

# EXSYS Case Study

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## Component Failure Prediction

*Canadian Pacific Railroad*

Still running and providing enormous savings over the last 12 years, Canadian Pacific Railroad uses a knowledge automation system to predict component failure in diesel locomotive engines. The system has been highly successful at CP and has saved the company thousands of millions of dollars.



The system bases its analysis on the type and concentration of metal impurities in the lubrication oil from the engine. The oil sample is analyzed in a spectrum analyzer to determine this data. The visual interpretation of these spectra required a skill that takes years to learn and is very difficult to teach.

The knowledge automation system developed at CP allowed a PC running the system to analyze the data automatically. All of the input required by the system is supplied directly from the spectrum analyzer. The system produces a printed report for the technician telling which components require service and which are likely to fail. The system is highly embedded and there is no direct user interaction with the knowledge automation system. In fact, this system was shown at the Texas Instruments Satellite Symposium as an example of an invisibly embedded system.

Many thousands of samples have been run with 98% accuracy. Major cost savings has been realized through the detection and replacement of components before failure. In some cases, the detection of a single failing component has saved more money than the cost of the entire system.

The system has also been modified to predict component failure in diesel marine propulsion engines for the Canadian Navy.

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*"If unchecked, the oil contamination problem would have resulted in \$8 million dollars in damage. The maintenance cost was less than one tenth of the achieved cost avoidance."*

*The US Air Force Oil analysis programs reported a total cost avoidance figure of \$15 million dollars in F-16 engine damages. A conservative estimate for the total cost avoidance generated in the USAF by (knowledge automation system) oil analysis would be over \$100 million dollars."*

Machinery Oil Analysis - Methods, Automation & Benefits,  
1995, Larry A. Toms