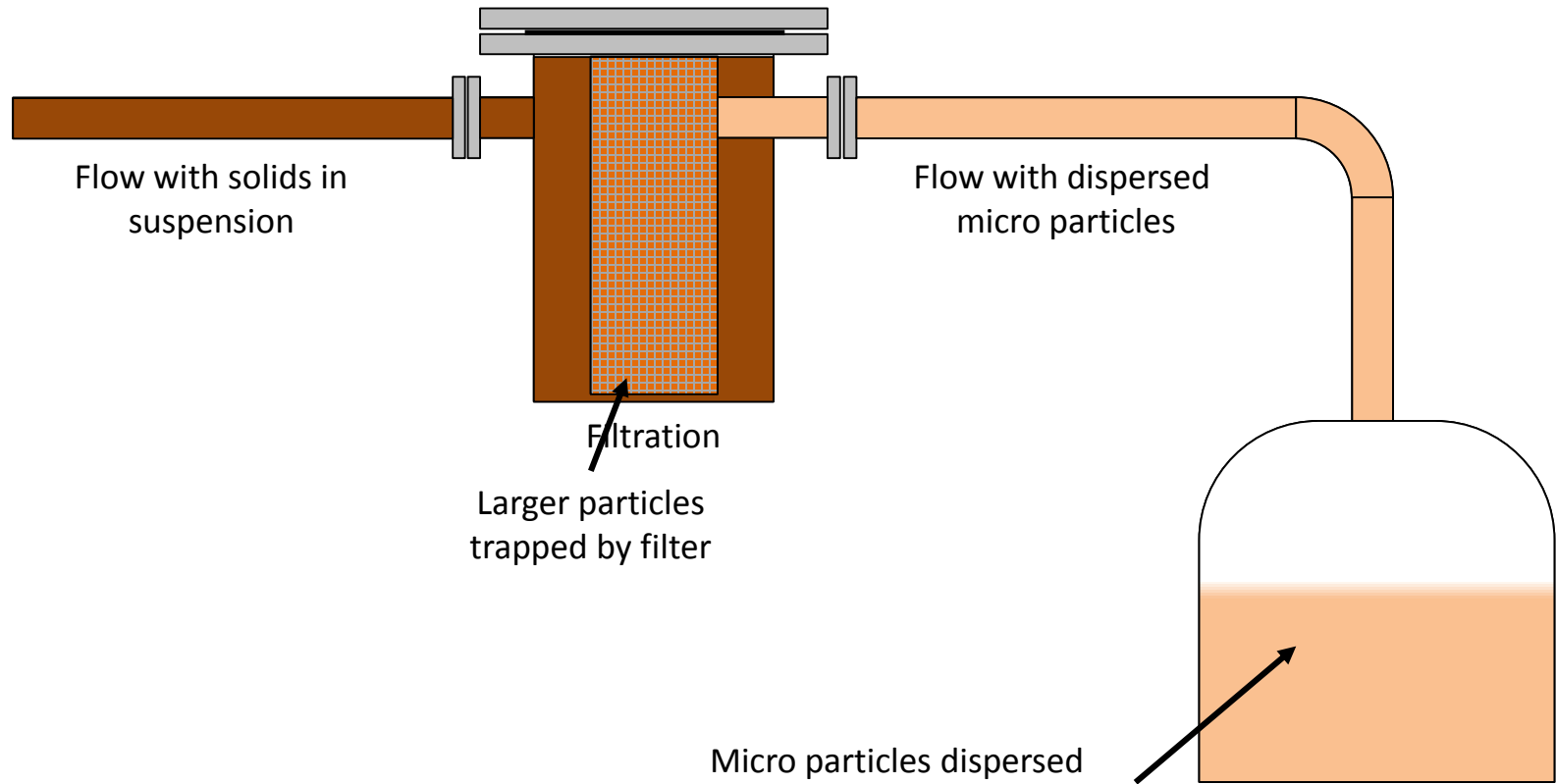
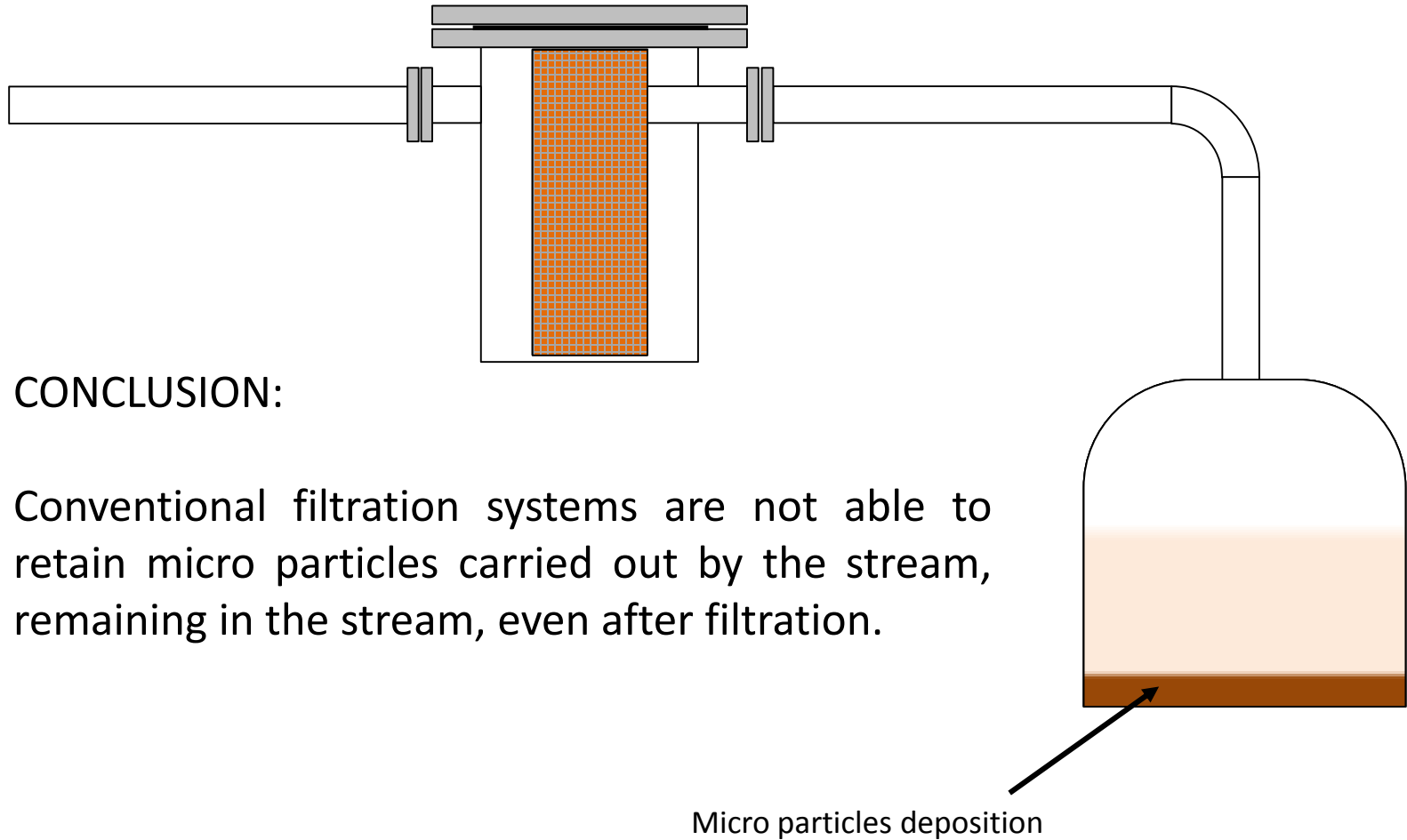


