CONDITION-BASED MAINTENANCE FOR ZOOTECHNICAL FARMS

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Abstract

In the current economic crisis, reducing costs is a primary goal. The objective of maintenance is to reduce the number of unexpected breakdowns due to failures, which may be catastrophic and may cause huge loss or animal death. Many companies have shifted their maintenance programs to condition-based maintenance (CBM), which, if correctly and effectively implemented, can significantly reduce the maintenance cost by cutting down the number of unnecessary scheduled preventive maintenance operations.

Key words: condition-based maintenance, farm.

INTRODUCTION

In today's farm facilities, maintenance is one of the most costly aspects of operation and plays an important role, not only the costs of maintenance itself, but also the costs of production losses due to equipment breakdown. In order to cut the cost and increase profit margin, it is necessary to develop an optimization system to achieve the system maintainability, reliability, availability and safety at the same time.

Three major categories of maintenance strategies are used: corrective maintenance, preventive maintenance and condition-based maintenance. Corrective maintenance is in fact the traditional way in which maintenance is performed. Repair or replacement is only performed when a breakdown is detected. That will cause tremendous loses in time, profit and productivity. These losses are surpassed by the savings made in maintenance investment. Preventive maintenance is performed according on a schedule in order to prevent system breakdown. The intervals are usually based upon historical data and experience, and can be updated when more data becomes avaible. Preventive maintenance can prevent certain degrees of breakdown from happening, but extra costs and resources are involved. Condition-based maintenance makes decisions based on the current condition of the equipment. Equipment status is monitored through many outputs including temperature, force, vibration and other sources, either continuously or at predefined interval. Maintenance is then decided upon the result of the inspection. It enhanced the preventive maintenance strategy by maximizing part life utilization and minimizing the unnecessary work, and lowers the possibility of any unexpected breakdown if proper signals are monitored and proper models are used [6].

Maintenance strategy objectives are illustrated in figure 1 [2].

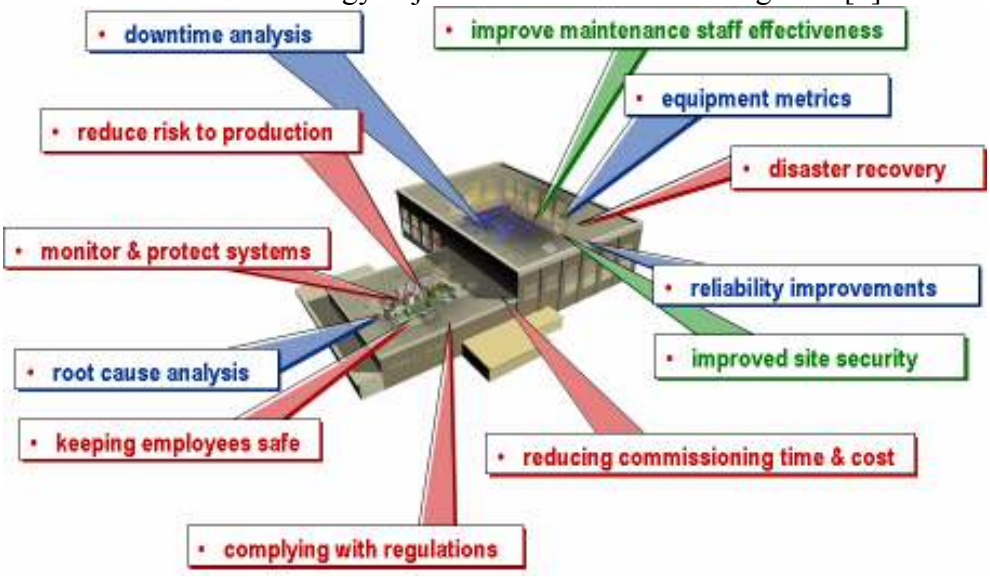

Figure 1. Maintenance strategy objectives

CBM with predictive component is based on early detection of failure as presented in figure 2 [1].

