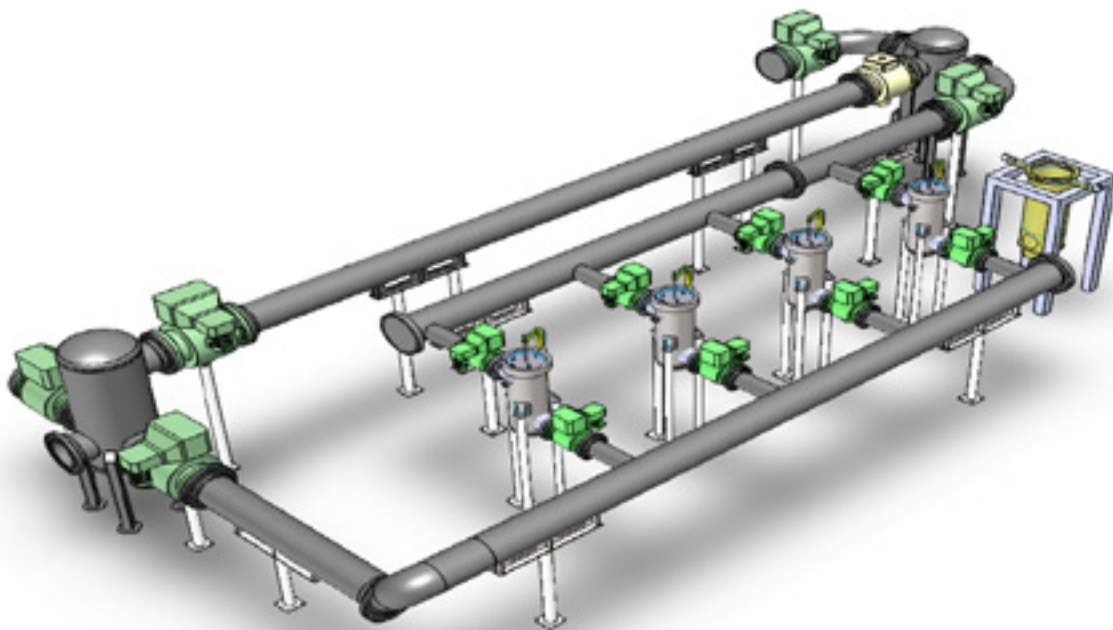




Refined Products Application

The installation of the Black Powder Separator System in pipelines carrying refined products will protect pumps and meters from the contamination inherent in these products. By removing Black Powder before refineries or pumps (to sub-micron levels) the life expectancy of the line, its components and the product will be increased.

