

Eliminating The Paper Checklist

Written by Jeffrey Lewis, QMS Consulting, Inc.
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Moving to an electronic version resolves problems that create a performance credibility gap.

Traditionally, paper checklists are employed to identify maintenance activities and their frequency of application. Quite often the format of daily, weekly, etc., checklists consists of the equipment identification number and description along with the required checks or activities to be performed. These checklists usually are generated from a computerized maintenance program or by prepared forms to ensure repeatability at each defined period.

The principal use of the paper checklist is to record predetermined maintenance activities at the component level. Each time the checklist is completed, the information either is keyed into a computerized system to the history file or is maintained as a record itself. In either case, the history of the executed activities may be used to trend degradation, based on the level of sophistication of the organization's management.

Many checklists are developed simply as a reminder of the maintenance on each piece of equipment, with initials or signatures for indicating acknowledgement of the complete or incomplete activity. The status of defects, corrections, or simple adjustments is usually addressed. Failed items are handled through work orders, which identify symptoms, root cause, and rectifications for history records.

The advent of electronic devices allows infrared, ultrasound, eddy current, and similar types of technologies to be used in a measurement system for condition monitoring. Trends of degradation toward failure are based on these measurements. This methodology facilitates prior knowledge of failure, thus triggering the timing of an open window for component replacement prior to failure, consequently enhancing equipment reliability. Paper checklists usually identify the appropriate medium for the applied situation.

Limits to paper checklists

However, paper checklists are limited in their execution:

- Time taken to upload to computer via keyboarding, not real time and it is not unusual for record-keeping to lag behind. It is difficult to recognize critical trends in a timely fashion.

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- Do not record the time of execution and responsibility automatically
- Take considerable time for training
- Opportunity for over or under maintenance at the point of execution
- Opportunity for error on uploading data to computerized system
- Do not provide previous records at the point of application for immediate decision making
- Can become dirty in a maintenance environment and difficult to read

Color and bar coded pictograph decals or labels at the component location can replace the paper checklist. Decals allow maintenance instruction (preventive or condition monitoring) to be demonstrated by the pictograph at the component level on the equipment. Different colors on the decals can be used to indicate the frequency of the maintenance activity.

Use of bar codes

Utilizing the concept of maintenance based on degradation management, the bar code provides the location and maintenance activity that are brought to the point of application. It is embedded in the bar code. A handheld palm device with scan features reads the bar code to provide the specific maintenance information required for the site. The scan on the bar code can project on the handheld screen the date, who, location, component, required activity, metrics, and start and complete time of the executed activity. Therefore each bar code is coded differently to reflect the data at each point on the equipment.

Palm technology in a handheld device facilitates the storage and transmission of current maintenance data when the bar code is scanned. The handheld device does not operate independently, but is tied into a computerized database for collecting data. Queries and reports formulate the data to create the information that will best serve to manage reliability at the component level and consequently for the equipment. As with any other system of its kind, the base data and format has to be developed and implemented to drive the system.

Thus the color pictograph decal provides visual information about the location and frequency to the user and the bar code facilitates the activity to be carried out. The handheld device acts as the conduit to provide the upfront activities and stored information at the point of application and the subsequent history on preventive and condition status. Together, these features (pictograph, bar code, handheld) meet the ideal requirements for the display of data, accuracy and timeliness of performance,

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and speedy history analysis for determining on-going equipment reliability at the lowest cost.

The paper checklist even with the support of a computerized system does not offer this facility. This may point to the key to a successful maintenance information system—the interface management between the computer and the equipment. This also may reduce the complications sometimes associated with the implementation of maintenance information systems.

Create work orders

In the event there are emergency failures, the bar code can facilitate a scanable work order, where rectification activities can be punched in on the handheld and uploaded to the history file. By creating a bar code electronic system for the checklist, work orders can be directed by bar code technology and information on repairs can be directed to and from remote locations.

By eliminating the paper checklist, the requirement for keyboarding information into the system also is addressed. This facility is particularly useful for offsite activity, since information that must be centralized from differing locations, such as in the case of utilities and transport, can be scanned and uploaded via modem (or in the near future by wireless), thus increasing efficiency and effectiveness, and lowering costs associated with manual transmission of information. More importantly, it reverses the negatives as previously described for paper checklists.

The decal/bar code system provides the following advantages to the end user:

1. Presents maintenance activity at the required point of application.
2. Decal color clearly defines the frequency of application, making training easier.
3. Decal allows each point on the equipment to separately define the preventive and condition monitoring activity.

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4. Decal changes the focus from the equipment specialist based on defined activities at the point of application to maintenance for reliability.
5. Encourages proactive data input at the initiation of the system.
6. Missed maintenance activity will show up if not scanned.
7. Items will not be scanable if not due for the activity stated on the decal.
8. Records can be updated immediately without the use of a keyboard, reducing the time for doing so compared with a paper system that encourages backlog of information for decision making.
9. Practically reduces the cost associated with administering the maintenance information system, as time reduced for keyboard activity.
10. To develop the bar code system directs that component identification be known as part of the system. Consequently, purchase order generation for spares can take place in a timely fashion.
11. System if properly managed will reduce the opportunity for cascading equipment damage generally caused when consumable spares (bearings, belts, etc.) fail.

New opportunities

These new tools open new opportunities in preference to the paper checklist, when reliability is the objective of the maintenance strategy.

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- Shifts the need for ownership of a maintenance computerized system or the need not to have any system at all. Current technology can facilitate accessing information via an Internet platform that is private and secure. The handheld enables the download of proactive activities and upload of historical data for processing and analysis, once the bar code system is in place.
- Requires such little training that where maintenance skills are in short supply, instructions at the point of execution are clearly distinguished. Only relevant records or activities can be triggered by the appropriate bar code, reducing the opportunity for error.
- Facilitates the characteristics of a quality management system for reliability assurances.
- Facilitates more accurate maintenance costing and budgeting, along with increased responsiveness.
- Identifies missing maintenance activities, if any, based on decal location and any root cause determination.
- Encourages the determination and application of engineering principles to resolve the potential causes of degradation and consequently to determine a failure threshold level based on a condition monitoring medium.
- Facilitates all stakeholders' (repairers and suppliers) access, reducing the retrieval time for spares.

Looking ahead, as organizations outsource more activities and retain control over their core production activities only, the system described will provide critical advantages. Contractor maintenance costs can be more accurately tracked, controlled, and consequently managed because the evidence of performance is embedded in the bar code. On the other hand, contractors who provide maintenance services can sharpen their performance because they have real time data, since they can trend conditions toward failure and manage resource allocation for repairs and service. Thus moving to an electronic checklist resolves the problems that create a performance credibility gap when a paper checklist is used. **MT**

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