

Is safety performance a matter of luck or judgment?

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AS WITH SO many other industries, the oil and gas sector relies largely on safety performance indicators that are based on recording the numbers of injuries.

But how accurate are these measures in assessing the inherent safety and integrity of a drilling operation and is it possible that good safety results can, to some extent, be achieved by “being

assessment between 1998 and 1999, adoption of the Safety Culture Maturity Model concept in 2000 and 2001, as defined by the UK Step Change Team’s *Changing Minds* publication, and a follow-up safety culture assessment by an internationally respected industry consultant in 2002-2003.

Many of the concepts had already been used, such as the KCA DEUTAG Toolbox Talk and Risk Identification Card (TRIC), which was developed in 1997

part of its incident investigation process.

The matrix allows the assessment of the real potential of an incident to have caused injury, loss or damage and the number of people who could have been affected, rather than solely the actual outcome on that day.

Asking “what may have happened” or, in other words, what is the worst likely outcome, is often more helpful in understanding the real significance of an incident.

Where KCA DEUTAG’s use of the potential matrix differs from similar tools is that it is quantified (i.e. each cell is ‘scored’ with a numerical potential matrix factor).

This allows use of the matrix beyond the case-by-case assessment of incident severity.

Scores ascend geometrically so that a potential fatality is assigned a far higher number of points (1,000 points) than would be a potential minor injury (20 points).

The total number of points accrued for a rig is then calculated as a frequency per 200,000 man-hours.

The Potential Matrix Frequency Factor (PMFF) is of greatest value when compared with the traditional injury frequency rate (TRCF).

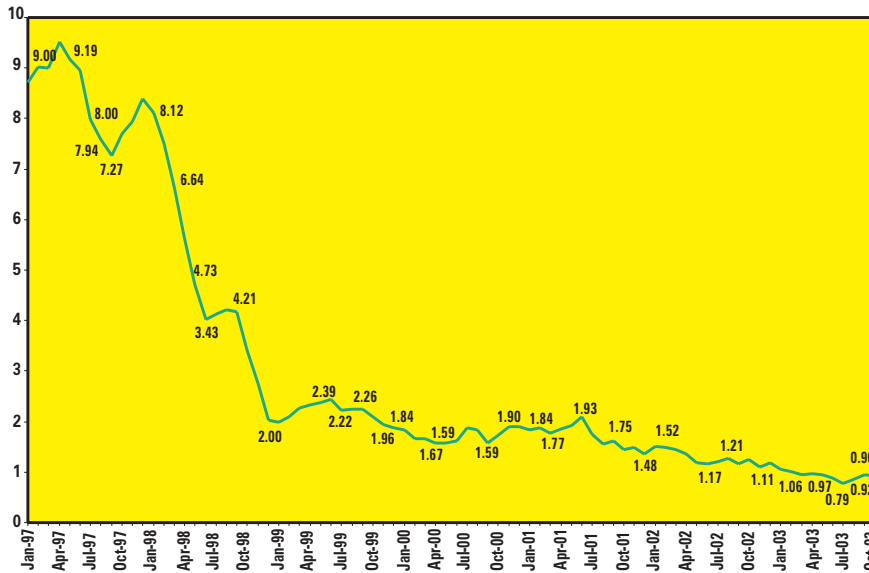
FRAGILITY INDEX IN THEORY

Where there is a low TRCF and a low PMFF there is some evidence that the incidents occurring are being controlled to the extent that their outcome could not seriously injure someone.

For example, on rig “A” if a heavy lift should fall but entry to the area below is an exclusion zone with barriers, as part of the company’s management controls, then the worst that could happen is equipment damage, which is considered low potential.

Whereas on rig “B”, if people were working in the area where the dropped object landed, it is a matter of luck that it did not kill someone and so should be treated as a high potential incident.

Monthly Accident & Incident Frequency Rates



lucky” rather than through good practice and judgment?

It is an interesting question and one that, as a company, KCA DEUTAG began to explore two years ago.

In recent years, KCA DEUTAG has seen a dramatic improvement in safety performance as demonstrated in the chart *Monthly Accident & Incident Frequency Rate*, which shows Total Recordable Case Frequency (TRCF).

This is, of course, not an unusual trend in the drilling industry and could be put down to improved hardware and procedures. However, a major factor has been the company’s introduction of a behavioral safety program in 1998.

BEHAVIORAL SAFETY PROGRAM

The program involved a safety culture

with significant input from the workforce. This has proved to be one of KCA DEUTAG’s most effective risk management tools, encouraging leadership, communication and workforce involvement.

