



Herguth Laboratories, Inc.

101 CORPORATE PLACE · P.O. BOX B · VALLEJO, CA 94590

## *Aluminum Oxide Contamination in Engine Crankcase Oils*

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*Discussion:* Aluminum Oxide is an abrasive material “glued” to paper to facilitate the remove of surface materials i.e., sand paper. It is used in all types of sandpaper such as cloth, disks, tape and sheets. It is used throughout the automotive industry in the aftermarket repair of engine components. Its primary use is to remove old “stuck on” gasket material and smooth surfaces for refitting new gaskets.

The problem is, through carelessness this material will enter areas of the engine where it does not belong and will cause severe abrasion of parts (bearings, cylinders, etc.).

After operation for a period of time these abraded engine parts fail. Parts such as bearings, piston rings and cylinders are not designed to tolerate these extreme conditions. By-pass oil filter are not very effective in removing the abrasive.

*Laboratory Analysis:* A microscopic analysis of the debris contained in the oil may show the presence of aluminum oxide if it is in fact present in any measurable concentration. The visual identification of aluminum oxide ( see Optical Microscope photos)like abrasive material in the oil and high aluminum results using an Inductively Coupled Plasma Spectrometer (ICP) give ample evidence that aluminum oxide is present. Aluminum oxide is ALWAYS a foreign contaminant it should not be present in the engine oil.

Occasionally, when this situation is first encountered a mechanic will change the oil and filter. This normally removes any evidence of the aluminum oxide in the oil system. When this happens the bearings need to be analysed. The abrasives that damage the bearings are found at the end of the abrasive furrows in the bearing (See Scanning Electron Microscope, photo, SEM). When these particles are observed they are then characterized by Energy Dispersive X-ray (EDX) analysis for the presence of aluminum and oxygen.

An example of a naturally occurring contaminant is silicon. These particles come through the air intake system. However, they are clearly a different particle than aluminum oxide visually and by ICP or EDX analyses.

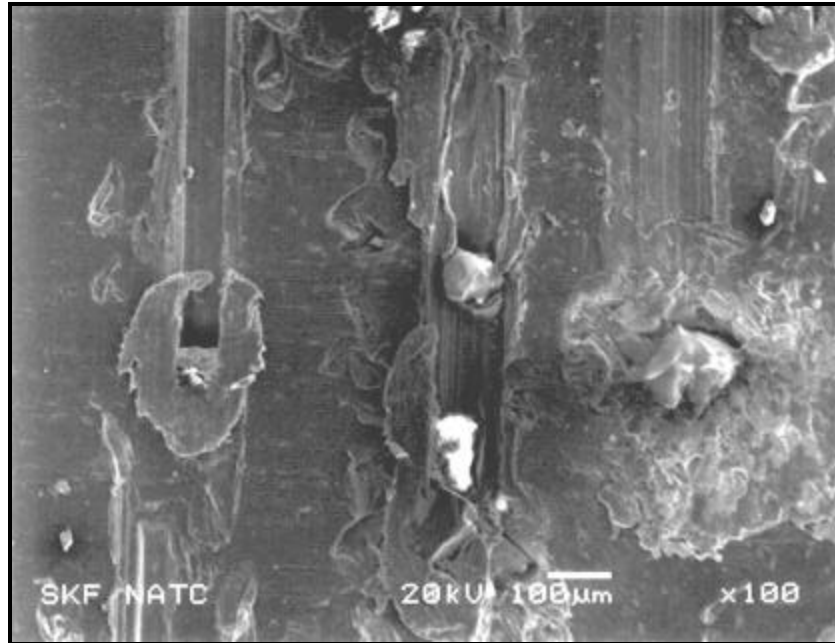


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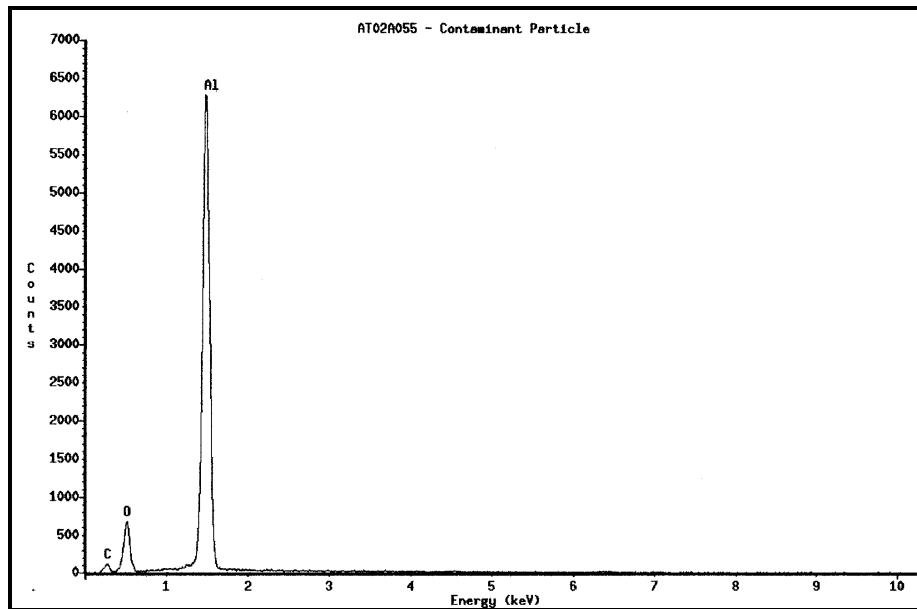
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SEM



SEM



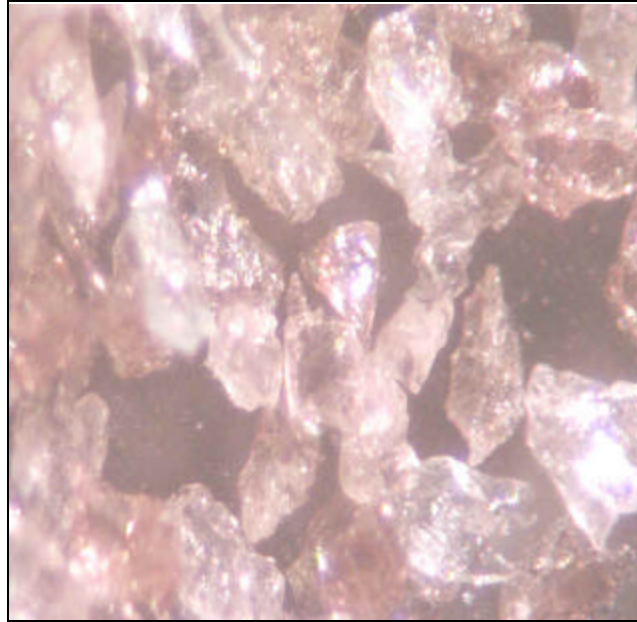
EDX



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Optical Microscope ~ 20X

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