TRADITIONAL FILTRATION

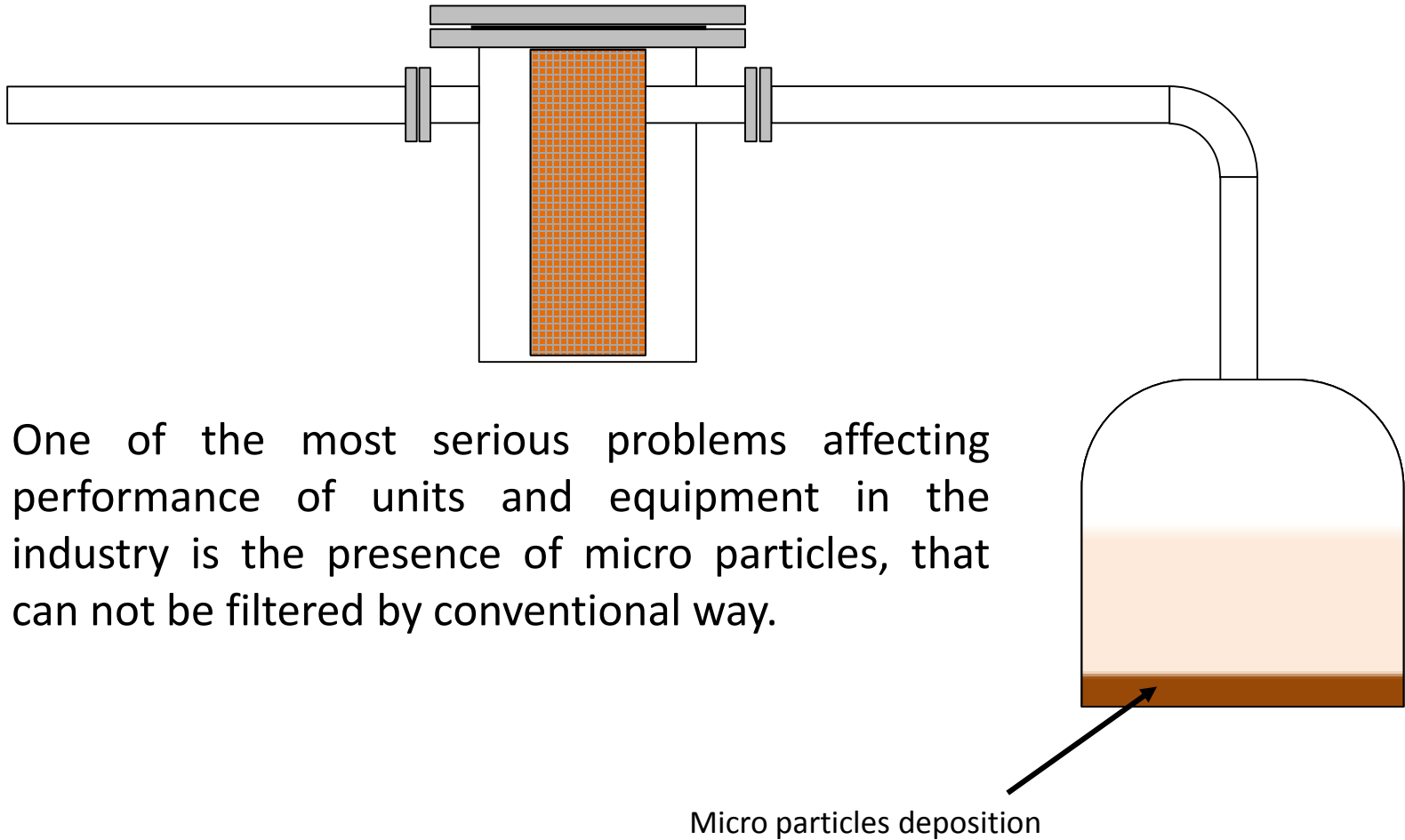




CONCLUSION:

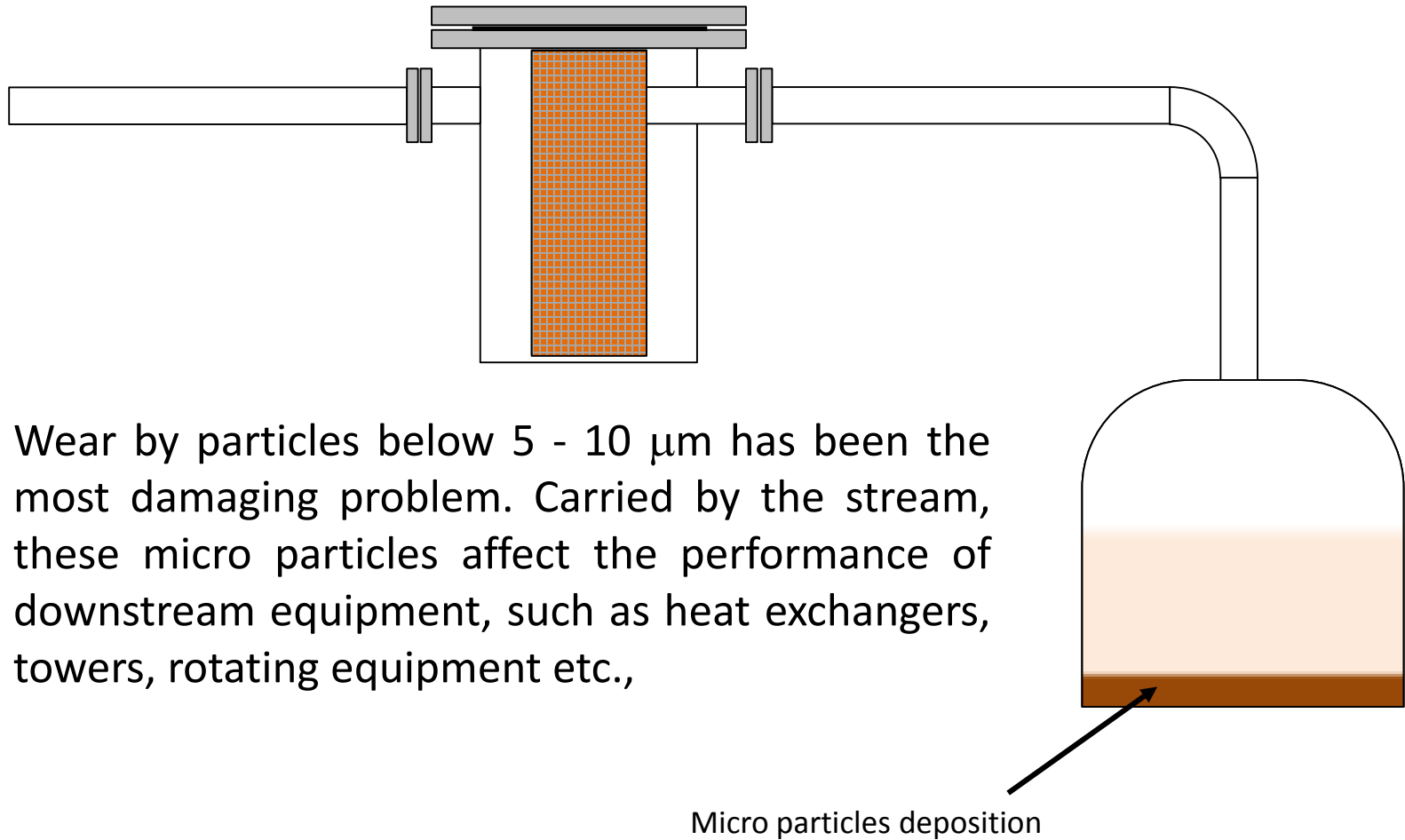
Conventional filtration systems are not able to retain micro particles carried out by the stream, remaining in the stream, even after filtration.