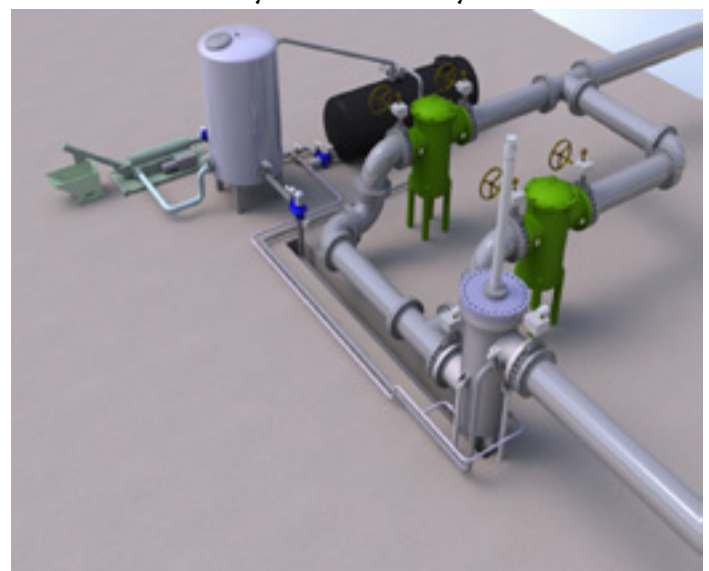
Complete System Installed



Manual Small System



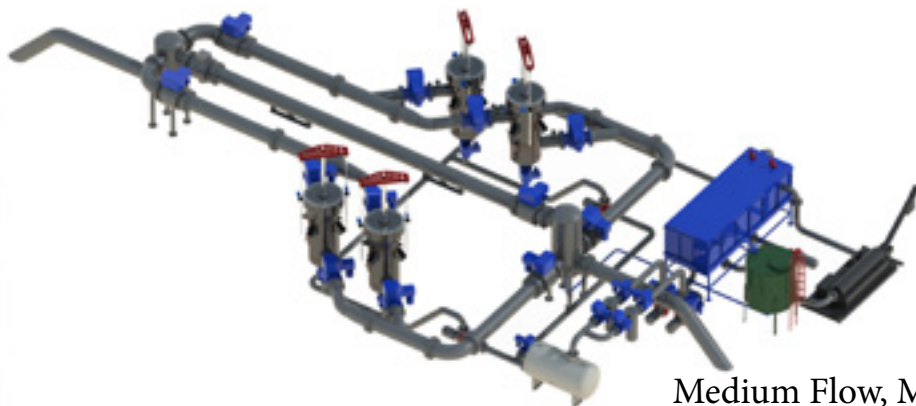
Fully Automated System



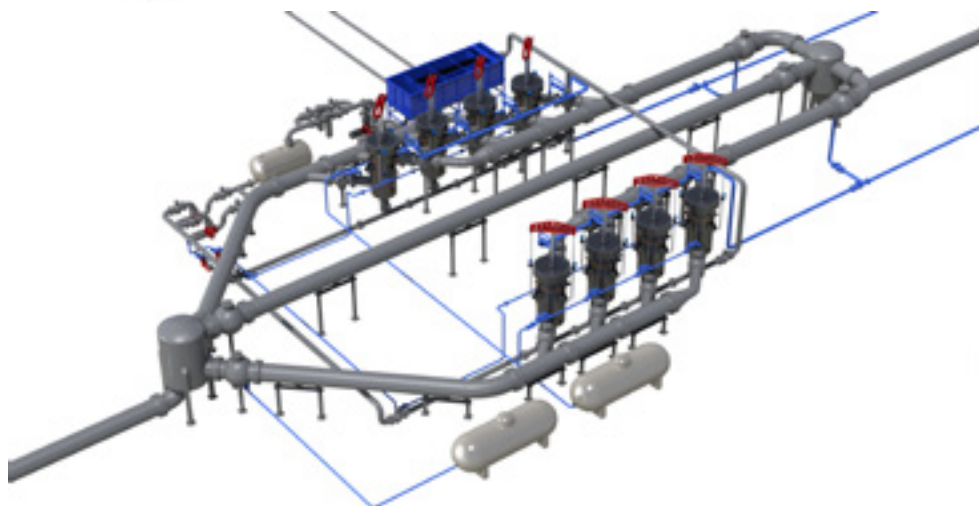
BLACK POWDER SOLUTIONS®

The number of modules necessary will vary with the amount of flow the system requires. The greater the flow the greater the number of modules recommended to remove the Black Powder contamination present in the gas or hydrocarbon transmission lines.

