



Herguth Laboratories, Inc.

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

CERTIFICATE OF LABORATORY ANALYSIS

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Pages: 3 (plus laboratory data)

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**Herguth Project Number: #600850 01-3413-C Fluid Sample
#600851 JW-4 Residue**

Please accept this report as our findings on the above project. If you have any questions or comments, please feel free to call.

Conclusion: All of the analyses point to the fact that the residue sample is the product of silicate “drop out”. The substance does not appear to be foreign to the cooling system. It is the result of a chemically unbalanced system, causing the silicate portion of the antifreeze package to form a solid matrix.

Background and Analysis: There were 2 samples submitted for analysis. A fluid sample from the system and a deposit removed from the radiator. The objective of the analysis was to identify the make-up of the residue.

The fluid sample had small particles of debris partially suspended in the fluid. It was assumed that this substance was the same as the residue and was not extracted or analyzed. However, we did analyze the fluid for metallic constituents, pH, and glycol concentrations, to determine the serviceability of the fluid (see Laboratory Report). The absence of silicon in the fluid supports the findings of silicate drop out. The cited reference states, “In most North American coolant formulations, the corrosion inhibition of heat-rejecting aluminum surfaces is provided by alkali metal silicates. But their tendency towards polymerization, leading to gelation and/or precipitation, can reduce the effectiveness of a coolant”. The absence of silicon in the metals analysis of the fluid indicates precipitation. This, along with the silicate in the residue, supports the conclusion that the additive “dropped out”.



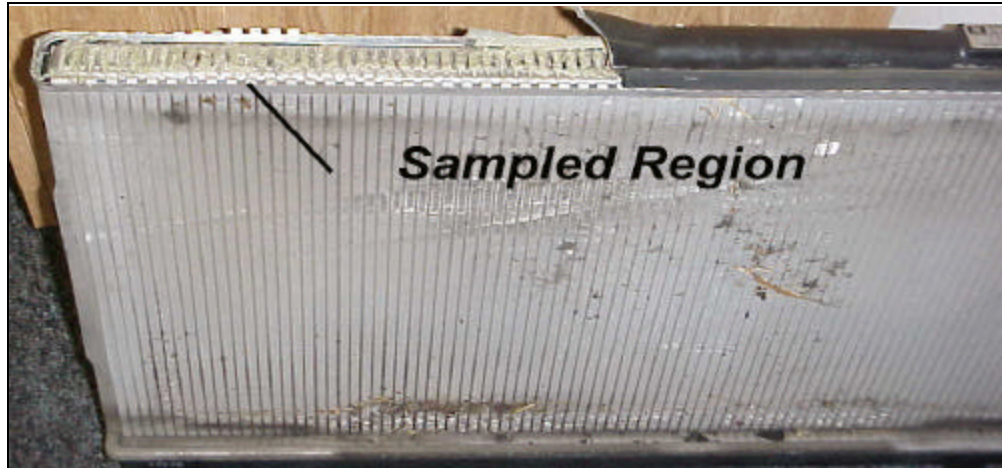
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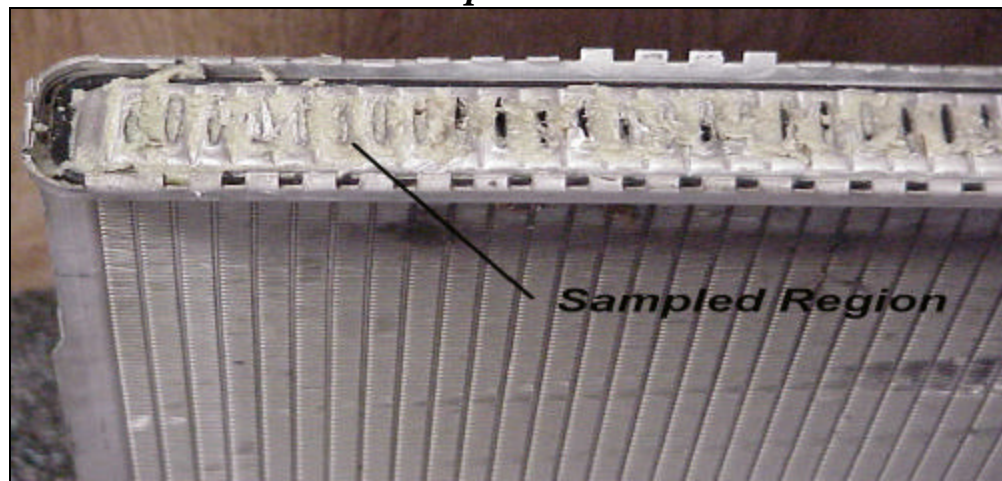
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#600850 01-3413-C Fluid Sample

