



Case Studies

Refrigerated Transport Co links CMMS & RCM to analyse their Turbo problem.

SUMMARY:

RTC's business has been hampered by failures of key truck components. Using REWOP, OMDEC's reliability software, RTC was quickly able to extract data from its Fleetmex vehicle maintenance system to show the link between their turbo impeller failures and a slow aging process. Further condition analysis is underway to extend this early diagnosis to an accurate prediction of failure dates.

BACKGROUND AND OBJECTIVES:

RTC's core business is the "on time, on temp" delivery of frozen and refrigerated foodstuffs on the 8000 km round trip from Perth to Adelaide to Darwin. These huge distances across the Australian outback place a huge demand on truck reliability – as a recent towing bill of \$14,000 shows. Together with their lubricant supplier, and OMDEC (a Canadian company specializing in reliability), RTC sought to "improve reliability and reduce costs safely." More specifically, the trucking company was seeking a way to better use the historical data from their Fleetmex vehicle maintenance system plus their current knowledge of the fleet to improve the quality of their maintenance, to predict and reduce breakdowns and to control costs.

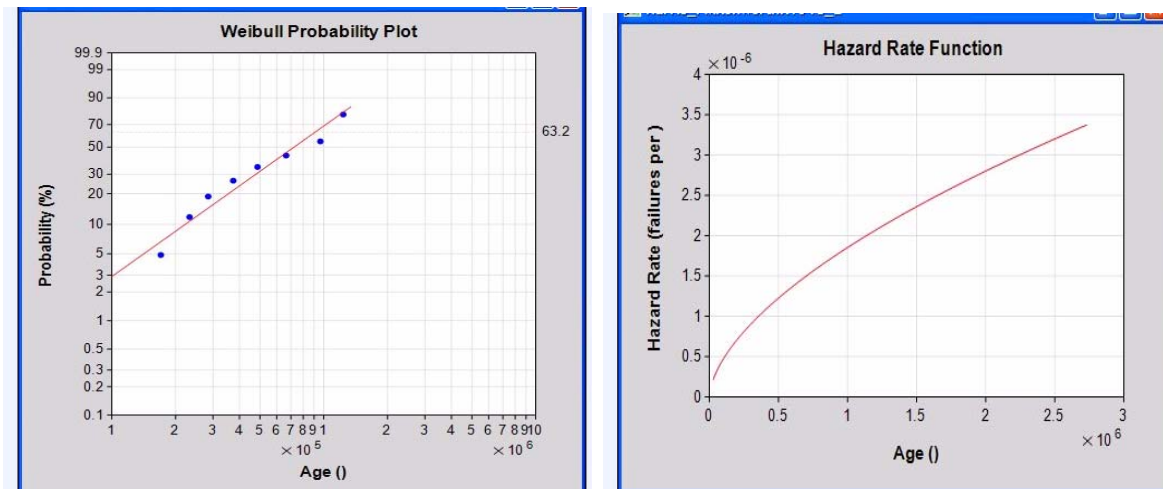
METHODOLOGY:

RTC soon realized that improving the quality of the data on which the analysis depended was key to an effective solution. To help with this, they brought in OMDEC's software package REWOP (Reliability Engineering Workbench Optimizer), together with OMDEC's experience in reliability. REWOP is a software tool which creates a reliability analysis knowledge base by combining key historical data from CMMS and EAMs, current condition data from CBMs, and information about failure expectations from RCM.

Step 1 was to integrate REWOP with the Fleetmex system. This proved to be very simple – and as an important by-product, the Fleetmex Work Order was modified to collect two key data elements. These were the type of failure (using the RCM concept of potential failures, functional failures and suspensions), plus a cross reference to the RCM database record. The absence of a solid and current RCM database did not invalidate the process; the project team simply used REWOP to build and update the RCM database – thus embodying Living RCM.

Step 2 was a hands-on training session involving mechanics, maintenance supervisors and the manager of the Fleetmex system. Lasting less than a day, the training emphasized practicalities – defining equipment functions, functional failures, effects etc – the same concepts that are familiar to RCM users. Work orders also need to be identified if they are "significant" – ie including data contributing to the creation of the reliability knowledge base. The test of significance is also borrowed from RCM – do the consequences have hidden, safety, operational or high cost non-operational impacts.

Step 3 was to apply the training and the software in a live reliability study. RTC's Maintenance Supervisor, had identified a re-occurring problem with the turbo-charger impeller on their Kenworth tractors. Using REWOP and Fleetmex, he extracted the relevant historical work orders, and added in the event type (functional failures in this case) plus the RCM record number from a hot link search to the RCM database. Next came the creation from REWOP of the events table – the knowledge base used for the reliability analysis. Several reliability analysis tools were used to produce and validate the conclusions – Pareto, Jack-knife, Weibull, Exakt. Of these, the clearest demonstration of the results came from the Weibull analysis:



The Weibull probability plot in the left chart shows how closely the experienced failures follow a straight line. Converting to the Hazard Rate function in the right hand chart, we can see the clear relationship between age and failure. However the statistics behind the analysis show that there is sufficient randomness around the age-failure correlation, that a simple time-based replacement is not financially recommended. Instead, RTC is now taking the next step – evaluating various condition data to draw a predictive relationship with the failure date.

RESULTS:

Two very significant results can be directly drawn from this project:

1. The turbos exhibit a clear pattern relating failure to age; however while the general relationship is proven, further analysis is required to provide high quality predictability.
2. Extracting data from standard work orders to use as the basis for reliability analysis was easily accomplished using REWOP – without which this initial analysis would not be feasible.

NEXT STEPS:

Based on the success of this project, RTC's Management is keen to extend the system use to more accurately predict failures, and then examine other failures such as brakes, steering and wheel bearings. Specifically, RTC wants to further analyse the data to see if a predictive correlation can be drawn between engine conditions (such as the results of oil analysis, running temperatures etc) and the incidence of failure. This will enable them to dispatch their trucks on the cross-country run with a higher level of confidence in their promise of "on time, on temp".

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