Micro particles deposition



One of the most serious problems affecting performance of units and equipment in the industry is the presence of micro particles, that can not be filtered by conventional way.

Micro particles deposition

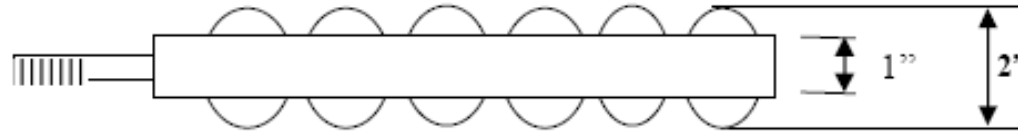


Wear by particles below 5 - 10 μm has been the most damaging problem. Carried by the stream, these micro particles affect the performance of downstream equipment, such as heat exchangers, towers, rotating equipment etc.,

Micro particles deposition

BPS's vs. Traditional Magnetic Field Strength

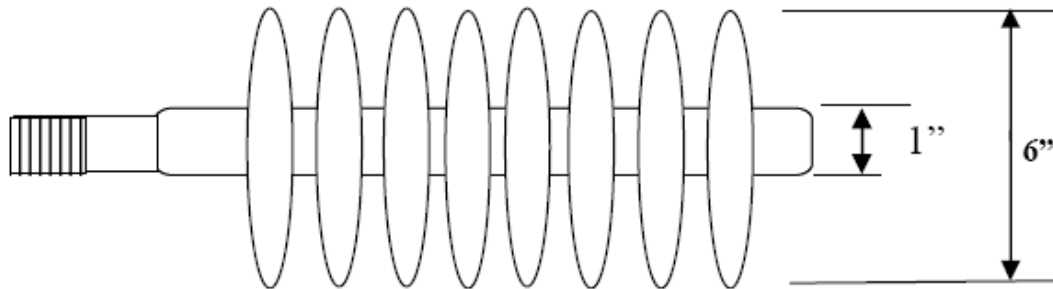
**Traditional
Magnetic
Separator
Element**



Length	Number of Fields	Diameter of Field	Holding Strength	Magnetic Surface Area sq/in
12"	6	2"	40 lbs/lft.	14.14 sq/in

Length	Number of Fields	Diameter of Field	Holding Strength	Magnetic Surface Area sq/in
12"	8	6"	160lbs/lft.	219.84 sq/in

