

# Accident investigation

Bill Gall\* (MEI) of Kingsley Management Ltd urges you not to investigate and analyse incidents and accidents. Unless, that is, you commit to delve below the surface of those events, find their actual causes, stop automatically blaming the person immediately involved, prepare to face up to potentially uncomfortable truths about your organisation's failings and provide the resources required to make lasting changes. The following describes new guidance on the issue.

The European Process Safety Centre's conference 'Learning from Accidents' took place in Antwerp on 9–10 October this year. Bill Gall, representing the Energy Institute's Human and Organisational Factors Working Group (HOFWG), presented its new publication *Guidance on investigating and analysing human and organisational factors aspects of incidents and accidents*. A long title, but it captures the key elements of 'learning from accidents':

- Investigating – gathering information, reconstructing events, establishing what happened.
- Analysing – making sense of the information gathered in the previous step; impossible to do well if the investigation is poor.
- Human and organisational factors – the management principles, processes and procedures required to manage human performance.
- Incidents – unintended events where there was the potential for injury, ill-health or material damage as outcomes.
- Accidents – unintended events resulting in those outcomes.<sup>1</sup>

The Guidance emerged from cross-industry interviews with a wide range of developers and users of incident analysis methods, coupled with an extensive review of relevant literature including a range of incident reports. Its aim is to describe useful methods for identifying the root cause human and organisational factors for incidents that warrant a detailed investigation having passed a screening based on criteria such as complexity, actual or potential consequence.

Some 28 currently available methods used for identifying human and organisational factors in the petroleum and allied industries feature in the Guidance, plus six more with potential for use as methods in these industries. However, the problem is not the availability of good methods – it is the expertise of the analysts applying them. For example, one incident report concluded: 'immediate cause – human error; root cause – human error'. This reveals far less about the

incident than it does about the incident analysts.

## Heart of the matter

The industry's leading incident investigators rarely, if ever, use specific methods. They rely instead on their accumulated knowledge and experience from years of conducting major hazard incident investigations. Their most used tools are large sheets of paper, coloured pens, a supply of stick-on notes and a willingness to continue asking questions.

Methods can actually lead the unwary down false trails. One incident reporting form, for example, includes a checklist. From this, the user can select one or more possible root causes such as 'lack of skill or knowledge', 'lack of/inadequate procedures' and 'inadequate tools or equipment'. These are *not* root causes. They are factors that may explain the incident – the most obvious immediate causes, but they do not get to the heart of the problem. To do that requires the analyst to apply the experts' favourite question – 'Why?' Why did John lack essential skills or knowledge for the task his supervisor gave him to do? Perhaps the company's selection procedures are inadequate; its training methods are inappropriate; or training is OK for most people, but following training and several weeks' practical on-plant experience, competence is not properly assessed. So, in this case, if the company cannot identify what exactly is wrong with its competence assurance system, it will be unable to put it right.

## Framework for understanding

To support the aims of helping to identify root causes the Guidance begins with a description of human factors, safety management and safety culture and how these fit together into a human performance management system. It then describes the various types of human failure – 'slips', 'lapses', 'mistakes' and 'violations'.

If the investigator found the immediate cause of an incident to be a simple 'slip', for example – the panel operator reached for a

control but operated the wrong one – the solution to this (relocate or redesign the controls, ensure they are distinctive, introduce a check before operating etc) is quite different from the solution if the operator believed this to be the correct control ('a mistake').

A framework showing the link between underlying and immediate causes of incidents is provided to supplement the information on human failure types. It illustrates how poor decisions at the organisational level can introduce 'latent failures' in the system; these increase the likelihood of an incident at a later date. The decision to locate two similar controls near to each other referred to earlier was the origin of a latent failure. Coupled with a subsequent 'sub-standard act' – the operator reached blindly for the control rather than visually checking his selection – resulted in his activating the wrong device.

Barriers feature in the framework. They are risk control measures – physical guards or various 'administrative' controls. Accidents occur when barriers are defeated; hence, examining barriers is essential to making improvements.

The Guidance emphasises the importance of organisational culture in relation to incident analysis, urging organisations to aim for a 'just' culture – a system of sanctions and rewards that is transparently fair. Too punitive an approach to incidents will result in mistrust between workforce and management, and under-reporting; too lenient an approach will reduce employees' motivation to conform to procedures and rules. Note also that the 'just' culture applies to managers as well as supervisors and shopfloor workers.

## Incident investigation

The Guidance outlines the key stages of an investigation – reporting, investigation/analysis, making recommendations, assigning tracking and closing out actions and sharing information. It advises on how to conduct each stage to ensure that detailed and appropriate information is gathered and subsequently analysed correctly. Potential pitfalls at the investigation stage, for example, include making assumptions, asking leading questions, causing concern or suspicion among witnesses and failing to use a systematic structured approach.

