

CleanMud:

The unknown 1%

- Erosion of casing and drill pipe are the main sources of wear contamination in drilling fluids and they combine with natural iron compounds and silica released from the formation.
- On average, wear contamination makes up 1% of drilling fluids, causing premature wear. When removed, users experience a 50+% life extension of fluid ends and drill string components.
- Traditional filtration technologies – centrifuge, shaker trays and ditch magnets – are not efficient in removing wear contamination under 10 microns
- Wear contamination under 4 microns acts like sandpaper and a CleanMud Filtration System captures it – down to and below – 1 micron.

A CleanMud Filtration System keeps drilling fluids clean; resulting in a 30-50% reduction in NPT, fewer sweeps, prolonged equipment life and reduced ESG risk.



CleanMud Filtration System

Resetting
the standard
for drilling
fluid
cleanliness



In 6 hours, these magnetic filter elements captured 100 lbs of contamination under 4 microns

Drilling at higher temperatures and pressures increases the production of wear contamination

Additional benefits



Equipment protection

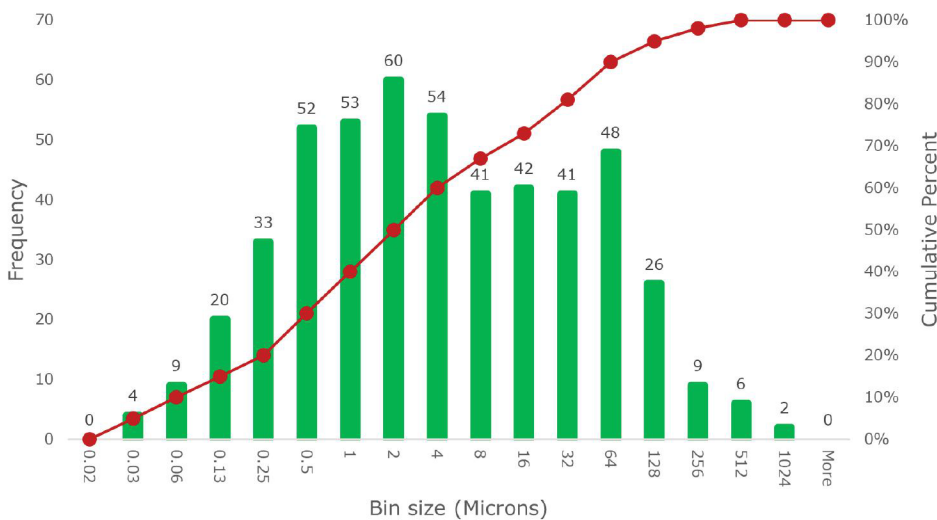
- Extends the life of all components in the fluid ends of pumps and drill string.
- Reduces wear of the drill and casing pipe; translating to fewer inspections and change-outs.
- Prolongs drilling mud and fluid operational life.



Increased production

- Increases production cycles.
- Reduces costly unplanned maintenance and downtime.
- Faster times to well completion.

Component life improvement through CleanMud Filtration



This graph illustrates the partial size distribution of the contamination captured on the CleanMud Filter. The bars are representative of the fequency that a particle size occurs. The red line represents the cumulative total particals based on size.

35% of particles were below 1 micron.

CleanMud Filters remove 95+% of wear contamination down to and below 1 micron - without affecting chemical or clay additives

The unknown 1%

From our testing, we learned about the 1%. On average, wear contamination below 4 microns accounts for 1% of drilling fluids.

30% of particles in the 1% were Silicon dioxide – one of the most harmful contaminants contributing to premature wear.

