Written by MT Staff
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Wellesley College service technician Mike Dawley takes a sample from one of the engines. The engines and gearboxes are sampled every 500 hours. When Wellesley College, Wellesley, MA, put its 5.6 MW cogeneration plant into operation, the objectives were to cut energy expenses and provide an independent, reliable source of power. Now there is another objective: avoid unscheduled downtime because the plant is operating near or at capacity most of the time. A rigorous preventive maintenance program that includes a computerized oil analysis service from Mobil Oil Corp. keeps the plant running at an almost-perfect 99 percent uptime.

Wellesley experienced an upsurge in load as the result of the personal computer. "In 1994, when the plant was commissioned, only a small number of students had their own computers. But then the college wired the campus into a network and now 95 percent of the students use computers. Plus, most of the faculty has computers," explained Traci DiGiorgio, systems operation engineer for the Wellesley College physical plant.

"In addition to supplying all the electricity for the college, we furnish power to the municipal electric system of the Town of Wellesley, principally for peak demand shaving. The town buys baseline power in bulk from the local utility, Boston Edison. The requirements of the college and the town put a premium on avoiding downtime, especially during periods of high demand."

The Wellesley College cogeneration system consists of four 16-cylinder, 1500 rpm, 2340 hp Jenbacher natural gas engines, each driving a 1.4 MW AVK generator through a step-up gearbox. The normal speed of the Jenbacher engine is 1500 rpm to provide the 50 Hz power used in Europe; the step-up to 1800 rpm is necessary for the 60 Hz power used in the United States.

Wellesley subscribes to the oil analysis programs for both the engines and the gearboxes: Engine Maintenance through Progressive Analysis (EM/PA) for the gas engines and Trend Analysis for the gearboxes.

Plant maintenance workers sample lubricating and gearbox oils every 500 operating hours and send the samples to a laboratory for analysis. For the engines, the laboratory generates reports on levels of oil oxidation, nitration, viscosity, and contaminants such as coolant, dirt, and wear metals.

DiGiorgio explains, "Previously, reports were mailed to us, so it was a week to 10 days before I received the results. This was adequate for the gear oil, because the reports almost always came back completely positive.

"However, two problems can develop in the engines which could lead to major problems if not detected in time: dirt ingestion and coolant leaks. These problems can be particularly acute because the engines run constantly. Dirt ingestion can occur from a leak in the air intake system, but it probably would take longer to develop into a problem because we operate in a clean environment. Coolant leaks are another story. They can quickly escalate into major repairs if not detected."

The data analysis program, Monitor for Windows, allows users to receive sample reports electronically by downloading their data through a modem from a computer at the laboratory. The program delivers clear, concise reports and the user can manipulate, analyze, and graph data easily and effectively.

Information can be accessed as soon as it is recorded. Problems are red-flagged on the screen and corrective action is taken immediately. The red and yellow flags (yellow indicates borderline situations) include suggestions for corrective action.

A coolant leak did occur on Unit 1, resulting in damage to the camshaft and a cam follower. "However, it could have been much worse," says George Hagg, manager of physical plant operations. "We could have experienced broken valves and other problems that could have meant replacing an entire head costing more than $35,000 not including downtime. This situation would have reduced the capacity of the plant and its ability to meet the needs of both

the college and the Town of Wellesley."

DiGiorgio points out that she can generate trend graphs easily with the program. "We also generate reports requested by the engine builder. In fact, I can generate any kind of report I want fairly easily." Photographs can be scanned and included in the body of the report. These are important for presentations to the college administration.

Reports generated by the software are necessary for insurance claims, Hagg points out, as well as evidence of corrective action taken.

Based on the experience with oil analysis, Hagg has the oil changed every 3000 hours. "The manufacturer recommends every 1000 hours, but we were able to demonstrate that because we use a premium product and run analyses every 500 hours, we could safely raise the change interval to 3000 hours." Engine oil filters are changed at 1500 hours, and gearbox oil is changed every 3000 hours.

Hagg also notes, "We have a waste oil permit. After 3000 hours I sample the used oil and then burn it in the plant boilers. I keep the sample reports as required by the U.S. Environmental Protection Agency."

Because the engines are fairly new there has been only one minor top-end overhaul at 10,000 hours. At 20,000 hours another minor overhaul and camshaft and cylinder liner inspection will be performed.

A major overhaul is currently scheduled for the 5 year mark. At that point major trends will have been established, particularly in wear metals, to correlate with inspection of the entire engine.

Hagg says he expects to reach the major overhaul mark without any unanticipated repairs. **MT**

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