Whilst cautioning the user against blindly following checklists, the Guidance features a checklist describing the key factors that can affect human performance. This is a high level list to be used as an *aide memoire* in investigations, not a substitute for detailed analysis. The checklist covers four topic areas:

- Workplace factors – the size and layout of the workplace, how equipment and

'This Guidance provides a great introduction to human failure. The types of failure are described and the reader introduced to the factors that make human failure more or less likely. A lot of operational people do not understand this and the Guidance will fill that knowledge gap. It then goes on to explain how human factors can be integrated into an investigation in straightforward terms. The benefit is simple – investigations that will have successfully addressed the part played by human failure in incidents and more importantly the identification of appropriate interventions to prevent reoccurrence.'

**Graham Reeves**

*Human Factors Advisor, Safety & Operations, BP International Limited*

materials are designed and used.

- Task factors – workload too high or low, team working problems, unstimulating tasks.
- Personnel factors – competence, health and fitness, fatigue, job satisfaction.
- Organisational factors – supervision and leadership, inadequate safety management systems and poor change management.

### Method selection

The last part of the Guidance describes 28 currently available methods used for identifying human and organisational factors in the petroleum and allied industries, plus six more with potential for use as methods in these industries. Before selecting a method, the prospective analyst must be entirely honest about their expertise in human performance issues – the opening sections of the Guidance provide sufficient information for the reader to gauge their level of expertise. If they are not familiar with the human and organisational factors presented, with human failure models and with the incident investigation lifecycle, then they are highly unlikely to succeed in

identifying the root causes of incidents – no matter what method they select – without further training or support.

If they wish to proceed, they can select the method that best suits their needs based on the following eight criteria:

- Training required (yes or no).
- Paper- or software-based.
- Capable of retrospective analysis (of historical incidents).
- Used in the petroleum industry.
- Generates graphical content eg timelines.
- Is a complete method for incident analysis (does not require other methods).
- Provides solutions.
- Includes checklists or flow diagrams.

**Table 1** shows a random selection from these methods.

It was difficult to identify objective criteria for selection. For example, cost was included in the original list but, although some methods are available free of charge, they require several days' training and several practice runs before they can be used and, in use, they take many more days to produce an analysis. Some proprietary software-based methods appear expensive to buy and the associated training is costly, but the vendors contend that in the long run it makes the process of analysing incidents very rapid and efficient.

Each description includes where infor-

'We will be referencing this Guidance widely. Investigations are often inadequate with regard to human and organisational factors and this publication addresses many of the reasons why. We will also use the Guidance to increase the emphasis on using experienced investigators and training and selection for those investigators.'

**Rob Miles**

*Offshore Safety Division, Health and Safety Executive*

mation could be found:

- The origin of the method – if based on a specific human performance model for example.
- Basic attributes – uses flowcharts, results in graphical output.
- Worked examples including diagrams and illustrations.
- How applied – the steps involved.
- References to more detailed descriptions and where to obtain the method.

This Guidance originated from a real need to ensure that the conduct of incident investigators is logical and systematic, and based on a clear understanding of the human and organisational factors at the root of most such events. Feedback to date from users of the Guidance, including the UK Health and Safety Executive (HSE) and some major petroleum companies has been overwhelmingly positive.

The valuable input of the many contributors to the Guidance – interviewees, suppliers of case studies and examples, and peer reviewers – is gratefully acknowledged. ●

### Footnote

1. For the purposes of this article, after this point the term 'incident' refers to incidents and accidents and the term 'analysis' refers to investigation and analysis.

Guidance on investigating and analysing human and organisational factors aspects of incidents and accidents (*ISBN 978 0 85293 521 7, May 2008*) is available as a free download from [www.energyinst.org.uk/humanfactors/incidentandaccident](http://www.energyinst.org.uk/humanfactors/incidentandaccident) or as a hard copy from [www.energyinstpubs.org.uk](http://www.energyinstpubs.org.uk) (full price £10, EI Member price £7.50).

\*Bill Gall, CPsychol MErgS MEI, is a human and organisational factors consultant and manages a registered Ergonomics Society Registered Consultancy. He is a member of the EI Human and Organisational Factors Working Group and the primary author of several of its publications.

	Training required	Paper-based or software		Retrospective analysis of incident reports	Used in petroleum industry	Generates graphical content (eg timeline)	Complete method for incident analysis
		Paper	Software				
ECFA		✓				✓	
ECFA+							
TRIPOD BETA	✓	✓	✓	✓	✓	✓	✓
5 WHYS		✓				✓	
HFAT	✓	✓	✓	✓	✓	✓	✓
MORT	✓	✓	✓	✓	✓	✓	✓
STORY BUILDER	✓		✓	✓		✓	✓

**Table 1: Some analysis methods and their features (abridged)**

*Note: A tick indicates that the method meets the criterion*