



BLACK POWDER SOLUTIONS

WHY MAJOR OPERATORS ARE USING MAGNETIC SEPARATION: A 5 MINUTE INTRODUCTION

November 2019

www.blackpowdersolutions.com



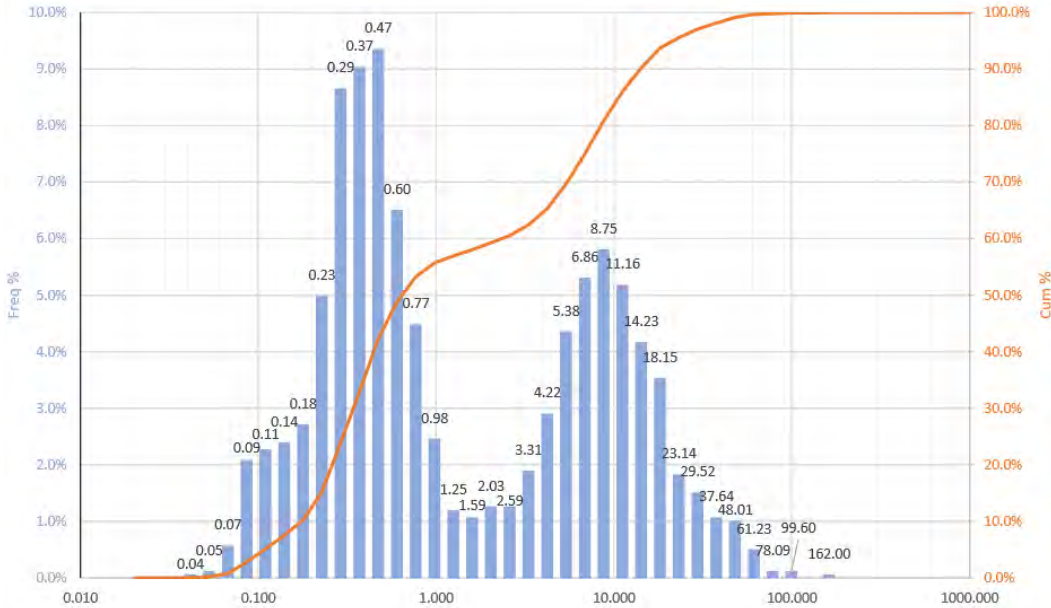
Black Powder Contamination

- The abrasive ferrous and non-ferrous contamination present in all hydrocarbons and hydrocarbon derivatives.
- Typically precipitates out during transportation, processing, storage, fractionation, refining, and loading/offloading.
- Consists of iron sulfide and iron oxide, with other non-ferrous compounds including chlorides, sodium, calcium, mill scale, sand, silica, other varying types of **contamination labeled “dirt”**.
- Forms initially as a sulfur-based corrosion product from microbial and chemical interactions. It continues to build as iron sulfide and iron oxide compounds through hydrocarbon pipelines and facilities. Also present in amine & glycol systems.
- Typically 60% to 70% of black powder contamination is under 10 microns in size, requiring continuous replacement of expensive conventional filter elements.





Black Powder Contamination Impact



OPERATIONS

- Equipment & system failures
- Shorter service life
- Parts replacement

PRODUCTION

- Degraded product quality
- Unscheduled downtime
- Production loss

ENVIRONMENT

- Disposal of waste materials
- Consumables
- Emissions

SAFETY

- Labor to manage contamination
- Maintenance for equipment failure
- Increased opportunity for injury

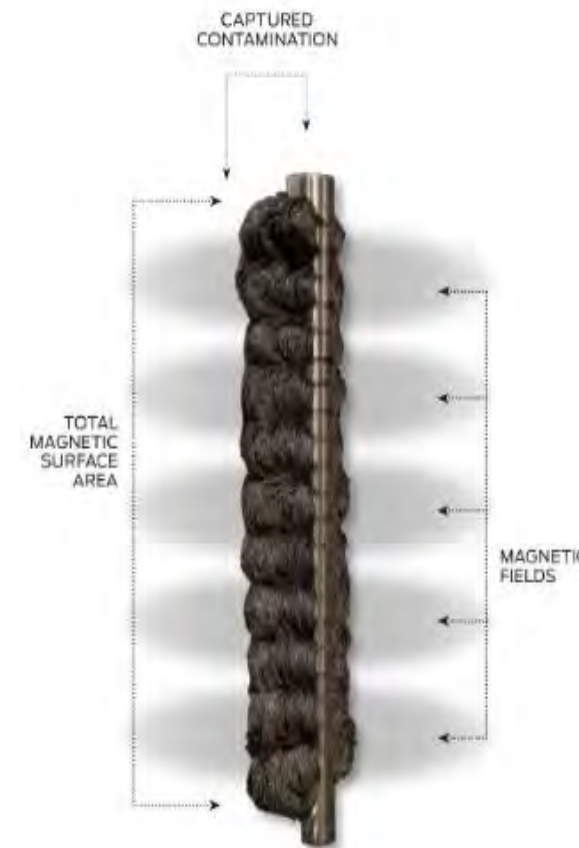
Sub 10-micron contamination has significant impacts along each value chain, impacting pumps, compressors, valves, meters and product quality and causing equipment replacement, downtime, lower efficiency, product loss, disposal of consumables and safety issues.



