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Preprocessing of Offshore Platform Integrated Marine Monitoring System Data: What to Do With Unusual Values or Trends?

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Abstract

Full-scale measurements provide indispensable information for validating behavior of an offshore oil platform; however, they often contain some observations that deviate from a majority of other values. This paper addresses the challenge posed by such data. Specifically, the paper discusses measurements obtained by offshore platform integrated marine monitoring systems such as metocean data, GPS data, and structural data that at a glance have unusual values or trends. In each case, a solution for how to treat unusual values is presented. The paper discusses some unusual episodes in full-scale measured data and suggests possible treatments for such unusual values. Proper treatments of the measured data can help marine assurance engineers to make right decisions, avoid possible damages to the system, or even a shutdown of the production due to faulty alerts.

Introduction

Measured data that contain unusual or unexpected values cannot be used directly in automatic data analyses and results interpretation because the values could be erroneous for a variety of reasons. Detecting and understanding data errors and “rare” event syndromes are particularly important when statistical techniques are applied to the measurements. If data are used unconditionally, the calculated statistics may be biased. It is important to differentiate between errors in the data and unexpected values that are products of real but rare events. It is unquestionable that interpretation of rare events is a challenging task, particularly if no numerical simulation or model test results are available.

It is common practice to validate the most recent measured data by comparing it with the previously measured data under similar conditions.

When previous measurements are few, or simulated results are not available, unbiased techniques for detecting unusual values or trends in the data, such as Artificial Neural Networks (ANN) and Kalman filters are useful additions to common statistical trend analyses.

Unusual data need not always indicate a platform integrity failure. Rather, they may originate from instrumentation failures. For example, a sudden “jump” in the GPS data can indicate an instrumentation issue as simple as a change in satellite constellation or a change of atmospheric conditions. On the other hand, the “jump” can indicate a sudden drift of a platform due to breakage of a mooring line. The latter is a real event that indicates a serious platform integrity issue requiring immediate attention. An ability to differentiate between the two is essential for deciding on a proper course of action.

This paper discusses some unusual episodes in full-scale measured data and addresses possible treatments for such unusual values. Proper treatments of the measured data can help marine assurance engineers to make right decisions and to avoid possible damages to the system or even a shutdown of the production due to fault alerts (Prislín, *et al.*, 2005).