

The Future of Condition Monitoring: A View from the CBM Laboratory at the University of Toronto, Canada

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Background:

Our views on the future of condition monitoring (CM) have been shaped by our collaboration since January 1995 with a number of international companies, deeply involved in achieving maintenance excellence. These companies, along with government agencies in Canada, supported financially the creation of a condition-based maintenance (CBM) laboratory at the University of Toronto.

Current reality with respect to CM:

It is often said that the collection of more CM data will result in better maintenance decisions. While we do not object to such a view, our experience is that even more effort should be placed on smart interpretation of the vast quantities of CM data currently available within an organization. The goal of interpreting the CM data is to make the best possible maintenance decision by, for example, getting a handle on the true state of health of the equipment, calculating the risk of impending failure, and estimating the remaining useful life. Quality estimates of necessary values cannot be obtained solely from condition monitoring data, but additionally require “event data”, such as when equipment was installed, when maintenance actions took place, when equipment was replaced, and so on. From our experience, this “event data” is frequently incomplete: missing or perhaps embedded in work orders that may not be easy to access.

Short term future with respect to CM:

As a consequence of our studies we expect that companies who seek excellence in their maintenance practices will recognize the importance of capturing critical “event data” that must be available to achieve the optimization of condition-based maintenance (CBM) decisions.

Long-term future with respect to CM:

The optimization of CBM decisions requires using mathematical models and associated software to refine the condition monitoring and “event data”. We expect such software will be developed and embedded in enterprise asset management (EAM) systems to assist maintenance and reliability professionals in their condition monitoring decisions.

CBM optimization software:

Organizations collaborating with the CBM Lab have vast quantities of condition monitoring data from sources such as oil analysis and vibration monitoring. They want to refine the data into useful information that can be used to ensure the optimization of their CBM decisions. Earlier theoretical work on CBM optimization had been completed at the University of Toronto, and this laid the foundation for the EXAKT software that has been developed in the CBM Lab. The software is used to identify the key CM signals to calculate the risk of impending failure of the equipment, and then blend in economic considerations to establish the optimal maintenance action. This action is either to leave equipment in service and inspect it at the next planned inspection time, or to replace it at a specified time prior to the next inspection. Furthermore, EXAKT provides an estimate of the remaining useful life (RUL) of the equipment. On-going collaboration with companies that support the CBM Lab is leading to continuing enhancements of EXAKT to meet their requirements associated with the optimization of CBM decisions.

[For additional information on the CBM Lab please click here.](#)