Criticality Assessment

It is always a good idea to carry out a criticality assessment on every piece of kit on your plant. This will give you an indication of which items of plant are most critical to your process. Usually, this helps determine which items of plant should be covered on a condition monitoring program, however, even if you are intending doing CM in house and have the time and resources to cover every item of plant equipment, it is still a good idea to do a criticality assessment so everybody involved on your plant knows how crucial any single item of plant is to the process and how quickly to act when the CM technician diagnoses an impending failure.

In order to do this, you need to determine the consequence of an individual item failing and the likelihood of that happening. The criticality rating is the product of these two factors. There is a spreadsheet which can be downloaded from our website www.efftek.co.uk which allows you to enter values and calculate a criticality rating for your own plant items.

In order to determine the consequence of an item failing, it is necessary to look at what impact it would have on health, safety and the environment (SHE), how production would be affected and most importantly, how long production would be affected. These are scored as follows;

Impact on SHE	0 – no perceived risk
	1 – moderate risk, no hazardous substance escape
	2 – significant risk, some hazardous substance escape
	3 – High risk, catastrophic hazardous substance escape
Impact on production	0 – no impact , fully spared unit
	1 – minor effect, some production interruption
	2 – serious effect, partial production loss
	3 – severe effect, total production loss
Repair time	1 – less than 4 hours
	2 – 4 to 12 hours
	3 – 12 to 24 hours
	4 – 1 to 3 days
	5 – greater than 3 days

The scores for the impact on SHE and production are squared to add a greater bias to those units whose failure would have more serious effect. The factor for the impact on SHE is added to the product of the impact on production and the repair time. This gives a consequence of failure value.

The likelihood of a failure is determined by looking at the reliability of this or similar items in mean time before failure (MTBF), how the item is used – continuous or batch and the actual duty compared to the rated duty and a factor for stress – is the product inert or harsh, is the environment normal or harsh and is there any vibration from external sources (this could lead to premature failures such as false brinelling of the bearings whilst the item is not even in use) These are scored as follows;

Reliability MTBF	1 – very high, greater than 48 months
	2 – high, 24 – 38 months
	3 – medium, 12 – 24 months
	4 – low, less than 12 months
Usage (mode)	1 – continuous
	2 – intermittent
Usage (rating)	1 – less than 90% FLR
	2 – greater than 90% FLR
Vibration sources	1- no
	2 – yes
Service conditions	1 – inert product, normal environment
	2 – harsh product, normal environment
	3 – inert product, harsh environment
	4 – harsh product, harsh environment

To determine the likelihood of failure factor, the usage mode, usage rating and vibration source factors are multiplied together and added to the reliability and service condition factors.

The overall criticality factor is given by multiplying the consequence and likelihood factors.

The results are comparative and give an indication of the relative criticality of each individual item on your plant hence no guidelines can be given as to what values are deemed critical etc.

Steve Ferry

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