



White Paper

Supporting Maintenance Planning through Audits

The Why and How of Predictive Maintenance Planning

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Introduction

The primary goal in maintenance auditing is to provide an organisation with the information it needs to create maintenance programs that use available funds to most effectively meet organisational objectives.

To achieve this goal, the maintenance planning methodology that an organisation adopts must provide information to all levels of management within the organisation. To ensure consistency in the information provided, the information must be derived from one, granular, detailed data source.

Different levels within an organisation require different types of information. Strategic decision-makers require information at a global level that relates to the current state of the facilities. Senior managers require data for budgets and planning, and staff responsible for maintenance require data for purchase orders, quotations and the like.

What is a Maintenance Audit?

A maintenance audit is a rigorous and systematic method of collecting information about the maintenance requirements of the sites, buildings and rooms (spaces) of a facility.

Why do we audit? This is a very big question. We hope to provide some of the answers in this paper. Following are some high-level reasons:

1. Legislation. Many government agencies and departments are required to report on the condition of their facilities.
2. Planning and budgeting. Auditing provides the information necessary to create three-to-five year plans and budgets.
3. Efficiency. Poor performance and high levels of sick leave have been attributed to 'Sick Building Syndrome'.
4. Risk and Quality Management. For an organisation to achieve and maintain quality accreditation and manage its liabilities, rigorous and well-orchestrated maintenance methodologies must be in place.

Determining Maintenance Needs

There are currently three general approaches for determining and addressing maintenance needs.

Reactive

This methodology fixes only what is broken and nothing else. This is of particularly high risk for many organisations. If an essential building element fails, it could quite possibly have a catastrophic effect on the organisation. Further, a reactive approach doesn't address efficiency issues and provides little data for maintenance programming, budgeting and quality assurance processes.

Preventative

This methodology is based on the expected lifecycle of a building element. When the element nears the end of its expected life, it is replaced regardless of its current condition. This approach reduces the risk for an organisation as it is rare that an element will fail.

However, preventative methodologies can be very costly and does not seek to maximise the performance of an organisation's maintenance program. In addition, backlogs of unfunded maintenance work will continue to grow.

Predictive

Predictive maintenance planning is emerging as one of the most efficient methods of identifying maintenance needs. The basis of predictive methodology is to know the current condition of each element in a facility. When correctly implemented, this method produces much of the information needed to meet an organisation's maintenance planning and budgeting requirements.

A comparison of the maintenance costs using lifecycle method and condition assessment made for the purposes of the Victorian Education Asset Management Strategy suggests that lifecycle estimates for maintenance backlog was 57% higher than that determined by condition assessment.

Norman Jackson and Janet Mattiske – CIB Proceedings, Publication 253

The biggest challenge in this methodology is getting the condition data in the first place. The process of gathering the data was traditionally costly and time consuming. However, recent advances in technology and the availability of maintenance audit software and systems mean this methodology is now accessible to organisations of all sizes.

Historic Trend



Figure 2 – Historic Trend

Key Outcomes of Predictive Methodology

The first outcome of the predictive approach is reconciliation between the actual current condition of a facility (operational data) and the strategic needs of an organisation. This occurs when the data being used by strategic decision makers and the people carrying out the maintenance program is the same.

A second key outcome is that the performance standards of a facility can start to be identified and the appropriate funding can be allocated to achieve those standards. Ambiguity in the communication process between all levels of organisation structure is reduced because the data that everyone is using provides a clear demonstration of real needs.

Methods of Auditing

The quality and granularity (detail) of information gathered during the audit have a direct impact on the effectiveness of predictive methodology. There are three main methods of conducting maintenance audits: consultant's reports, condition grading and electronic data collection.

Consultant's Report

Having a consultant inspect a facility and provide a report on its condition can be a very effective means of establishing maintenance needs. However, there are two major issues. Firstly, the reports are typically paper based and cannot be used to provide data to other systems.

Secondly, and most importantly, it becomes very difficult to provide high-level summary data when the organisation has a large number of facilities. For example, an organisation may need to know how many square meters of carpet is required to replace flooring across 50 retail shops.

Condition Grading

Establishing the current condition of every element in a facility provides the information which Facilities Managers need to plan their maintenance programs.

The key problem with this method is that it still doesn't answer all the questions necessary to a wholistic approach to maintenance planning, such as:

- ▶ When do I have to do it?
- ▶ What do I have to do?
- ▶ How much is it going to cost?

Collecting this data during an inspection is very difficult without the assistance of a computer, however this type of auditing is typically performed using paper-based checklists. To provide for the entire information requirements of an organisation, the checklists have to be key-punched into a computer system to allow for analysis and reporting.

Further, the amount of reference material which inspectors need to gather all the data in the field is practically impossible to manage without a computer. The practicability of this type of audit method creates a serious compromise and directly impacts the quality and quantity of the data collected.