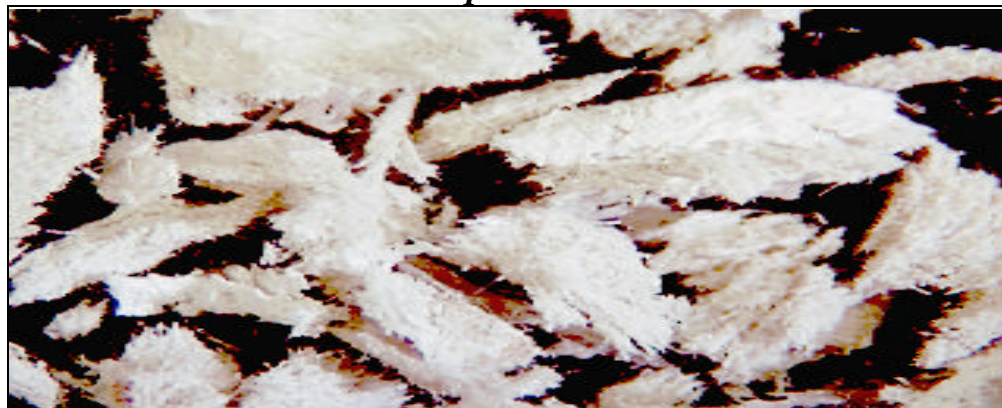
#600851 JW-4 Residue



Sample Point



Sample Point



Deposit Water Washed, Dried @ 95C and Magnified



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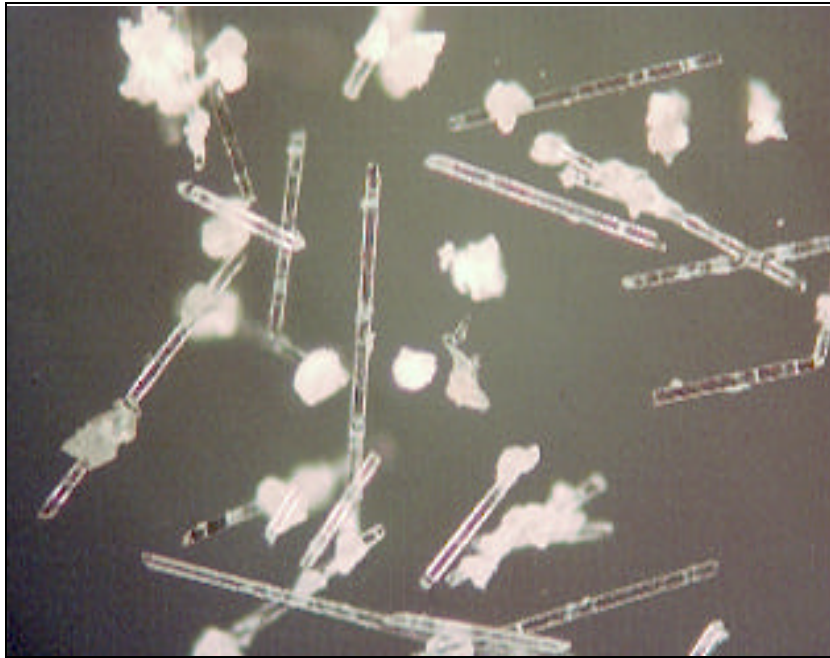
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Photo Shows agglomerated particles and polymerized silicate

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#600850 01-3413-C Fluid Sample

#600851 JW-4 Residue



***Deposit Water Washed, Dried @ 95C and Magnified
Photo Shows agglomerated particles and polymerized silicate***

Once again, if you have any questions or comments, please feel free to call.

Respectfully Submitted,

William R. Herguth, CLS

Enclosures Laboratory Data

Ref:

1) Schwartz, S.A., "Silicate Stabilization Studies in Propylene Glycol" Engine Coolant Testing: Fourth Volume, ASTM STP 1335, R.E. Beal, Ed., American Society of Testing Materials, 1999, pp.327-351

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