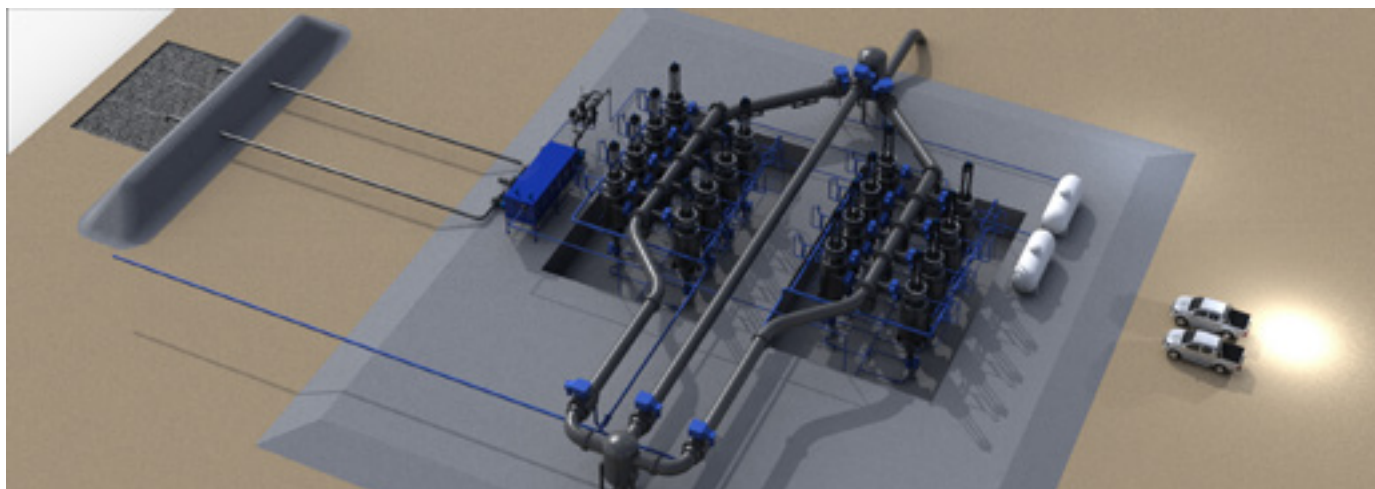
Low Flow, Fewer Modules



Medium Flow, Moderate Modules



High Flow, Numerous Modules



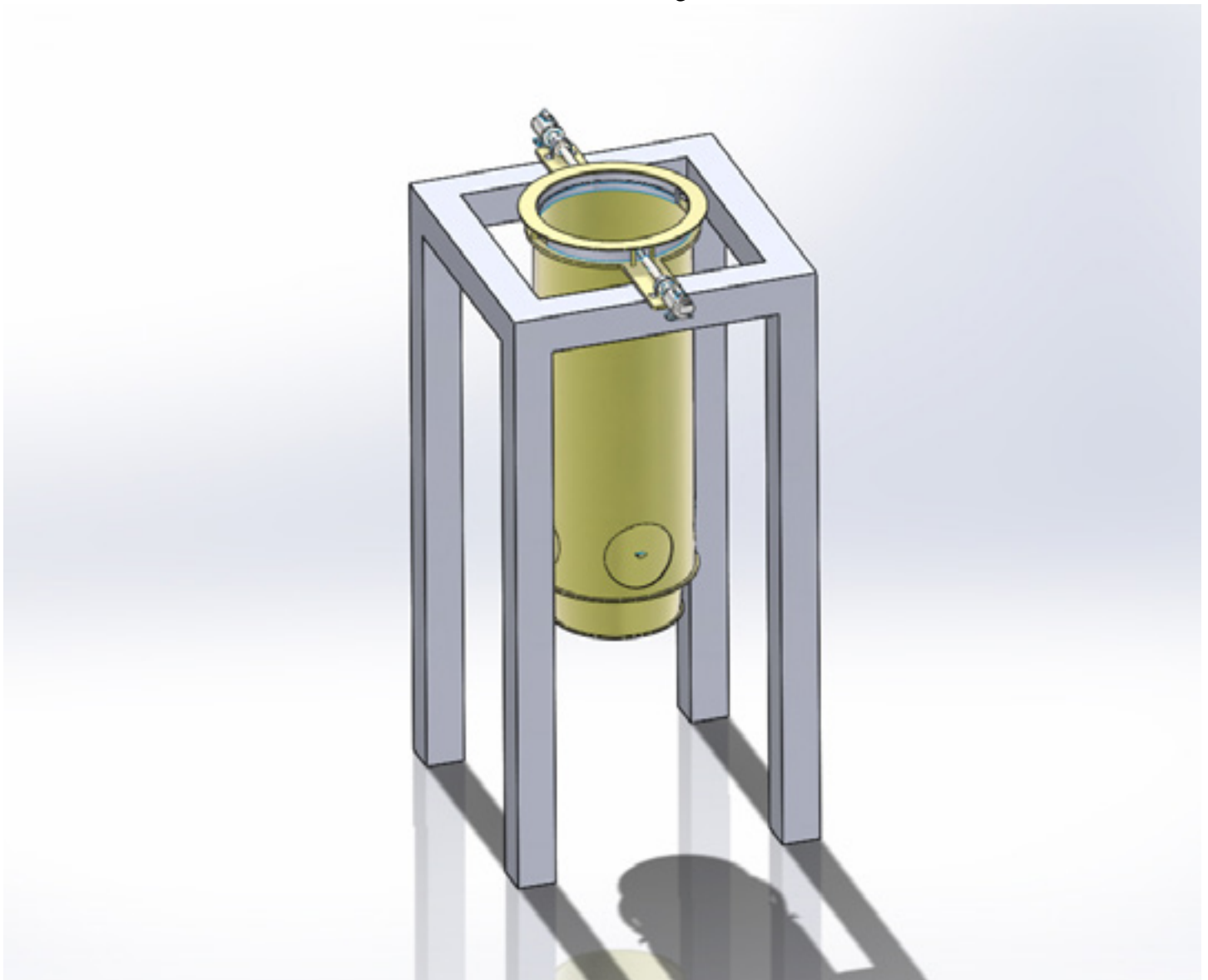


The degree of automated self-cleaning for these separator systems is derived by the size of the units.

Manually Cleaned Separator Station

The manually cleaned system is used for small units and functions as the user removes the magnetic filters from the vessel and installs them in the cleaning station. The magnetic filters are lifted through the scrapers allowing the contaminants to be collected in the containment bag. The contamination can then be discarded or removed for analysis to determine wear trends and the extent of the corrosion and erosion in the line.