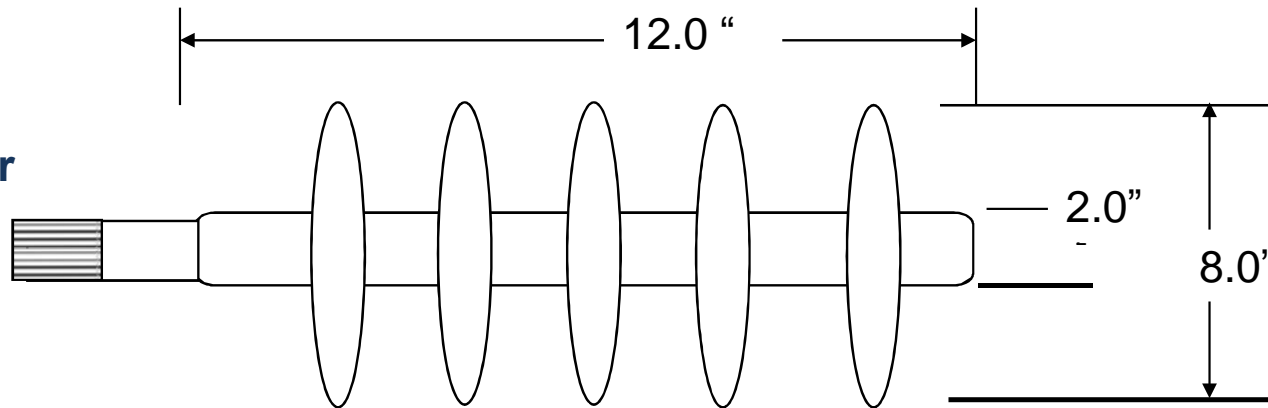
**BPS's
Magnetic
Separator
Element**



Unable to locate another manufacturer of a 2" magnetic separator for comparison

Length	Number of Fields	Diameter of Field	Holding Strength	Magnetic Surface Area sq/in
12"	5	8"	600lbs/ft.	989.6 sq/in

