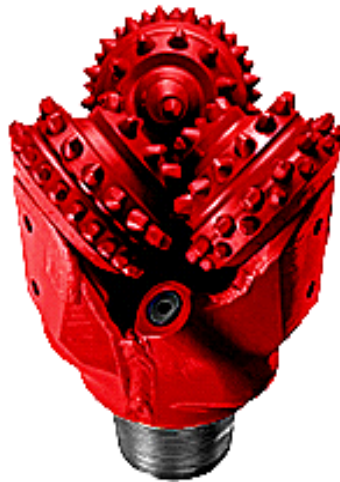


Seal Reliability Analysis Tool

The Problem

The type of bit used for drilling the harder rocks in an oil well is typically a roller cone bit. This consists of three cones, with independent bearing supports, that roll over the surface of the rock and cut by the action of crushing from the inserts set into the cones. Considerable load is required for cutting and this has to be carried by the bearing. Temperatures can be high as is the surrounding fluid pressure. Strong vibration can also contribute to an extremely hostile environment in which to operate. Protecting the bearing surfaces is critical to the integrity of the bit and therefore the reliability of the seal is of paramount importance.



Special Points of Interest:

- Development of analysis tool as an Excel macro
- Signal Processing to aid data interpretation
- Graphs allow for ranking of bit designs
- Tool useful in sales and marketing as well as development

Our client carries out a program of continuous improvement of seal design based on field performance. Feedback is available on accumulated drilling time and on the condition of the seal at the end. Transforming this data into a quantity that measures the seal reliability in a way that can compare designs is important in the development process.



The Approach

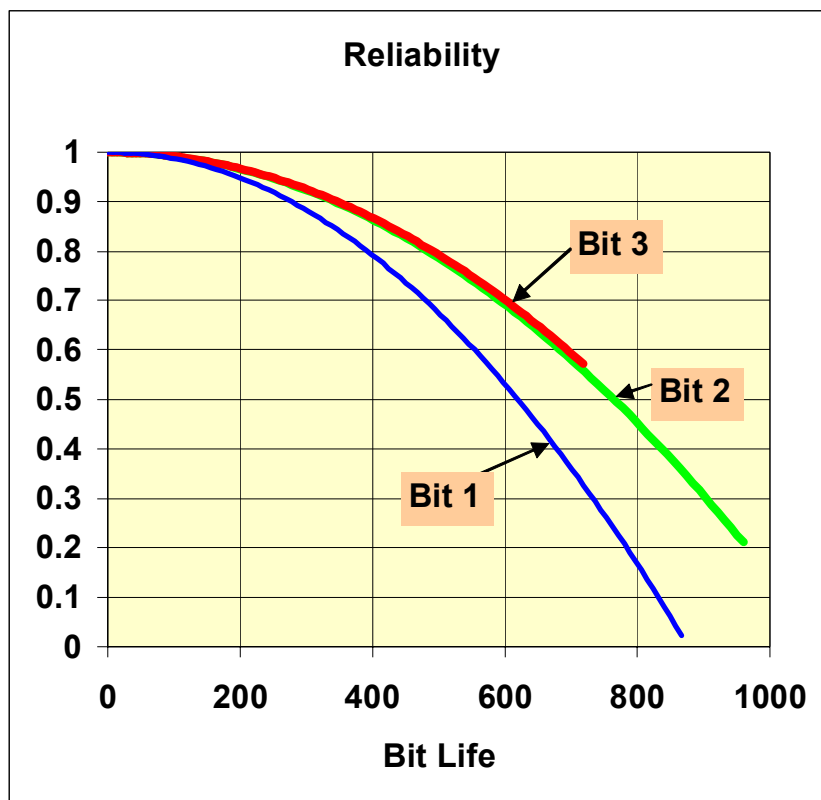
Recognised approaches to reliability analysis already exist and can be applied directly to the measured data. Without some pre-processing, however, the spread of results makes interpretation

almost impossible. Fundamentally, the problems arise because of the relatively small set of data that is available and the widely varying conditions during the life of the bit.

A method was required that would allow any user to extract the essential information about reliability from the available inputs without relying on specialist skills. Eatec has extensive experience in signal processing techniques and was able to develop a new procedure to derive the reliability curve in a form that would be easy to interpret and use.

The client required the output to be presented in graphical and tabular formats in the Excel spreadsheet where the raw data was recorded. Eatec's response was to provide an analysis tool, written in Visual Basic, and embedded in the spreadsheet as a macro. In this way, the reliability analysis could be initiated through a customised button on the Excel toolbar, and the user guided through the

data selection and presentation options without being an expert in the processing techniques involved.



The Results

Output from the analysis tool can be displayed as a graph of reliability against bit life. This information makes the task of comparing the reliability of different bits much easier than would be possible from the raw data.

The Outcome

The reliability information output by the analysis tool has provided our client with a technique for comparing the performance of different bits, important in the process of continuous development

and improvement. It can also be used to demonstrate to purchasers of the bits that the products can be expected to have a superior seal life.

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