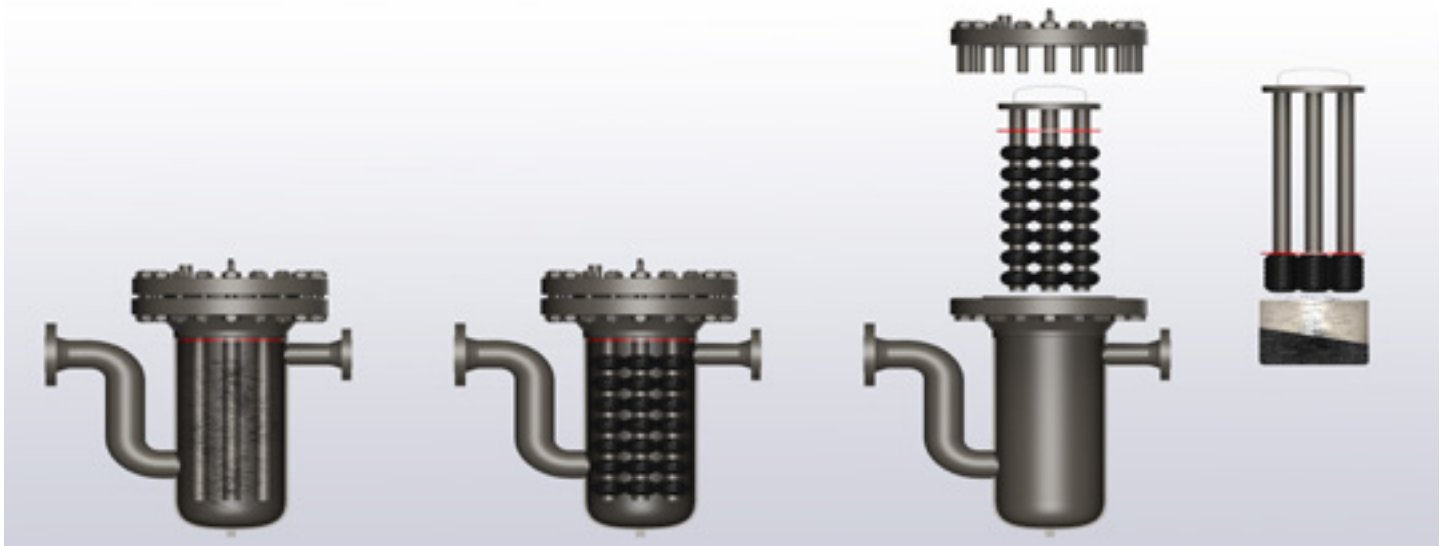
Manual Cleaning Station



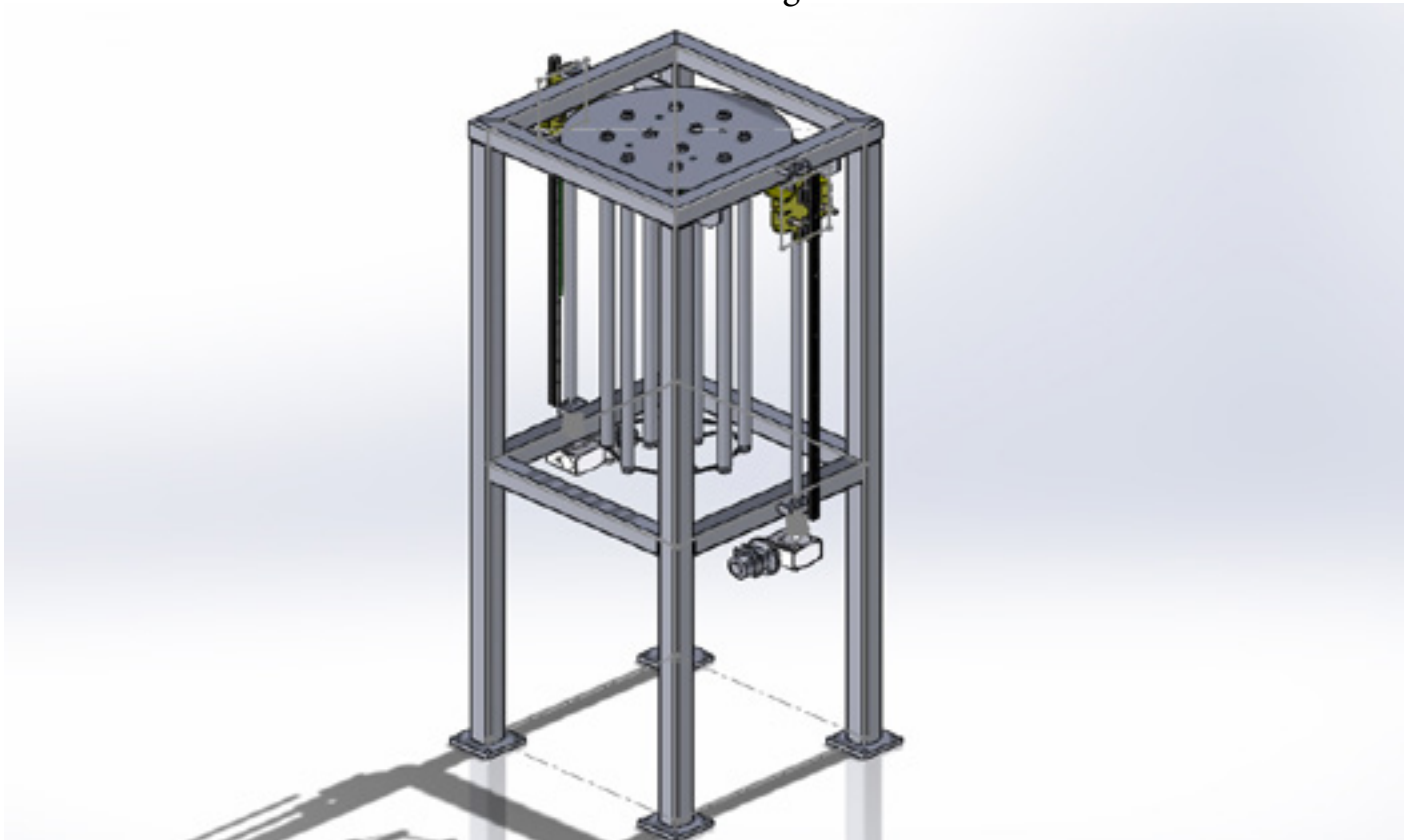


Mechanically Cleaned Separator Station

The mechanically cleaned system is for medium sized units and is semi-automatic as the user removes the magnetic filters from the vessel and installs them in the cleaning station. Once installed the unit automatically runs the magnetic separator through the cleaning cycle allowing the contamination to be collected in the containment bag. This contamination can then be discarded or removed for analysis to determine wear trends and the extent of the corrosion and erosion in the line.



Mechanical Cleaning Station





Automated Self-Cleaning Separator Systems

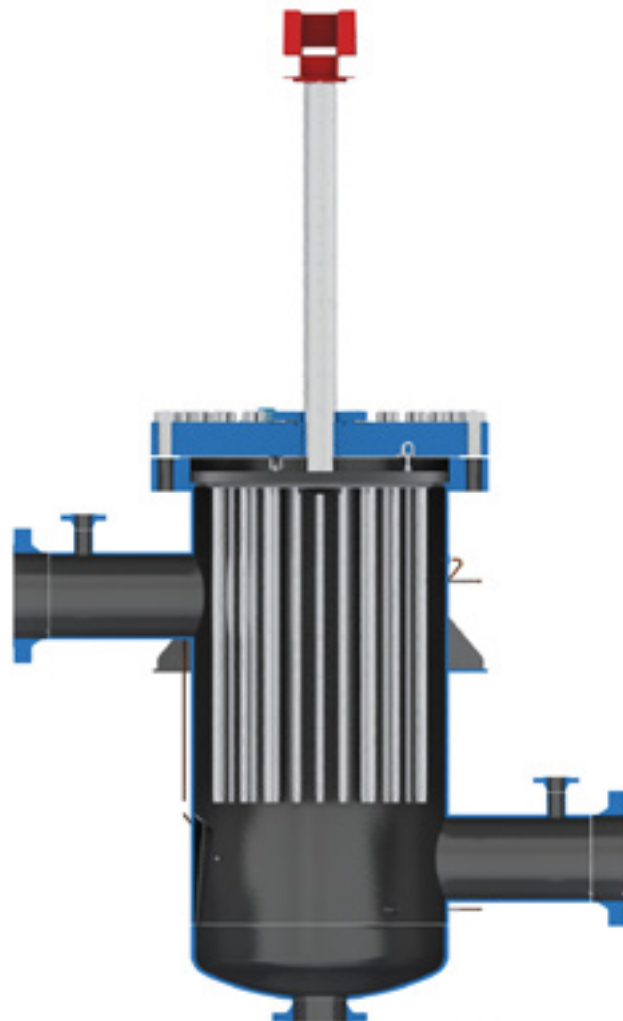
The automated self-cleaning system is used on large units. The Black Powder removal effectiveness can be measured in real time with particle counters and pressure transducers. Counters detect an increase in particles passing through the system and respond by increasing auto-cleaning frequency.

Every separator includes an enclosed actuated cleaning system to remove BP and liquids from the magnetic separators. With a duplex design of separator modules, scheduled and unscheduled system maintenance can be performed with no interruption to overall gas or oil delivery increasing uptime.

When a scheduled cleaning period occurs the proper valves will be either opened or closed diverting all flow to the opposite vessel of the duplex. The actuator will be engaged allowing the scraper to run through the cleaning cycle. This will remove the contamination from the magnetic separators and flushed out the drain valve to the collection station.

Once a cycle is complete, the vessel will remain in stand-by mode until the other vessel of the duplex is in need of cleaning.

BPS systems are fully scalable and modular to accommodate ALL line sizes, pressures and volumes.