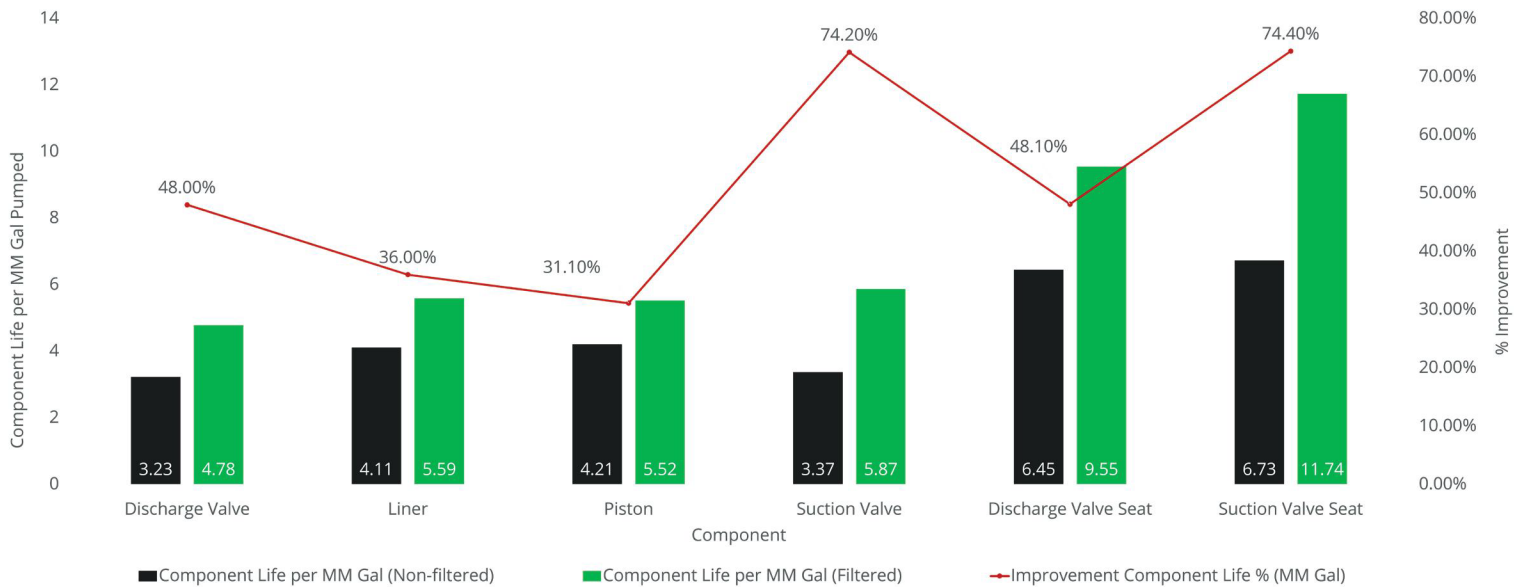
The remaining 70% was mostly made up of iron, chromium, zinc, nickel, copper, lead, vanadium and steel.



In the field - CleanMud Filtration System Pilot Project

A CleanMud Filtration System was tested on three, 1500 horsepower rigs over the past 12 months in Texas and Louisiana. This analysis focused on component life extension and increased production.

Component life extension through a CleanMud Filter



The results identified a financial payback within 1.56 years on the fluid end components. • The average fluid end life extension was 52%. • Calculating the drill string component and its life extension - users would realize a financial return in less than one year.

Analysis of unfiltered drilling mud

Product Type	Value (PPM)
Iron	3,400
Chromium	7.0
Nickel	15
Copper	14
Lead	44
Tin	<1.0
Cadmium	0.79
Silver	<0.20
Vanadium	12
Zinc	140

Analysis of wear contamination removed from mud

Product Type	Value (PPM)
Iron	52,000
Chromium	340
Nickel	77
Copper	60
Lead	59
Tin	3.0
Cadmium	0.91
Silver	<0.20
Vanadium	21
Zinc	200

Test protocols and results

Mud Volume	58,000 gal
Weight per gal	15.7 lbs/gal
Total mud weight	923,160 lbs
Total contamination removed	13,822 lbs
Percentage of contamination	1.5%

Increased productive time

- Reduced labour and overhead
- Asset life extension
- Higher well turnover
- Supply chain savings

Other benefits realized were:

- Reduced ESG risks
- Increased market share
- Competitive advantage

The unknown 1% of wear contamination = the weight of two, F150 trucks!

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Cost savings for all stakeholders

- Operators
- Drilling contractors
- Completions contractors
- Mud suppliers
- Well stimulation contractors



Applications

- Oil, water and chemical-based mud
- Frac fluid
- Completion fluid



CleanMud Filter specifications

Material	304 SS 316 SS
Sizes	24" OD - contains 14 elements 32" OD - contains 30 elements custom sizes available
Configuration	Single Duplex Offset Inline ports Other as required
Installation	Kidney loop In-line full flow
Modular design	Scaled to application specifications
Cleaning Mechanism	Semi-automatic Fully-automatic

Efficiency	95+%
Clean pressure drop	<0.5PSI
Vibration Resistant	Yes
Partical sizes removed	<0.5 μm - 500+ μm
Operating life	20+ years
Holding capacity	8-14 lbs per linear foot



CleanMud
semi-automatic
system



CleanMud
fully-automatic
system

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