As seen in Maintenance Technology Magazine-

Using MTFB to Determine Maintenance Interval Frequency Is Wrong

Collecting failure data to calculate Mean Time Between Failures (MTBF) for the purpose of determining accurate maintenance task intervals is wrong and should not be done. MTBF is a measure of reliability. It is a measurement of the time between two successive failure events. Failures predominantly fall into two categories, age related and random failures. Typically age related make up less than 20% of all failures while random make up 80% or more.

For **age related failures**, it is not MTBF, but rather useful life that is significant when attempting to determine maintenance task intervals to avoid failures. For an age related failure there is a point during the course of the equipment's age at which there is a rapid increase in the equipment's conditional probability of failure. The measurement between the point when the equipment is installed and the point where the conditional probability of failure begins to sharply increase is the "useful life" of the equipment. It is different than MTBF. The MTBF is defined as the average life of all the population of that item in that service. If we want to prevent a failure from occurring, using traditional preventive maintenance, we would intervene just prior to the end of the equipment's "useful life", not just prior to MTBF. Incorrectly using MTBF to determine the preventive maintenance interval will result in approximately 50% of all failures occurring before the maintenance intervention. In addition, approximately 50% of the remaining components that have additional life will receive unnecessary maintenance attention - in both cases, not a very effective maintenance program. Therefore we need to use "useful life" and not MTBF, when looking at age related failures and determining the frequency of preventive maintenance tasks.

Random failures make up the vast majority of failures on complex equipment as research has shown. For example, consider the failure of a component. Assume that each time the component failed we tracked the length of time it was in service. The first time the component is put into service the component fails after 4 years, the second time after 6 years and the third time after only 2 years. (4 + 6 + 2 = 12 / 3 = 4) We know that the average lifespan of the component is 4 years (its MTBF is 4 years). However, we do not know when the next component will fail. Therefore we can't successfully manage this failure by traditional time based maintenance (scheduled overhaul or replacement). What is important, in this case, is to know the condition of the component and the life remaining before failure, in other words how fast can the component go from being OK to NOT OK. This is sometimes referred to as the failure development period or potential failure to functional failure (P-F) interval. If the time, from when the component initially develops signs of failure to the time when it fails, is 4 months, then the maintenance inspections must be performed at intervals less than 4 months in order to catch the degradation of the component condition. The inspection must also be performed often enough to provide sufficient lead time to fix the equipment before it functionally fails. In this case, we might want to schedule the inspection every 2 months. This would ensure we catch the failure in the process of occurring and give us approximately 2 months to schedule and plan the repair.

Using MTBF to determine maintenance interval frequency is not correct. Failure prevention requires the use of some form of condition based maintenance at appropriate inspection intervals (failure finding, visual inspections and predictive technology inspections). My experience has been that for every $1 million in asset value as many as 150 condition inspection points must be monitored. Gathering and analyzing condition monitoring data to identify impending failure for $billions of assets is practically impossible without the use of reliability software. Reliability

software is imperative to understanding the failure development period and required to help you refine the frequency of maintenance inspection tasks.

The reliability software you choose should be able to:

- collect equipment condition data from controls, sensors, data historians, predictive maintenance technologies and visual inspections
- use single or multiple data points to analyze the data, applying defined rules and calculations to get a true picture of the equipment health
- perform the calculations and conduct the analysis automatically
- present results visually through flashing alarms and trending graphs, identifying potential failures and recommending corrective actions - before the equipment fails

Reliability software can further help as it is now able to correlate all data into one information system and turn the data into actionable knowledge that ensures the right work be done at the right time to optimize asset performance and extend asset life.