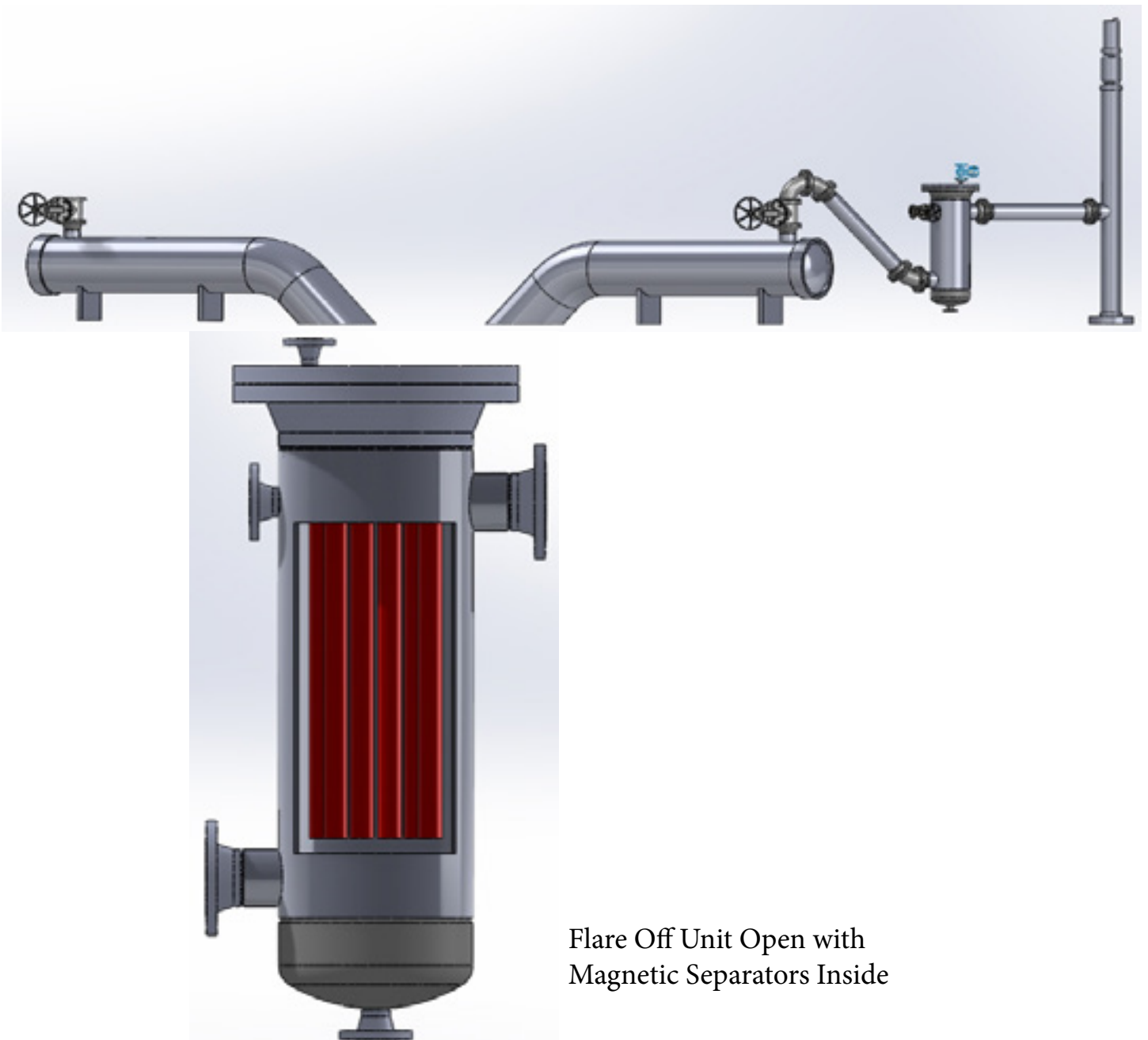


Cross Section of BPS
Separator System



Flare Off Unit

The BPS Flare Off Unit is designed for natural gas pipelines using PIGs for cleaning. This unit will be installed between the pipeline vent and the flare to remove the ferrous particles created by the scraping of the PIGs. This contamination is picked up by the inert gas flowing through the system which is traditionally released into the atmosphere, as are the ferrous particles, creating emissions. By removing this contamination down to sub-micron levels before flaring, the quality of the burn is increased and the emissions are reduced.



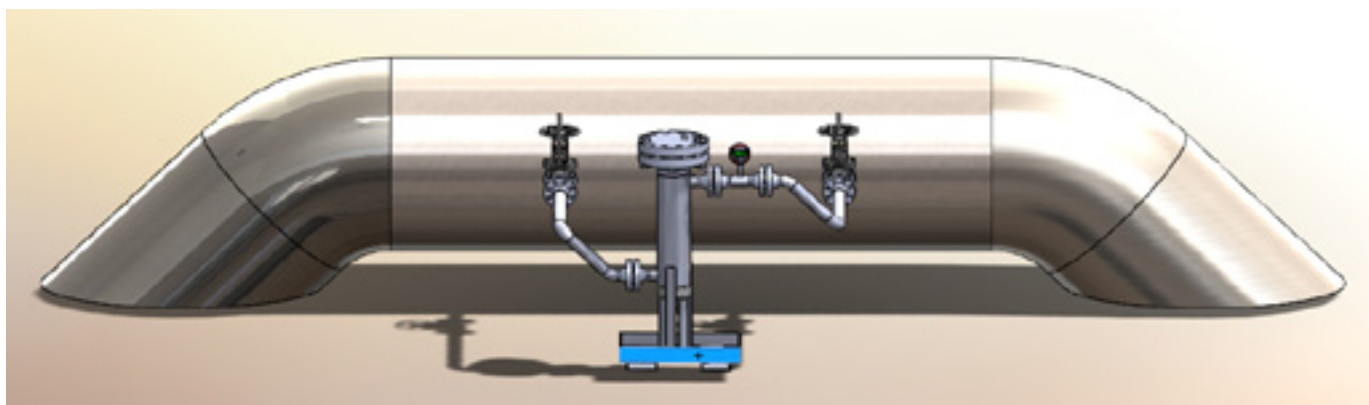
Flare Off Unit Open with
Magnetic Separators Inside



Pipeline Sample Station (PSS)

Introducing our Pipeline Sampling Station for Black Powder (BP) contamination on liquid and gas hydrocarbon transmission lines. For natural gas specifically we have our coalescing sample station that removes both liquid and particulate. The PSS accurately identifies the volume of BP contamination (down to sub-micron in size) throughout the year and an analysis will identify the composition. This information will confirm the filtration/separation requirements and the most effective location to install a Black Powder Separator.

