

Particle Contaminant Characteristics

Particles are not just defined by their composition, size and amount. They have many significant physical and chemical characteristics. These characteristics determine how potentially destructive a particle can be as a contaminant in your equipment. The table below details these important characteristics.

Characteristic	Definition	Significance
Size	Spherical diameter measured in microns.	Particles enter into critical clearances, causing wear. Bigger particles become smaller particles
Surface Area	An object's total exterior.	As particles become smaller their combined surface areas increase, causing more wear and reactions.
Density	Determines the buoyancy of an object.	Less dense material will remain in the oil longer causing more wear and reactions.
Shape	A particle's roundness or sharpness (angularity).	Dictates what type of wear the particle will cause, indentations or abrasions. The more angular, the more wear.
Hardness	A particle's resistance to deformation or fragmentation	The particle's hardness compared to the machine surface's hardness will dictate ability to cause wear. (See table below for hardness)
Composition	The particle's capacity to react with other surfaces.	A non-reactive particle may cause damage because the particles it creates by abrasion can be highly reactive, promoting oxidation and creating acids.
Polarity	Possessing an ionic charge which determines how likely the particle is to stick to other things.	Promotes the attraction of other ionic things, including scavenging performance additives. Can cling to surfaces restricting flow.

Common dirt particles consisting of silica and aluminum can be harder than a hacksaw blade. The table below illustrates various materials' relative hardness. Mohs Scale of Hardness defines an object's resistance to scratching by a standardized object.

Particle Type	Mohs Hardness
Fingernail	1
Babbitt Particles	1
Aluminum	1-3
Road Dust (silica)	2-8
Copper, Silver, Gold	3
Forged Steel	4-5
Cast Iron	4-5
Knife/Hacksaw Blade	5.5
Rust	5-6
Quarry Dust	5-9
Glass	6-7
Aluminum Oxides	9
Diamond	10

Particles can be very destructive. Their destructive capacity increases tremendously as the number of particles raises. Additionally, particles create more particles that cause wear, lubricant degradation and surface fatigue to opposing surfaces. Controlling particles and their propagation is critical for equipment health and survival.

"A Much Closer Look at Particles Contamination"
Practicing Oil Analysis, September 2005
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