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### **Don't try to manage maintenance by looking at MTBF!**

Most readers will recognise MTBF as being the short form of “Mean Time Between Failures”. It looks at the number of past failures for any piece of equipment and the time between them, to create a ratio that describes the number of years/months/days between each event. The calculation can equally be applied to individual components or indeed, the entire equipment package.

As an example, consider a gearbox that fails after 3 years in service, then fails again after a further 2 years. The MTBF would be 2.5 years (averaging those two durations).

So why can't that data be used to predict another failure after a further 2.5 years? Well ..... it can, but not with very much confidence and only with the risk of seeing some disturbingly large variations!

**Firstly**, common sense tells us that these two failures might have been caused by very different circumstances, perhaps with a sheared gear wheel in one case and a bearing seizure on the second occasion. If those have each happened just once in the past, why on earth would we conclude that they help us to predict the next failure interval? For all we know, the next failure of the gearbox might be due to seizure through a total loss of lubricant!

Should there be any time relationship between a broken gear tooth; a seized bearing and total loss of lubrication? Even if we considered the gearbox as one whole package that fails at some intervals of service for reasons unknown, why should we think that different reasons for failure within it will define anything about when the next happening occurs? Perhaps the bearing seizure might be used as a means of predicting when the gearbox might suffer a further bearing seizure; however it's just as likely that the gearbox will next fail in service for an unrelated reason before anything to do with a bearing.

**Secondly**, MTBF calculations assume that a system (or a component within the system) will fail at an interval related to age. Yet in real life, age-related failures typically make up less than 20% of all equipment failures, with the rest (80% or more) made up of random failures.

### **Don't try to manage maintenance by looking at MTBF! (cont'd)**

Many people are unaware of this. It originates from the findings of reliability research that formed the logic behind RCM (Reliability Centred Maintenance). As an example, consider roller bearings. All bearing manufacturers provide technical data and amongst that, their operational data will infer a figure for expected life .... But look more closely and you'll realise that roller bearings don't have a life – they fail randomly. So how can a first failure provide a significant inference about when the next failure might occur?

**Thirdly**, a gearbox is like any other piece of equipment in that the failure of (say) a bearing infers total failure to rotate and so, total stoppage of the unit until repairs are complete. In reality, that failed bearing was detrimental for some time before it seized, perhaps slowing down the equipment or (more likely), absorbing ever more electrical power so that the equipment cannot operate at optimal conditions. There will have been a point at which there was a rapid increase in the equipment's conditional probability of failure and that point was associated with abnormally increasing costs (even when it goes undetected). Pragmatically then, the point where the conditional probability of failure increased sharply was a far more accurate mark of the end of the equipment's "useful life".

So that is NOT the same as the MTBF. In traditional preventive maintenance, we should expect to intervene just prior to the end of the equipment's "useful life", not waiting until just before the MTBF.

If MTBF were used as the basis of a preventive maintenance interval, about 50% of all failures will occur before maintenance intervention. What's more, about 50% of the remaining components with additional life will receive unnecessary maintenance attention! In both cases, that's really not an effective maintenance programme.

So put the focus on "useful life" in the future, not MTBF. But also bear in mind that it's likely to be less than 20% of failures which are age related. MTBF is simply a measure of reliability. It will never be a reliable factor in defining the service life of any equipment!

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### **Introduction to RCM2—3 day course**

RCM2, Reliability Centred Maintenance is a technique that will bring you greater safety and environmental integrity, improved operating performance, greater cost effectiveness and longer useful life of your equipment. Our 3 day intensive courses are available on the following dates:

- ◆ **15th to 17th February 2011—A FEW PLACES REMAINING**
- ◆ **12th to 14th April 2011**

If you would like to attend one of these courses please contact Sarah Chalmers (Business Development Manager) on 07773 670163 or email [info@globalreliabilitytraining.co.uk](mailto:info@globalreliabilitytraining.co.uk) to request a booking form. For more details, please visit our website [www.globalreliabilitytraining.co.uk](http://www.globalreliabilitytraining.co.uk)

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