The system identifies how flow values correlate to increased or reduced BP levels. The PSS can be used as a policing tool to determine contamination levels (95+% efficiency) at transfer points and ownership responsibility for product quality. PSS system offers 1" or 2" inlet/outlet for all pipe line sizes. Access by a blind flange or quick release closure. Equipped with a flow meter to calculate total flow contamination levels. PSS employs a BPS Magnetic Separator that is easily removed and the BP collected in a containment bag for analysis.



Box 1	Box 2	Box 3	Box 4	Box 5	Box 6	Box 7
5PSS	304	Q	600	20	N	???

Box 1	Model
5PSS	Pipeline Sampling Station
5PSLS	Pipeline Sampling Station Liquid

Box 3	Access Flange
B	Blind Flange
Q	Quick Access

Box 6	Product
C	Chemical
H	Hydro Carbon
N	Natural Gas

Box 2	SS Grade
304	316L

Box 4	Flange ANSI
150	900
300	1500
600	

Box 7	Preferred Flow Meter
	???

Box 5	Pipeline Flow
###	MMSCF/D



5000 Series Black Powder Separators

- Environmentally friendly design removing moisture and black powder contamination from fuel in rotating equipment to sub- micron levels at an estimated 95+% efficiency.
- The magnetic separators have a 10+ years operational life, the cleanable stainless steel cloth separator elements have a 3 to 5 year operational life.
- The BPS magnetic separators have the most powerful non-electric magnetic fields in the industry with a holding strength of over 650lbs (325Kg) per linear foot (300mm)
- The magnetic field strength creates the ability to extract and trap sub-micron contaminants. Change out and cleaning intervals are policed by a differential pressure gauge.



Crude Oil Separator 5B###

Applications for low and high pressure pumps are available and manufactured for distribution around the world, if required ASME U-stamp, PED and CRN certified vessels. Please send your operation requirements and we will quote to your specifications.



Fuel Gas Separator 5BFG###

Features a double separator design incorporating a magnetic separator as the primary design and a pleated Stainless Steel cloth element as the final separator



Coalescing Separator 5BCF###

Features a triple Coalescing separator as the primary design, magnetic separator as a secondary and a stainless steel cloth element as the final separator

HOW TO ORDER...

Box 1	Box 2	Box 3	Box 4	Box 5	Box 6	Box 7
5BFG	304	10	NPT		800	25

Box 1	Model
5BFG	Fuel Gas Separator
5BCF	Coalescing Separator
5B	Crude Oil Separator
Box 2	Stainless Steel Grade
304	316
Custom	

Box 3	Pipe Size/Inches		
1	8	18	
2	10	20	
3	12	22	
4	14	24	
6	16	Etc.	
Box 4	In/Outlet Type		
NPT	Thread		
WLD	Weldlet		
FLN	Flange		

Box 5	Flange Class
Blank	NPT
Blank	WLD
1	150
3	300
6	600
9	900
12	1200

Box 6	Flow Rate
G###	GPM
C###	CFM
Box 7	Micron Rating
10	25
40	



5BPS### Natural Gas Dispenser Filter

BPS is proud to introduce our Natural Gas Dispenser Filter for removing Black Powder contamination before fueling engines for mobile and stationary equipment, furnaces and power plant applications.

The Natural Gas Dispenser Filter removes Black Powder to submicron levels protecting valves, meters and compressor seals. Cleaner gas results in better combustion and less emissions. The unit is easily cleaned and returned to service and requires a yearly PM with minimal consumable components (flange gasket).

Please note: BPS magnetic separators are designed with oversized housings to allow maximum employment of the magnetic separators to ensure the most efficient filtration. Industry standard is a 2.5 to 1 ratio and BPS's a 4:1 ratio of pipe body.

A chart specifying body sizing is shown below.

HOW TO ORDER:

Box 1	Box 2	Box 3	Box 4	Box 5	Box 6	Box 7
5BPS	316L	6	600	40	C	240

Box 1	Separator Model
5BPS	Black Powder Separator

Box 2	Stainless Grade
304	304L
316	316L
309	310

Box 3	Pipe Size/ Inches
3	14
4	16
6	18
8	20
10	22
12	Etc.

Box 4	Flange
150	900
300	1500
600	

Box 5	Pipe Schedule
40	160
80	XXS

Box 6	Product
C	Chemical
H	Hydro Carbons
N	Natural Gas
W	Water

Box 7	Flow Rate
## MMSCFD	Natural Gas
## BBL/D	Crude Oil



BPS Introduces the 5000 Series Dual Stage Magnetic Separator Cone Strainer

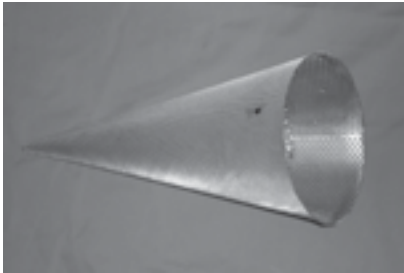
Designed for start-ups of new and existing pipelines. Traditionally after start-up the cone strainer is removed. The compressor and or pumps (meter) are left without protection from the ferrous metal created by the erosion and corrosion of the pipeline. With BPS's Magnetic Separator Cone Strainer, the screen can be removed and the Magnetic Separator reinstalled to offer continued protection.

Refineries



Phonographic Finish

Oil & Gas Transmission Lines



Removable Cone Mesh

Chemical Plants



Raised Inner Lip

Mesh screen is removed and magnetic separation continues with minimal flow restriction
Traps Black Powder - ferrous and non-ferrous contamination (due to static adhesion)
Protects compressors, pumps, turbines and flow meters
Designed with BPS patented magnetic technology
Can be ordered with or without mesh screen cone
2"D x 12"L magnetic separator has holding capability of 600lbs

HOW TO ORDER...