In its drive for even higher levels of safety management, the company sought a better understanding of what was behind the performance to date and, specifically, what element luck had played.

If luck was a factor in safety performance, that performance could be said to be “fragile”, and over the course of the internal discussions the term “the fragility index” was coined.

INCIDENT POTENTIAL MATRIX

In common with many other companies, KCA DEUTAG uses a potential matrix as

Comparison of TRCF and PMFF for Asset X

Asset X	2001	2002	YTD 2003
TRCF	0	2.54 ^{Note 1}	0
PMFF	3431	1068	48

Note 1: This increase in TRCF was the result of 1 minor injurious incident but due to low manhours the statistical effect was large.

Comparison of TRCF and PMFF for Asset Y

Asset Y	2001	2002	YTD 2003
TRCF	1.55	1.65	0
PMFF	3691	958	0

Comparison of TRCF and PMFF for All Client's Assets

Total KCAD North Sea Ops for this client	2001	2002	YTD 2003
TRCF	2.93	1.21	1.02
PMFF	2963	683	309

In this case no one was hurt so the TRCF remains unaffected but the incident potential (PMFF) was high.

In the above case relying on TRCF or LTIF (Lost-Time Incident Frequency) alone would show both rig A and B in a more-or-less equally good light, as no one was actually hurt.

However, using the PMF measure rig B is actually of much greater concern, based on an apparent failure to recognize the inherent risk in the lifting operation and remove people from harm.

Taking some hypothetical numbers for rigs A and B, results can be charted and compared.

The traditional measure of TRCF would require rig A to improve its poor safety performance in comparison to the noticeably better performance on rig B.

Introducing PMFF brings in two more dimensions. Firstly, it is actually rig B that needs to learn from rig A, as rig B's incidents are obviously much more serious than those on A.

Secondly, it is evident that rig B requires the development and implementation of safety recovery plans with some urgency.

FRAGILITY INDEX IN PRACTICE

In October 2001, KCA DEUTAG was experiencing high injury rates on a series of North Sea platforms owned by one operator.

The need for safety improvement on these drilling rigs was illustrated by KCA DEUTAG's total recordable case frequency for those operations of 2.93 for 2001.

This was more than double the average injury rate experienced by the company's other North Sea operations, which was 1.36.

A safety improvement plan was put in place in 2002 in which the fragility index contributed significantly.

It showed rig management just how poor even the best performing HSE performance was and exactly where the improvement needed to be targeted. In this case it was across the whole operation.

For example, at the end of 2001, one

asset group (Asset X) had an enviable TRCF of zero while another (Asset Y) had a TRCF of 1.55, which was only marginally above the KCA DEUTAG average.

A traditional view would have been that these two operations could have taken a lesser priority in any improvement plan because of their better records, among the best in the client's operation.

In reality, further investigation identified that they had the highest PMFFs; Asset X was 3,431 points while Asset Y was 3,691 points.

In comparison the KCA DEUTAG target for 2001 was 700 and the actual KCA DEUTAG average over 2001 was 460 points per 200,000 man-hours.

These assets were therefore given an equal or even greater level of attention and priority, as they had the highest potential for people to be seriously hurt and not the lowest.

SAFETY IMPROVEMENTS

With the sense of urgency that the fragility index helped to give to the implementation of the safety improvement plan, the following improvements have been gained through the efforts of the crews, supervisors and managers involved in the process.

The table above shows comparisons of TRCF and PMFF for Asset X, Asset Y and the Combined Values for all the Clients North Sea Operations for 2001, 2002 and YTD 2003.

It is of great credit to all those involved that an improvement of this scale was seen.

The benefits are two-fold. First, far fewer people are being hurt at their work and secondly (and as important), even the potential for people to be hurt at work is drastically reduced.

FUTURE DEVELOPMENTS

KCA DEUTAG continues to work on ways to present the fragility index in a manner that will, at a glance, show the extent to which luck is playing a part in preventing injuries.

With this fragility index providing significant information to the company's leadership, they can then take the robust action necessary to reinforce the integrity of safety improvement efforts, as evidenced by the practical example above.

The Fragility Index has been used to confirm those areas where safety improvement effort is required for both KCA DEUTAG Rig Management and clients.

The comparison of actual safety performance with the potentially poor performance there might have been is one that keenly focuses attention, gives no room for complacency and has turned what has traditionally been described as a "reactive" tool into a proactive instrument in the drive for world class HSE performance. ■