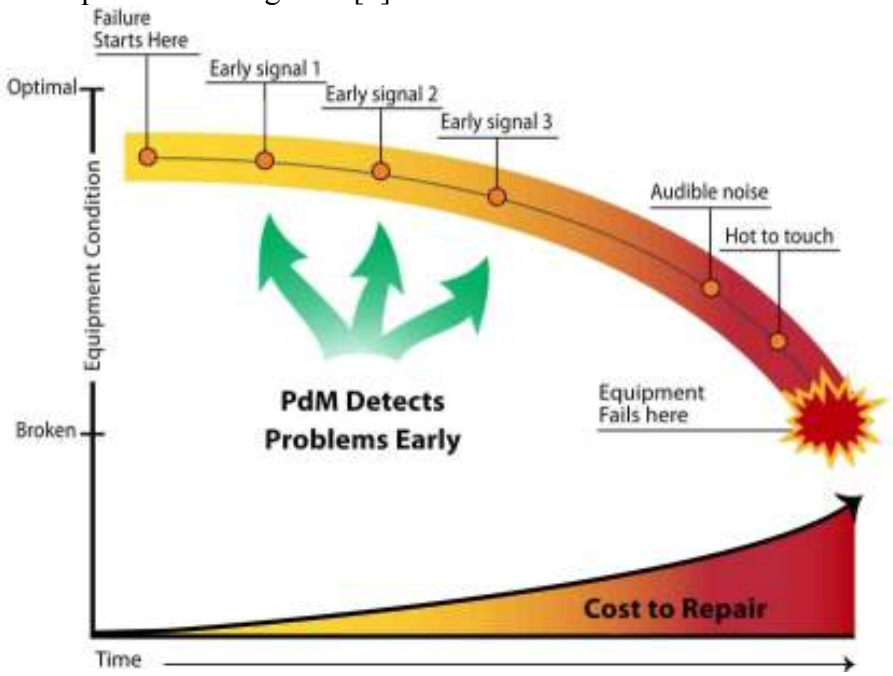

Figure 2. Early detection of failure with CBM

MATERIAL AND METHODS

The OpenO&M™ Initiative is an effort by multiple industry standards organizations to provide a harmonized set of information standards for the exchange of Operations & Maintenance (O&M) data and associated context. The OpenO&M Initiative is an open, collaborative effort composed of diverse groups of subject matter experts organized in industry specific Joint Working Groups (JWG) that are focused on enabling O&M applications interoperability for farms, manufacturing plants, fleets and facilities. OpenO&M is a virtual organization, maintained by MIMOSA, which serves as an umbrella for collaboration.

