

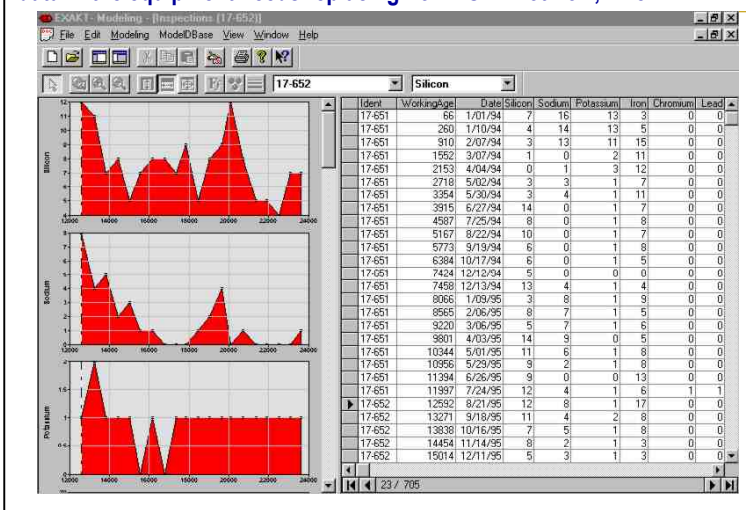
<EXAKT>™ is a sophisticated tool to help you make better decisions from condition monitoring readings and reduce the data capture workload. It is particularly appropriate if you already have a condition monitoring programme underway, and have already established a significant history of condition monitoring readings, alongside your normal maintenance records.

Many asset intensive organisations already have condition monitoring programmes in place, taking routine measurements of such things as temperatures, pressures, vibration or oil analyses. The theory behind this is straightforward, and well intended: if you can identify an incipient or potential failure (PF) before it becomes an actual or functional failure (FF) in sufficient time to allow an intervention which avoids the failure occurring, it is likely to represent the most cost effective maintenance strategy.

However, in reality, this simple picture is often not found in practice. Instead, we are

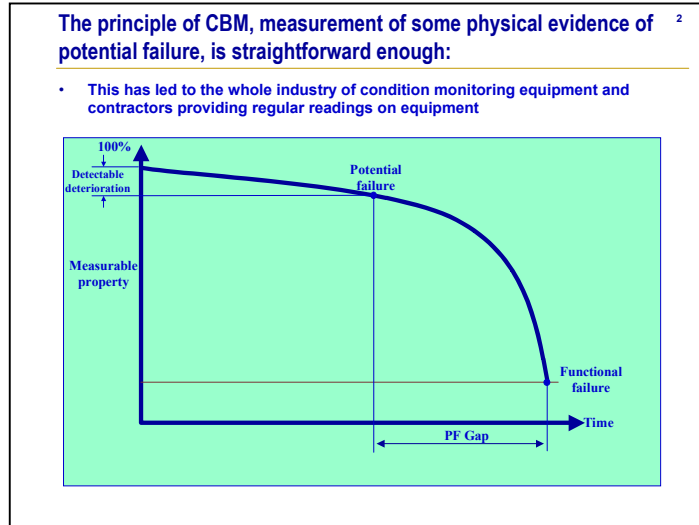
frequently dealing with a number of simultaneous readings. For example, vibration readings of just a single point can include readings at a number of frequency bands in three orthogonal directions, so it is easy to get 21 readings for each point, none of which follow a

But the reality is seldom so straightforward: How do you decide from this data if the equipment needs replacing now? Or if not now, when?



smooth trend over time, and where some are increasing whilst others are decreasing. Likewise, oil analysis readings may provide figures on a range of contaminants, which go up or down in ways which can be hard to identify a meaningful pattern, as illustrated in the diagram.

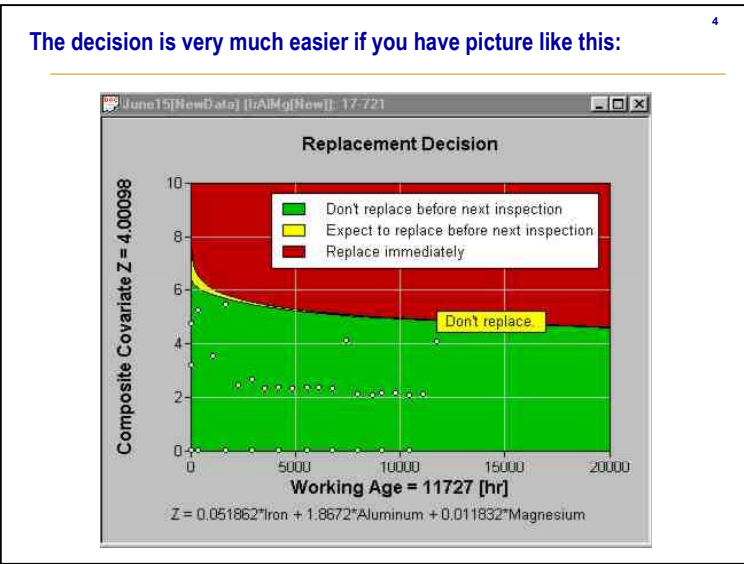
In these circumstances, it can be hard to decide on the basis of just the latest set of readings what, if any, corrective or preventive intervention should be made. Should you err on the safe side, and shut the plant down, losing valuable production in order to avoid possible damage to the equipment? Or should you keep the plant running, but risk potentially catastrophic failure, which will then incur



What is <EXAKT>™ ?

not only extensive downtime, but possibly a more expensive repair as additional damage may have been done during the failure? And who should take these decisions – can you trust your technicians with these decisions, or must you consume the much more expensive time of your best technical experts? And even when the experts look at the picture, are they doing any more than taking an educated guess? Do they have the tools, or the knowledge, or the data, or the time, to carry out a quantified analysis to deliver the optimum conclusion for your own particular business?