Magnetic Separator

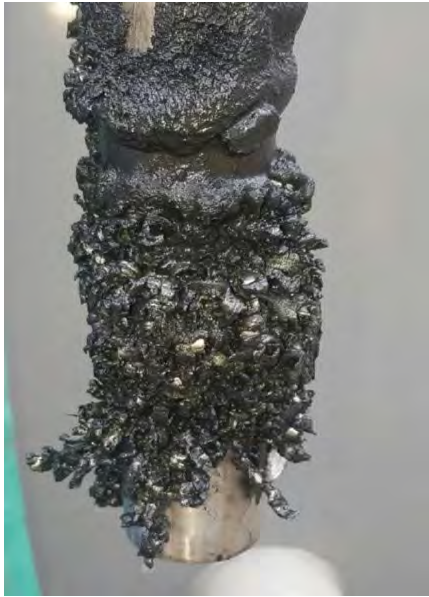
Black Powder Solutions' patented magnetic separator systems utilize very high field strength permanent magnetics to remove ferrous and non-ferrous contamination (sometimes >50% non-ferrous) in hydrocarbon liquids and gasses, as well as amine, glycol and water. No membrane filters employed.

- Established products - patented magnetic technology originally developed over 15 years ago by sister company (One Eye Industries) in industrial magnetic filtration products.
- High efficiency (95%+) removal of black powder above 500 microns down below 0.1 microns – no absolute or nominal filter ratings.
- Systems only require cleaning via wiping of the magnetic elements. Only the contamination is disposed – no disposable filter elements.
- Typically well below 5 psi differential pressure in fully contaminated systems, vs. typical pressure alarms at +/- 25 psi.
- Standalone system – no power or fuel requirements due to permanent rare earth magnetics.
- Permanent solution – longest system in use is 17 years (and running) with original equipment - no reported performance degradation
- Typical magnetic separator system holding capacity is measured in hundreds of pounds and cleaning intervals are measured in months.



[How it works video](#)

Magnetic Separation – Select Case Studies



Desalter

- Over 60 Pentair filter changeouts / year eliminated
- Filter cost reduced by \$793K p.a.
- Payback: <15 days

[Case study link](#)

Refinery (Kerosene)

- **Houston ship channel facility**
- **Downstream of CDU, upstream of kero pump**
- **Replaced cone strainer & eliminated constant pump replacements**

[Case study link](#)

LPG Ship Loading

- **Filters plug off during loading**
- **Magnetic separator upstream of filters**
- **~\$450K savings per year in avoided filters & demurrage**

[Case study link](#)

Compressor Lube

- **Flash vapor compressor system**
- **Black powder gets past compressor seals**
- **>\$300K p.a. savings in filters & pumps on single compressor**

[Case study link](#)

Pipeline Pigging

- **Transportable system for use at pig trap for 7+ days post-pigging**
- **Positioned upstream of conventional filters**
- **All contamination caught by BPS system**



Where is the Fastest Payback?



- How much would you save if disposable filter changeouts were reduced by over 60%?
- What is the financial impact of eliminating pump changeouts and delaying overhauls of compressors and heat exchangers by a factor of 2X–3X?
- How much would you save with a 70% reduction in maintenance pigging activity?
- What is the cost of a single process outage? How many are attributable directly or indirectly to contamination issues?
- What are savings from a 50%-80% reduction in lube-related maintenance frequency on rotating equipment.
- What is the value of reducing ship-loading filter cleaning / replacements by 80%?
- What is the value of avoiding off spec product rejections?
- **What's the value of 30%-50% reduced worker hazard exposure due to reduction in planned and unplanned maintenance and repair events?**
- **What's the value of a substantial environmental footprint reduction due to reduced filter, chemical and wastewater disposal?**