Electronic Data Collection

Collecting condition audit data electronically is by far the most efficient way to collect comprehensive data about the maintenance requirements of a facility. The combination of technology and a predictive maintenance methodology provides detailed, high quality information.

In recent years, the way we work has been significantly advanced by computer technology. The facilities management industry (and, in particular, maintenance planning) has been under-served by the information technology community to date, hindering advances in productivity and quality.

An organisation's audit methodology must be applied efficiently and return greater value, in terms of depth of results and cost, compared to other audit techniques and methodologies. For example, a consultant's report may only provide data to satisfy one or two levels of management information requirements. In comparison, computer-assisted audits that deliver information to all levels of management and offer significant advantages, including cost and higher quality information.

The benefits of computer-assisted auditing increase with economies of scale. Where a consultant's fees increase near proportionally to the number of audits, computer-assisted audits cost less per audit as the number of audits increase. After the initial investment in computer hardware, costs are limited to hourly rates for inspectors.

Other advantages include efficiency in data collection, administration and information distribution. If people at different levels of an organisation are able to analyse collected information and answer questions relevant to their area of responsibility, then the value of the audit becomes far greater than if the collected data only addressed the needs of a small part of the organisation.

Audit Requirements

To be useful, information collected during an audit must be consistent, complete and accurate. A well-orchestrated process and effective quality assurance are essential to collecting useful information.

Orchestration and Quality Assurance

Many organisations manage facilities that are geographically dispersed, such as universities or retail chains. As a result, it may be impractical to have one inspector perform all the required audits. Further, an organisation may have more than one facilities manager and therefore more than one method of assessing facilities. These situations make it difficult for organisations to compare facilities in a consistent manner and even more difficult to have a standardised business process to manage all facilities maintenance.

The key to addressing these issues is to have the entire audit process orchestrated by reducing the number of decisions made by inspectors and the people organising the audits. The goal is to have every audit performed in exactly the same way, regardless of the individuals involved.

Reducing the decisions to be made reduces the effect of value judgments and differing interpretations will have on the consistency of the data. In fact, the more the methodology is orchestrated, the less skilled the people involved need to be.

Well-orchestrated processes are the basis of any quality assurance program. Standards and quality measurements cannot be applied to an activity that is not carried out the same way every time.

Definitions

Definitions for condition, priority, remedial action and costings should be clearly described and associated with each element and sub-element. This will ensure that different inspectors assess every sub-element in the same way and that the assessment is relevant to the sub-element.

Element/sub-element lists ensure inspectors do not have to describe what the assessment is related to. They are also an important component of the quality assurance process - an audit must require that every sub-element relevant to an audit area is considered and assessed.

Audit Areas

Orchestrated procedures for the identification of audit areas result in consistent, repeatable audits. The manager controlling the audits must identify every site, building and room (audit area) that the Inspector is required to audit. This is usually achieved by the use of plans and a well-documented method by which a manager will identify the audit areas.

Transposition

Transposing audit data collected on paper or in reports into an information system is likely to compromise the quality of the data and therefore the entire process. Audits generate many thousands of records, and if even one or two of these records are entered incorrectly, the impact may be that many thousand of dollars are not identified or allocated properly.

A well-orchestrated process should minimise or eliminate transpositions of data, and therefore minimise or eliminate errors.

Conclusion

Results of academic studies leave little doubt that predictive approaches to identifying maintenance needs are highly valuable when developing maintenance plans. Adopting this methodology will allow decision-makers to focus their efforts on maintaining a facility for the sake of the organisation's activities rather than for the sake of the facility itself.

Information empowers people to improve the decisions that they make. The combination of information technology and predictive methodology can now provide the tools for a facility manager to confidently identify maintenance needs and disseminate this information to all levels of an organisation.

When dealing with the identification and allocation of millions of dollars in maintenance funds, there is no room for complacency. Organisations must be confident that their maintenance planning employs best practices, and that methodologies and processes can survive the most rigorous of due diligence and quality assurance audits.

By using the technologies now available to assist in predictive maintenance planning, facilities managers can use their funds to directly contribute to the profitability and overall success of their organisation.

About Hammond Street Developments

Hammond Street Developments (HSD) is an Information and Communication Technology (ICT) firm based in Nunawading, Victoria. HSD was formed in July 1996 and has developed ICT solutions for a broad range of market sectors including retail, education, telecommunication and law enforcement organisations. HSD develops innovative, tailored business solutions with particular expertise in application development, solution architecture, systems engineering and application hosting.

HSD's project experience includes developing Geographical Information Systems, Lawful Interception Solutions, Financial Systems, Facilities Auditing Systems, Credit Card Gateways and Electronic Access Control Solutions.

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