How much easier and better it would be if, for each of your critical assets, you were able automatically to produce



a simple picture like that shown here, which takes into account the history of your particular equipment, identifies which of the many readings you take are actually the critical few, and from an understanding of the cost of downtime and the cost of repair calculates the optimum decision for you at each reading. This picture comes from <EXAKT>™, a system which brings analytical rigour to condition monitoring management, allowing you simultaneously to improve your decision making whilst reducing your workload. In the picture above, the set of twenty-odd oil contaminant readings have been reduced to the critical three (in this case iron, aluminium and magnesium), and the relative

importance of those has been calculated, to permit the derivation of a single number (a “compound covariate”) which can then be plotted on the red-amber-green graph to give an answer as simple to understand as a set of traffic lights. In addition to this simple to interpret picture, the system can give you a quantified probability that the item in question will not fail before the next inspection is due, as shown in the table.

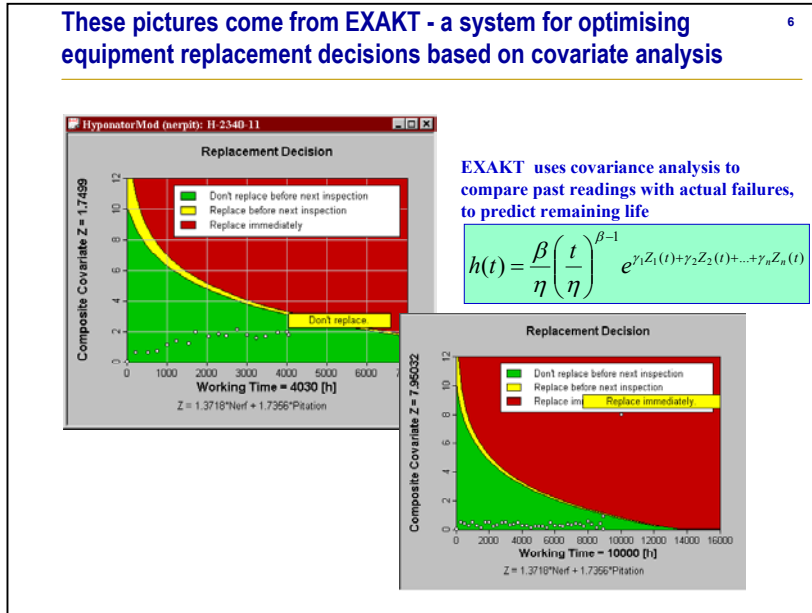
...and some quantified data on the probability of future life: 5

Inspection Interval = 30 days

	VEL#A Age 0 to 180 (Days)	0 to 0.1	0.1 to 0.15	0.15 to 0.22	0.22 to 0.37	Above 0.37
Very Smooth	0 to 0.1	0.575373	0.224181	0.145181	0.0405538	0.0147309
Smooth	0.1 to 0.15	0.205868	0.249818	0.330898	0.137414	0.0760018
Rough	0.15 to 0.22	0.0554257	0.137583	0.37788	0.229398	0.199714
Very Rough	0.22 to 0.37	0.0128519	0.0474217	0.190398	0.242338	0.50699
Failure	Above 0.37	0.000479881	0.002696	0.0170385	0.0521135	0.927672

What is <EXAKT>™ ?

The way that <EXAKT>™ works is through a detailed statistical analysis of your past records of condition monitoring readings, and of the associated history of maintenance work done, including the actual faults found on each occasion. By comparing these two sets of data, the system identifies the relevant covariates, and also identifies the Weibull parameters for the equipment, to indicate how the probability of failure varies with age, independent of the monitored condition parameters. This age related failure probability is what gives rise to the downward slope of the green / amber / red boundary. Additional information is then fed in on costs of downtime and



repair, to allow the specific recommendations to be produced.

The sequence for setting up <EXAKT>™ is shown diagrammatically here, with a sequence starting with preparation of the data to feed into the system. From that, the Weibull Proportional Hazards Modelling is carried out, to give an initial model on which more detailed statistical modelling is then performed. This includes an analysis of the costs, the optimum replacement policy and the sensitivity of the solution to the hazards involved. Once this has been carried out, the system is able to give straightforward and very simple answers to all staff involved, down to the front line technician taking the readings.

<EXAKT>™ has been used successfully in the rail, steel, mining, petrochemicals, food and drink, nuclear and electricity generation industries to give significant benefits. See if it can do the same for you.