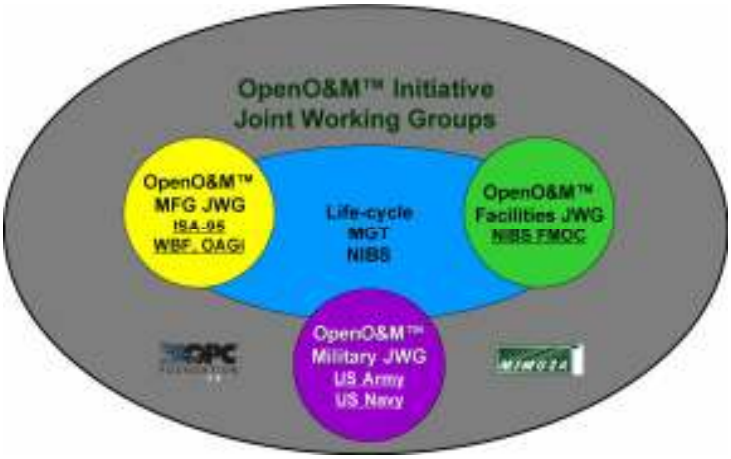

Figure 3. Current members of the OpenO&M Manufacturing JWG

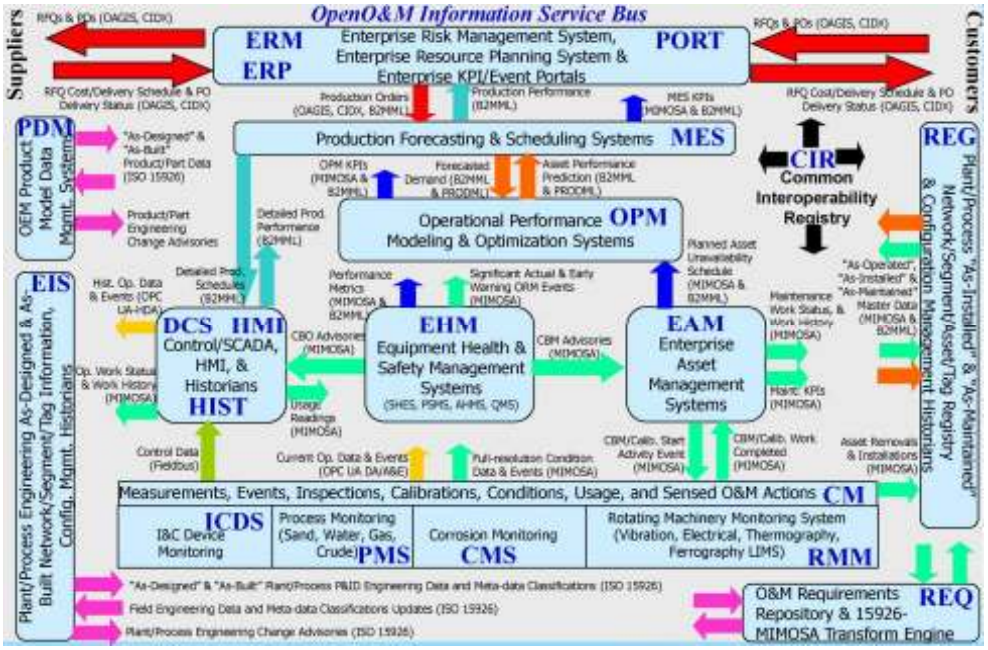

Figure 4. Condition based operations information exchanges by Mimosa

Key current members of the OpenO&M Manufacturing JWG are prezented in figure 3 [5] and include:

- MIMOSA - Asset management related information standards
- OPC Foundation - Data transport standards
- SP95 – ISA's Enterprise-Control System Integration Standards Committee
- WBF – B2MML (Business To Manufacturing Markup Language).

The condition based operations information exchanges developed with Information Bus are presented in figure 4 [5] and architecture based on CBM in figure 5 [5].