5SSC - 06 - 300 - 40 - I - Y - 80

Pipe Size If pipe is less than 10" precede # with "0".	Flange	Mesh NM-No/Mesh Screen	Mesh Placement	Open Area Y- 200%	Pipe Schedule
06 08	150	20	← Flow Wire mesh on outside supported NO#- Standard		40
10 12	300	40	→ Flow Wire mesh on inside supported I- Cloth		80
14 16	600	60	← Flow Wire mesh outside supported inside R-Reinforced		160
18 20	900	80			XXS
	1500	100			
*Quote per order				Note: Standard perforation is .125 Other perforations are available Custom sizes and designs available	



BPS Introduces our Magnetic Separator Y-Strainer Series

BPS understands the restriction of space on equipment and saw the need to improve the separating capabilities of the traditional Y-Strainer by installing our patented magnetic separator. The Y-Strainer is now capable of trapping ferrous and non-ferrous contamination to the sub-micron range. This is a major improvement to many systems that rely on a Y-Strainer for protection.

Stainless Steel

Bronze

Cryogenic

High-Pressure



BPS is pleased to offer our custom designed Magnetic Separator Y-Strainer for cryogenic applications. Our flanged access allows access for cleaning at -320 degrees F. The magnetic separator removes both ferrous and non-ferrous contamination to submicron levels, extending the life of linings and pump components.

This high pressure Y-Strainer is designed for hydraulic applications with system pressures up to 6000 PSI. It's increased filtration capability removes both ferrous and non-ferrous contamination, including that due to pump and motor wear, down to sub-micron levels without flow restriction, reducing the need for horsepower to move the hydraulic fluid through the line. Traditional filtration requires tremendous energy due to its increased flow restriction. The magnetic filter has a life expectancy of 10+ years and requires minimal consumables.

WORKING PRESSURE (NON-SHOCK): 300 PSI @ 350F Steam Rated 400 PSI @ 150F WOG						
In.	Size mm	DIMENSIONS		NET WEIGHT		
		A	B	Lbs	Kg	
1	25mm	4 3/4 (12cm)	4 (10cm)	3	1.4	
1 1/2	40mm	5 3/4 (14.6cm)	5 (12.7cm)	5	2.3	
2	50mm	6 3/4 (17.1cm)	6 (15.2cm)	7	3.2	
2 1/2	64mm	8 (20cm)	6 (15.2cm)	12	5.5	
3	75mm	9 1/2 (23.5cm)	7 (17.5cm)	16	7.3	
4	100mm	12 (30.5cm)	10 (25.4cm)	22	10	

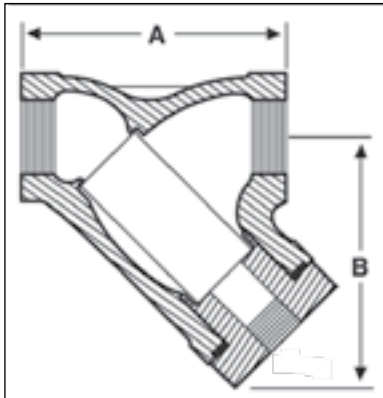
Box 1:	Box 2:	Box 3:	Box 4:	Box 5:	Box 6:
5Y	B	112	T		A

Box 1	Box 3	Box 4	Box 5	Box 6
5Y- Magnetic Y-Strainer	Pipe Size	Port Type	Flange ANSI Class	Mesh
	1	T - Threaded	Bronze leave Blank	X - No Mesh Screen
	1 1/2	F - Flange	1 - 150	A - 20
	2		3 - 300	C - 40
	2 1/2		6 - 600	D - 60
	3		9 - 900	E - 100
	4		15 - 1500	
NOTE:				
BC- Y-strainer available in 2", 2 1/2", 3"				



BPS Stainless Steel Y-Strainer Series

600# / 1500# ANSI - 316SS - NPT Thread



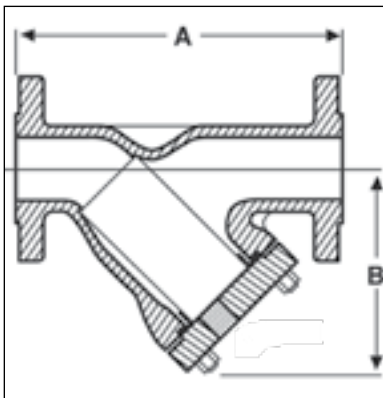
5YS2T6

Temp F	600#	1500#
	Working Pressure	Working Pressure
-20 to 100	1440	3600
200	1240	3095
300	1120	2795
400	1030	2560
500	965	2390

- Body has machine seat to hold screen securely.
- Cap has a machined screen holder to align screen during installation and to retain sediment when cap is removed.
- Body is machined to hold gasket in a blow-out proof design

Size	600#			Size	1500#		
	A	B	WT		A	B	WT
1"	4 9/16	3 1/2	5	1"	5 1/2	4 3/4	8
2"	7 1/2	6 1/2	16	1 1/2"	7 1/8	6	16
				2"	8 5/16	6 5/8	22

150#, 300#, 600# ANSI 316SS - Raised Face Flange

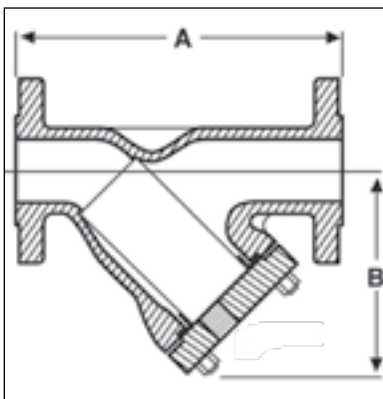


5YS112F3

Temp F	150#	300#	600#
	Working Pressure	Working Pressure	Working Pressure
-20 to 100	275	720	1440
200	240	620	1240
300	215	560	1120
400	195	515	1030
500	170	480	955

Size	150#			Size	300#			Size	600#		
	A	B	WT		A	B	WT		A	B	WT
1"	6 3/8	5	11	2"	8 5/8	6 1/4	28	1"	8 3/8	5	16
1 1/2"	7 3/4	5 1/4	17	3"	12	8 1/4	56	1 1/2"	9 7/8	6	24
2"	7 7/8	6	23	4"	14 1/2	11	98	2"	11 1/8	6 3/4	47
3"	10	7 1/2	42					3"	13 3/8	9 1/2	89
4"	12 1/8	11	73								

1500# ANSI 316 SS - Raised Face / RJT Flange



5YS2F15

- Body has machine seat to hold screen securely.
- Cover has a machined screen holder to align screen during installation and to retain sediment when cap is removed.
- Body is machined to hold gasket in a blow-out proof design.
- Flanges are back faced or spot faced.