**BPS's
Magnetic
Separator**

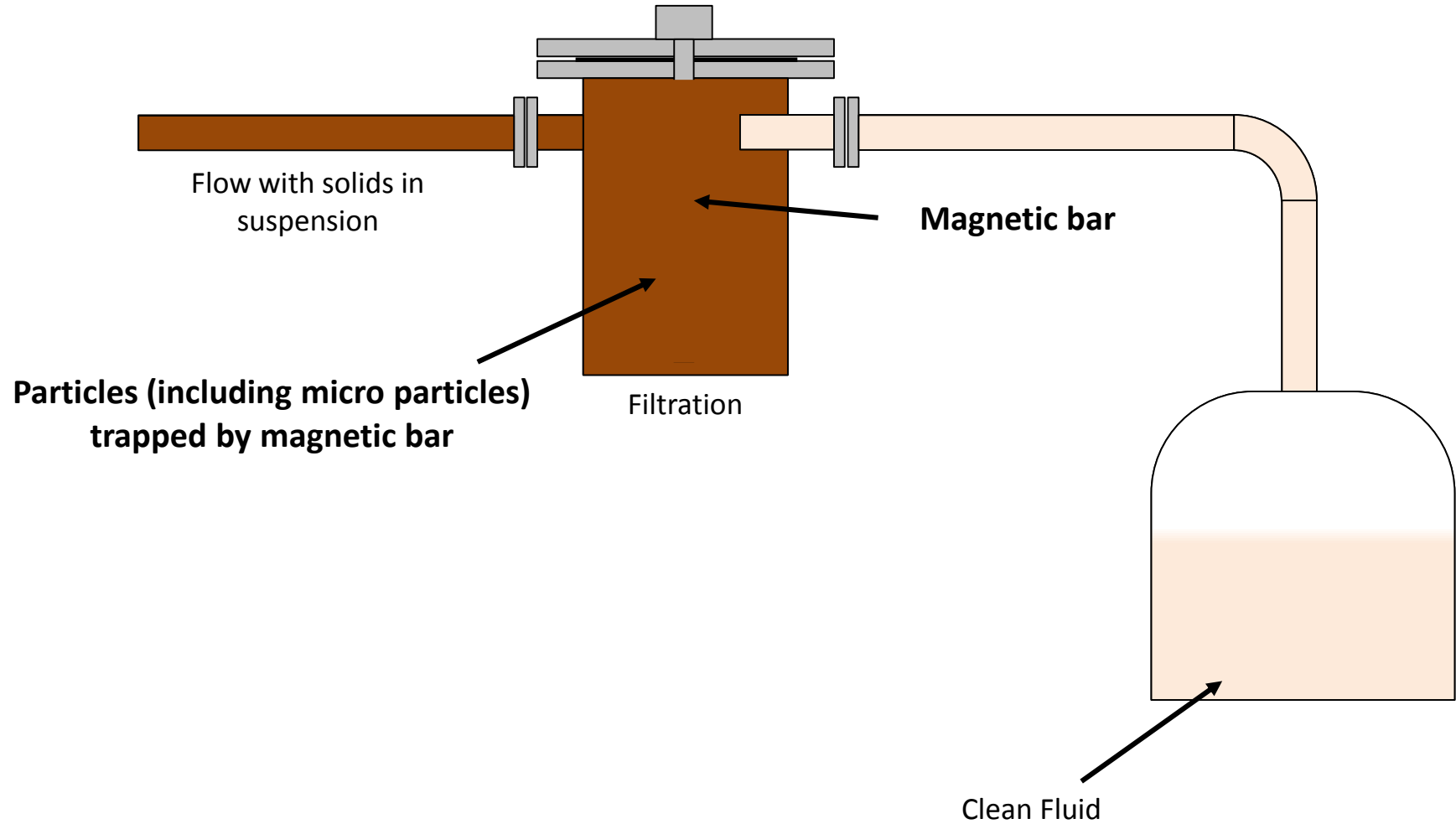


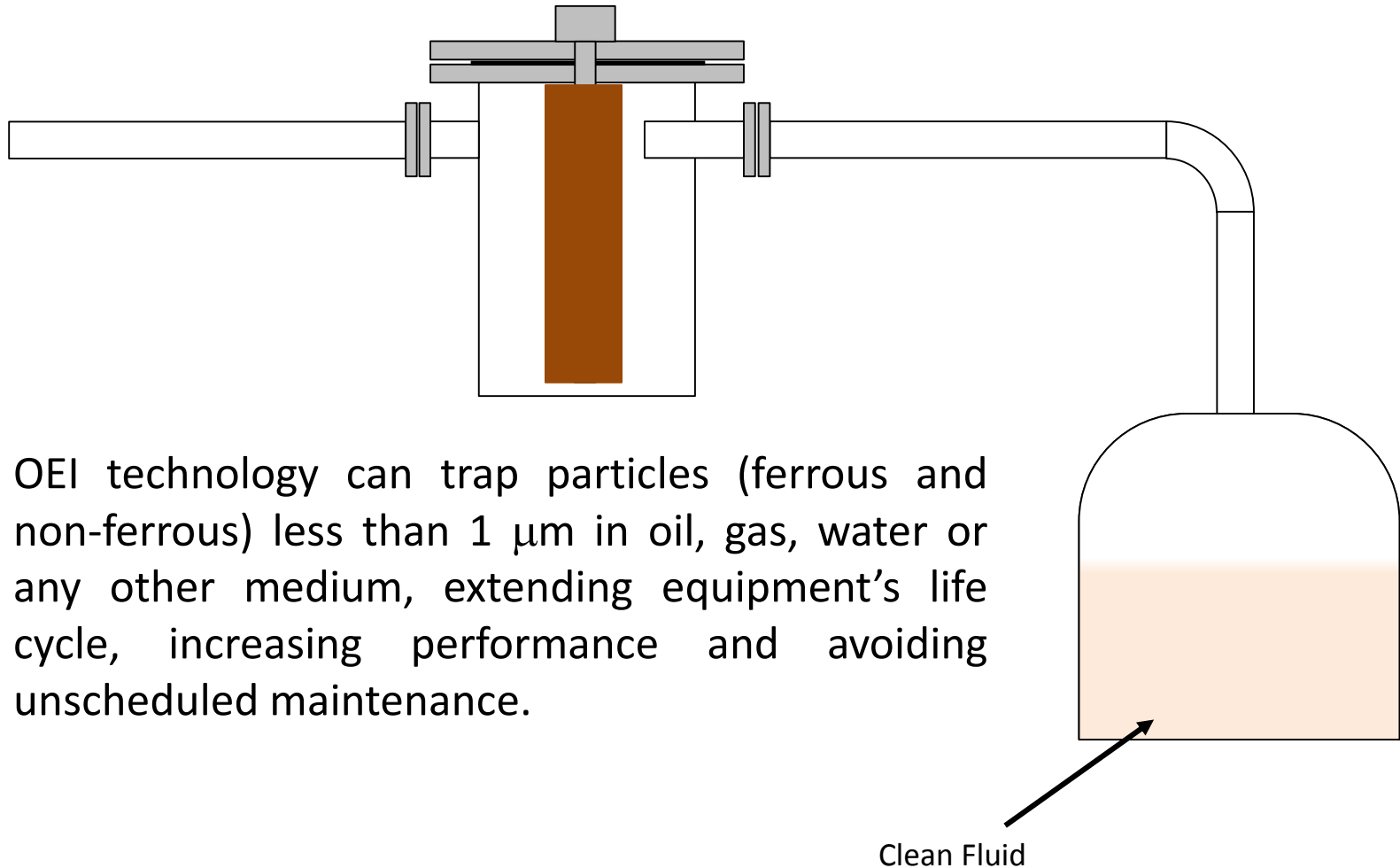
OEI designs magnetic filter rods using the highest-grade **neodymium** or **samarium cobalt** rare earth magnets.