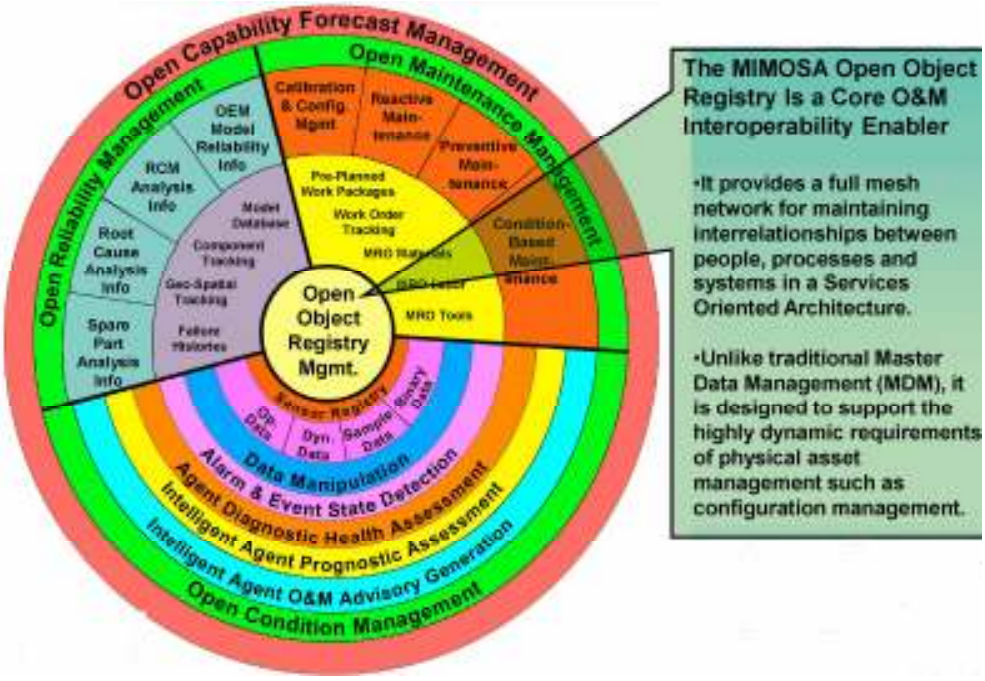

Figure 5. Architecture based on CBM developed by Mimosa

Today's used standard is ISO 13374 - Condition monitoring and diagnostics of machines. The benefits of standards based interoperability are:

- increases economic competitiveness
- compresses time to market
- reduces infrastructure vulnerability
- expands markets for companies
- decreases supply chain communication costs
- provides global access for software vendors
- lower TCO share costs.

In terms of standardization, OpenO&M is more than a reference standard, it is an implementation standard which harmonizes the standards as prezented in figure 6.

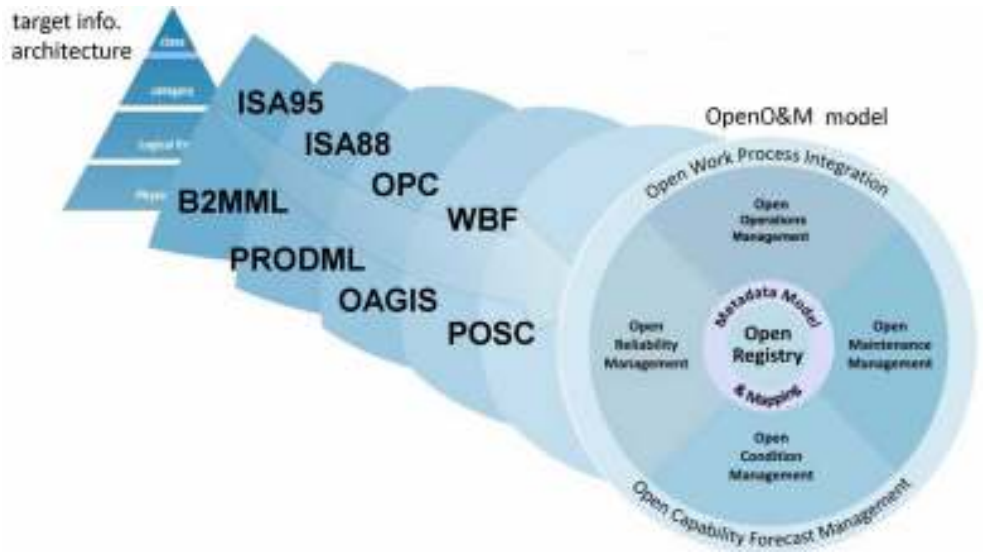

Figure 6. OpenO&M and standards

RESULTS AND DISSCUSIONS

The next step in CBM are Web-enabled systems. Web-enabled system is the fastest and easiest way to bring your real-time data onto the World Wide Web. It is a state-of-the-art component-based software product for farm data, which provide real-time data from a farm floor line into a database ultimately directly onto the web. One approach based on point-to-point Web Services is prezented in figure 7.

