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WILDFIRES TARGET CALIFORNIA WINERIES

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Figure 1

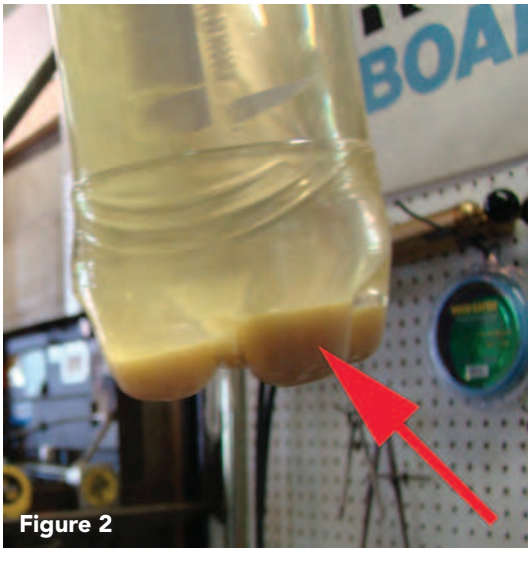
Figure 2

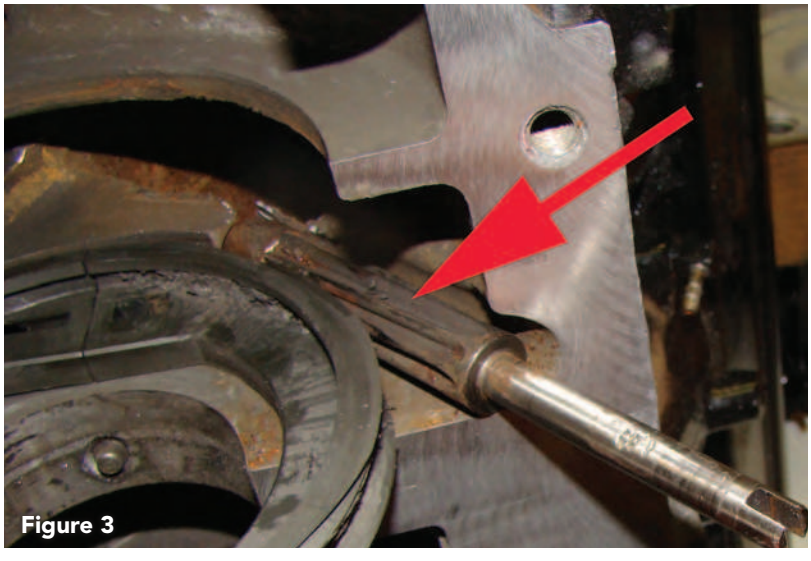
Figure 3

Sugar Contamination and Engine Failure

By Charles C. Roberts, Jr. Ph. D., P.E.

IT IS NOT UNUSUAL TO HAVE A claim asserting that an engine failure is a result of sugar contamination due to an act of vandalism. Sugar (glucose) contamination of the engine oil causes a lack of proper lubrication and engine failure. Sugar contamination can also cause damage to fuel injectors or fuel filters. The following case study illustrates details of an analysis of claimed vandalism by sugar contamination in an engine.

The incident involved a pleasure boat that sustained a seized engine. Figure 1 shows severely scoured pistons. Figure 2 is a view of a white immiscible substance from a fuel sample in the fuel tank. Chemical analysis of the substance revealed glucose as the fuel contaminant.

Wear metal analysis and additional chemical analysis of the engine oil showed no evidence of glucose and no evidence of long-term engine oil contamination due to lack of maintenance. The absence of engine oil wear metal data suggests that the scoring of the pistons occurred rather quickly.

Inspection of the engine fuel system showed no evidence of carburetor float bowl contamination or fuel filter contamination, suggesting that the

Figure 4

A failure of the oil pump drive gear causes scoring of the pistons quickly before any buildup of wear metals in the engine oil.

engine was not operating after the sugar was placed in the fuel tank. This alone would put the allegation of glucose contamination having caused engine failure in doubt.

Further inspection of the engine identified the probable cause of the engine failure as illustrated in Figures 3 and 4. In Figure 3, the arrow points to the oil pump drive gear and shaft. At the end of the shaft is the engine oil pump, which delivers oil at pressure to the engine components. What drives this shaft is the plastic gear wheel shown in Figure 4.

The arrow points to failed gear flutes, which were unable to turn the oil pump, causing a lack of lubrication and engine failure. Lack of lubrication is consistent with the damage to the pistons observed in Figure 1. A failure of the oil pump drive gear causes scoring of the pistons quickly before any buildup of wear metals in the engine oil.

The root cause of the engine seizure is failure of the oil pump drive gear, resulting in lack of lubrication, scouring of the pistons and significant interference of the pistons in the cylinders. This is an internal engine failure from a particular mechanical part and not a failure caused by the existence of sugar in the fuel tank.

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