These magnets are installed in a stainless steel encased magnetic rod with radial fields for optimized magnetic field strength.

OEI Magnetic Filter Rods are powerful enough to filter both ferrous and non-ferrous contamination to sub-micron level.

ONE EYE MAGNETIC FILTRATION





OEI technology can trap particles (ferrous and non-ferrous) less than 1 μm in oil, gas, water or any other medium, extending equipment's life cycle, increasing performance and avoiding unscheduled maintenance.

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Black Powder Solution

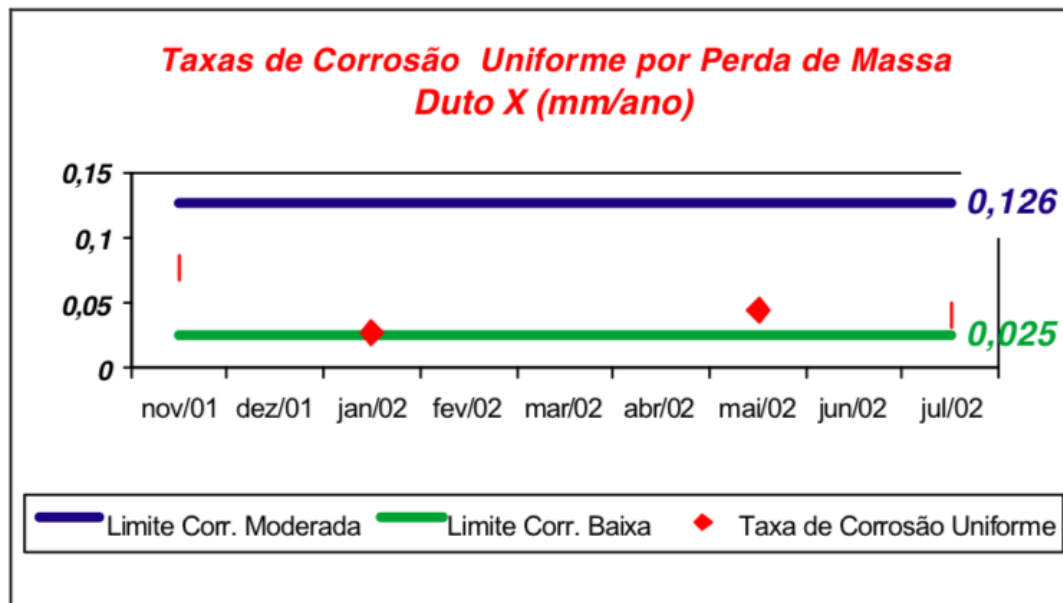
In long pipelines, the presence of small solid particles (**Black Powder**), **is more than expected.**

Magnetic filters in gas pipelines is therefore a very interesting application because it greatly reduces the need to stop the pipeline for PIG passage, and better protect all equipment downstream filtration system.

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Black Powder Solution

Considering a corrosion rate between 0,025 e 0,127 *mm/year* (ref. www.portalabpg.org.br/PDPetro/2/3040.pdf), an 8" pipeline (sch 120), 50 *km* long, can create, in one year, almost 20 ton of "black powder".



APPLICATIONS ON THE OIL & GAS INDUSTRIES

Black Powder Solution

Pipeline length: 50 km (50.000 m)
∅ Pipeline: 8" ($\varnothing_{int}=180$ mm)
Iron Oxide density: 5,2 ton/m³

<i>Corrosion Rate</i>	<i>mm/year</i>	0,025	0,126
	<i>m/year</i>	0,000025	0,000126
<i>Volume of Solids</i>		$= (\pi \times 0,18) \times 50.000 \times 0,000025$	$= (\pi \times 0,18) \times 50.000 \times 0,000126$
	<i>m³/year</i>	0,714	3,6
<i>Total Solids</i>	<i>ton/year</i>	3,71	18,72
<i>5% Less than 10μm</i>	<i>kg/year</i>	185,5	936

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Black Powder Solution

Carried by the stream, **micro particles affect performance of downstream equipment, such as erosion, plugging on trays valves, solid deposition on heat exchangers etc., as well as in metering systems.**

Most of these problems are caused by particles **below 5 - 10 μm** , which cannot be filtered by conventional ways.