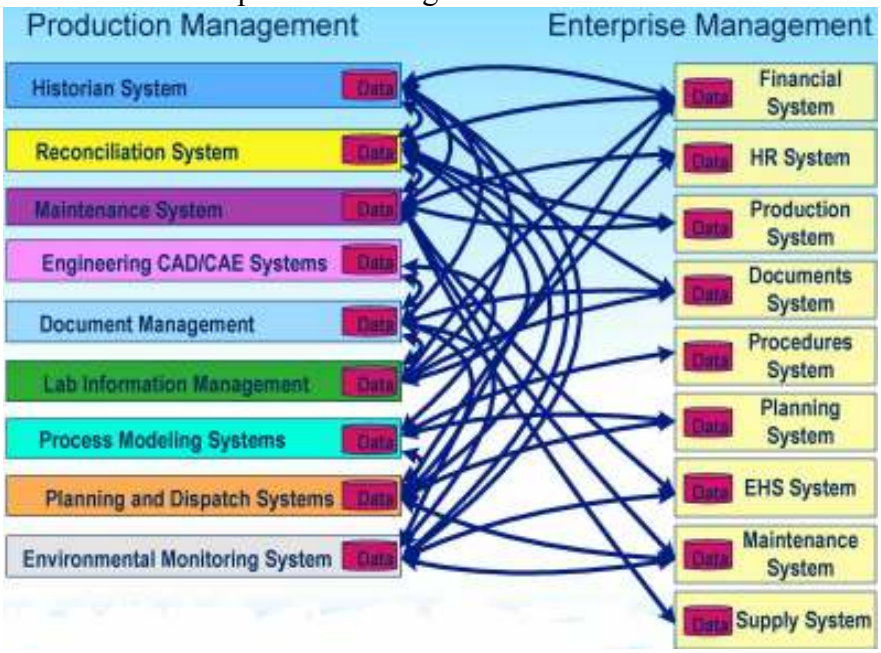

Figure 7. Web Services for CBM in zootechnical farms

CONCLUSIONS

The first impementation of CBM based on Web-Services was conducted by Suncor Energy Inc. as presented in figure 8.

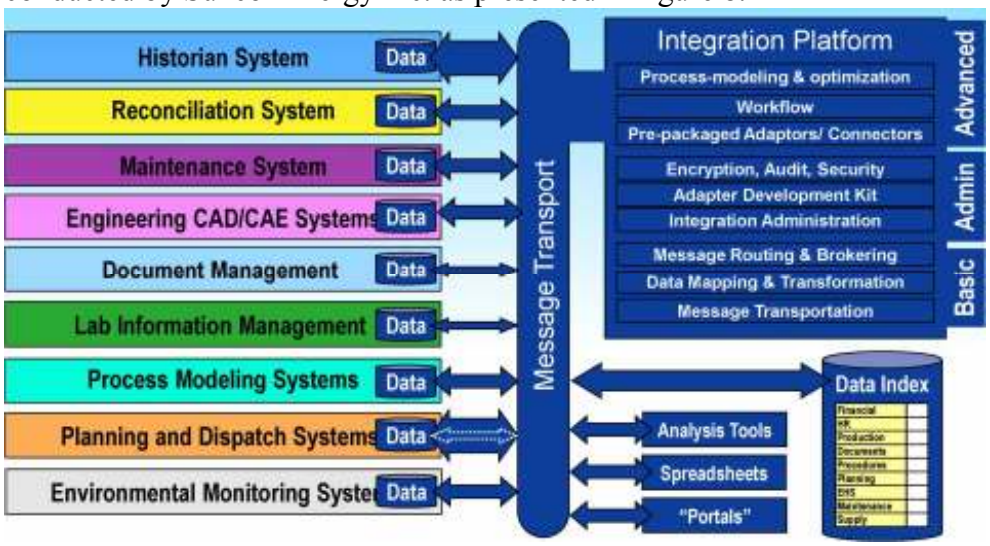

Figure 9. A coordinated approach to full integration within the enterprise

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