Temp F	Working Pressure	Size	A	B	WT	Description	Material
-20 to 100	3600	2"	13 3/4	8 5/8	96	Body	ASTM A- 351 GR CF8M
200	3095					Cap	ASTM A- 351 GR CF8M
300	2795					Gasket	Spiral Wound SS
400	2560					Screen	304 SS Specify Mesh
500	2390						



5000 Series Magnetic Separator Scrubber

BPS Scrubbers’ are designed for inline filtration on rotating equipment and are installed prior to existing filtration pumps or on return lines.

For fuel, lube oil, hydraulics, coolants and water systems, giving no flow restriction.

Fluids have full exposure to the magnetic separators and the contaminants are easily removed and collected for analysis to aid with predictive maintenance planning. All stainless construction, custom designs are welcome.

- 5000 Series Provides:
- Total Separation
 - 304/316 Stainless
 - Mounts horizontal or vertical
 - No flow restriction
 - Plumbed with W. O. G. valves (optional)
 - Monel Construction (optional)
 - 300F or 600F Operating Temperature



5SC	Dimension	lbs/Kg
12"	6"Wx4"Dx16"H	16
304 mm	101x101x406 mm	7.2
24"	6"Wx4"Dx28"H	28
608 mm	101x101x711 mm	12.7
36"	6"Wx4"Dx40"H	38
914 mm	101x101x1016 mm	19.3

5SC2	Dimension	lbs/Kg
24"	8"Wx6"Dx30"H	57
608 mm	150x150x762 mm	25.9



5SCD ##SCLFLN ##

This unit is designed for larger piping applications, designed with offset in/outlet, 5SC- (D) Double magnetic separator with (S) Square housing, the magnetic separator fastener is (CL) cam-lock and the In/Outlet is (FLN) flange.



5SCP ##SCLFLN ##

This unit is designed for ease of installation 5SC- (P) Parallel In/Outlet design with (S) Square housing, the magnetic separator fastener is (CL) cam-lock and the In/Outlet is (FLN) flange.



5SCPT ##SCLFLN##

This unit is designed for ease of installation, 5SC- (P) Parallel In/Outlet design with (S) Square housing, the magnetic separator fastener is (CL) cam-lock and the In/Outlet is (FLN) flange. The In/Outlet is located at the top of the housing.



Product Testing Results

CTDUT of Brazil tested Black Powder Solutions patented magnetic separator, (5SSC-14-300-NM-Y) designed to be installed in the 14" pipeline test loop. The test was designed to evaluate the separation capability of the magnetic separator in capturing pipeline erosion.

One Kg of black powder originating from another pipeline was introduced as a test medium.

In excess of one Kg of black powder was extracted by the magnetic separator during this test.

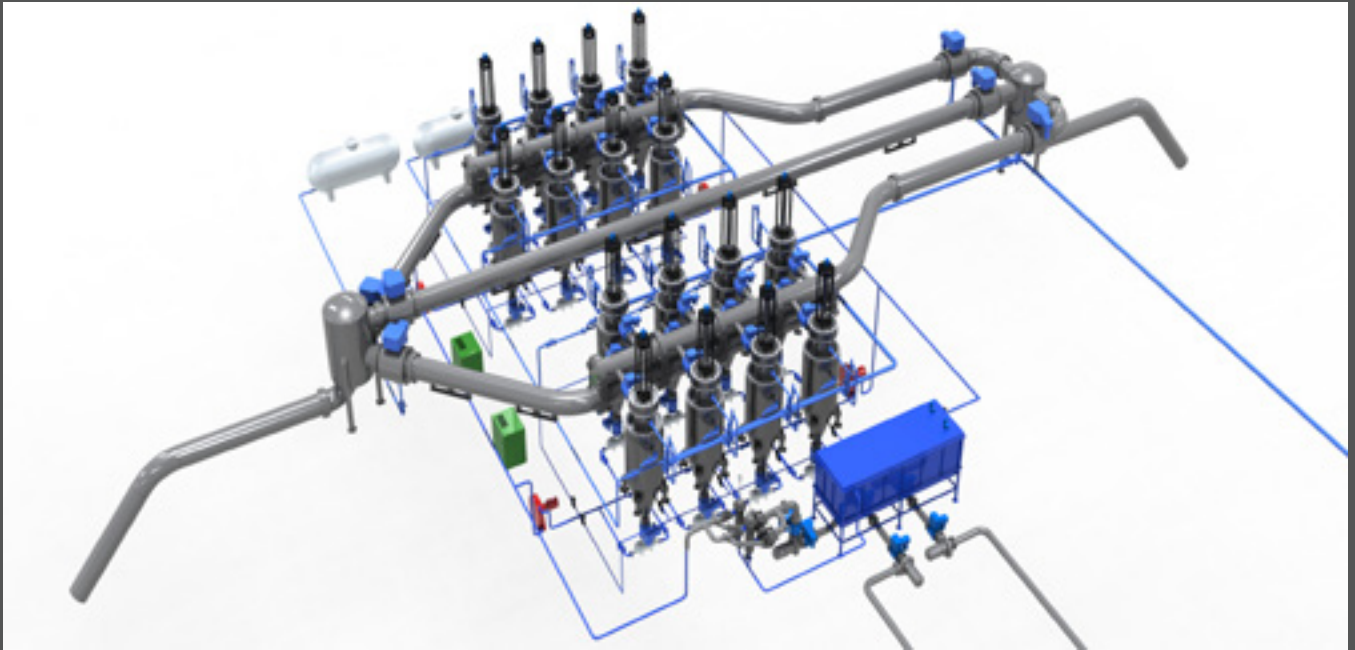


High pressure scrubbers installed prior to the meter gauges removes the Black powder to sub-micron levels before it causes premature wear affecting the calibration and operational life. Trapped contamination on the magnetic separator is due to continual erosion of pipelines and storage facilities.



Basket Strainers control the ferrous contamination; the oil transported will be cleaner, pipeline erosion, seal damage and meter equipment damage will be reduced.





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