OEI Magnetic Filters can retain such particles, increasing plant performance and reducing, significantly, maintenance costs.

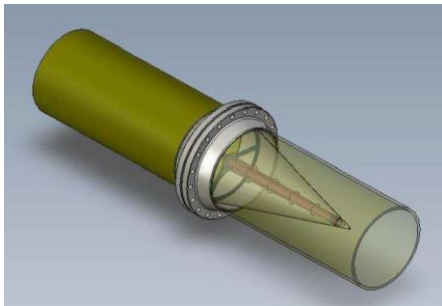
APPLICATIONS ON THE OIL & GAS INDUSTRIES

Black Powder Solution

CTDUT of Brazil tested BPS MSCS patented magnetic separator, (5SSC-14-300-NM-Y) designed to be installed in the 14" pipe line test loop. The test was designed to evaluate the filtration capability of the magnetic filter in capturing pipeline erosion.

One Kg of Black Powder originating from another pipe line was introduced as a test medium.

In excess of one kg of Black Powder was extracted by the magnetic separator during this test.



APPLICATIONS ON THE OIL & GAS INDUSTRIES

Black Powder Solution



Black Powder Captured



Removal from the Pressure Vessel



Scraper Plate Descending



APPLICATIONS ON THE OIL & GAS INDUSTRIES

Black Powder Solution



Jet Fuel was considered as CLEAN. OEI Magnetic Filter shows the opposite.

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Oil Systems

Oil and Gas Industries use oil for a lot of services...

Lube oil (compressors, pumps, turbines, gearboxes...)

Oil injection (screw and reciprocating compressors)

Sealing systems (pumps and compressors)

Control oil (turbines)

Hydraulic systems

The following comments apply to all of these applications.

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Oil Systems

Today's material quality, design and machining capabilities function are at a high level, so, **tolerances for rotating equipment components is tight.**

Quality bearings have a 1 μm tolerance as do servo valves for pneumatic and hydraulic systems.

Traditional full flow filtration is challenged to clean wear contamination under 10 μm in size because **filtration for below 10 μm capability is expensive and requires frequent oil change out.**

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Oil Systems

OEI filtration technology is unique in that it filters **contamination to sub-micron levels with minimal flow restriction, maximizing efficiency** (decreasing pressure loss and increasing continuous operation time).



OEI filters are engineered for individualized applications to account for flow rate, pressure, temperature, viscosity, space, ports, as well as multi-direction flow.

OEI technology is currently installed on water, gas, lube oil, fuel, condensate, LNG, LPG, glycol, coolant, chemical and oil applications.

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Oil Systems

Abrasive particles, from 5 to 10 μm (less than 1 μm for special services), is critical, so removal of these particles is of great importance.

In order to improve equipment performance (or avoid unscheduled maintenance) fluid cleaning should be a priority in maintenance programs.

Solids particles, however, are not the only problem to be considered in a oil system.

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Oil Systems

In general, all in-service **lubricants will fail at some point**. There are numerous ways to manage the condition of a lube oil and extend its life significantly.

There are three primary causes for oil replacement: **degradation of the base oil, depletion of additives and contamination**.

Degradation and depletion of additives can be controlled through a good specification, reliable suppliers...

Contamination has direct influence on degradation and depletion of additives, so must be followed closely.

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Oil Systems

Contaminants cause significant changes to the rate of oxidation, acting as catalysts for the reaction (oxidation). **Certain wear metals can dramatically increase the rate of this reaction**, especially in the presence of water.

While it may be impractical to forever prevent oil from failing, we can dramatically impact the oil's life by managing the influencing factors.

Preventing or removing contamination goes a long way toward extending the lubricant's service life. In some cases, **lubricant's service life can be extended over THREE times**.

APPLICATIONS ON THE OIL & GAS INDUSTRIES

Oil Systems



SUMMARY

	Conventional	ONE EYE
ΔP	CLEAN: Acceptable SATURATED: High or vey high	CLEAN: Almost ZERO SATURATED: LOW
Max. Filtration	25 μm	1 μm or less
Oil Change Out	Oil must be replaced every X years	Increase cycle up to 3 times
Metering Systems	Wear can affect measurement	No wear, no measurement error
Sealing Systems	Seal lifetime is affected by metallic particles in the oil	Increase seal lifetime, since the oil will be, always, clean
Black Powder	Responsible for wearing in a lot of equipment	Avoiding Black Powder inlet, wearing will be mitigated
Environmental	Contaminated water must be delivered for a safety place	Except for automatic systems, no water is necessary