

When testing confirms the presence of large ferrous wear, Analytical Ferrography is an excellent test for qualifying the type of wear occurring and identifying possible sources.

Analytical Ferrography can predict potential equipment failures as well as serve as an effective tool in determining the root cause of failure. It is a qualitative, rather than quantitative analysis that provides digital imagery of the actual particles present. Ferrous particles are trapped by powerful magnets and deposited on slides in patterns while non-ferrous and other wear debris particles are deposited randomly for microscopic analysis. Particles are analyzed based on metallic or non-metallic, alloy (determined by heat treatment), shape, size, color, and if possible, source.

Several types of wear can be identified through Analytical Ferrography, such as rubbing wear, abrasive wear, adhesive wear, cutting wear, corrosive wear, spalling, and spheres. It also identifies both red and black oxides. The following are some definitions and actual ferrograms of wear types.

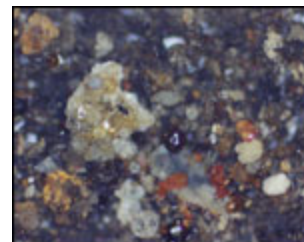
Rubbing Wear

Rubbing wear occurs between two metal surfaces that rub together and is typical of rolling element bearings and gearboxes.



Abrasive Wear

Abrasive wear is caused by dirt and other debris.





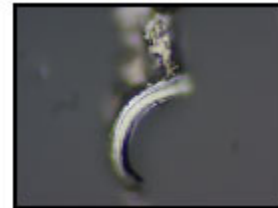
Cutting Wear

Wear particles become embedded in the softer metals of a shaft or bearing creating an affect similar to that of a cutting lathe.



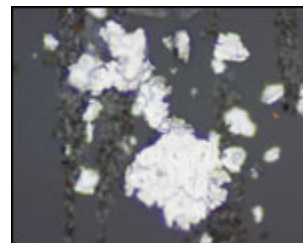
Heat Treating

Heat treating a ferrograph causes changes in particle color. Color allows an analyst to distinguish ferrous from non-ferrous particles. Blue indicates a low alloy steel. Silver or white particles indicate aluminum. Knowing a particle's composition helps in determining it source.



Spalling

Spall particles are caused by bearing surface fatigue. Over time, fatigue particles break away from bearing or shaft surfaces.



Spheres

Spheres form when microscopic cracks occur in bearing or shaft surfaces. These cracks cause minute particles of molten steel to cool rapidly and form spheres. Spheres are a pre-cursor to spalling.



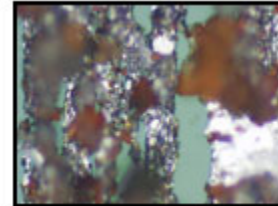


Black/Red Oxides

Black Oxides are decarbonized ferrous particles caused by age or exposure to excessive oxygen or heat. Red Oxides (rust) are ferrous particles that have been exposed to water.



Black Oxide



Red Oxide

Once the type of wear has been identified, an analyst can determine its source and with the evaluation of other tests, such as ICP, cause for the wear can also be determined.