



**Devastation:**  
Fifteen people  
were killed in  
the 2005  
explosion at  
the Texas City  
refinery (left);  
Three years  
later, the  
refinery's  
ultracracker  
unit (inset)  
was the scene  
of another  
accident



# Safety first

**Many major industrial accidents can be traced to poor organisation in a company, the Health and Safety Executive tells Ben Sampson**

**W**hen things go wrong in industry, more often than not people turn to engineers for the answers. Whether it is a plane or train crash, a leak at a nuclear power station, or an explosion at a refinery, we want to know why.

Engineers don't have all the answers all of the time. They can't, because sometimes it's not the machine's fault. Sometimes it's the way a machine has been used or maintained. But even then it's not necessarily the person using the machine, or driving the vehicle, who is at fault. The blame can lie with the company that person works for, or more precisely, with the company's poor safety culture.

At least that's what Martin Anderson, one of the HSE's specialist inspectors for human and organisational factors, believes. According to Anderson, who

specialises in the oil and gas and process industries, almost every major industrial incident in recent living memory can have its root cause traced to organisational failure, a term he prefers over poor safety culture. And responsibility for an organisation, he asserts, lies at the door of management.

"The causes of most incidents are management failures – not providing resources, not training people, or creating a do-it-now atmosphere. It's a difficult thing for managers to swallow but until they do we won't move forward."

After the BP Texas City oil refinery explosion killed 15 workers and injured 170 others in 2005 the US Chemical Safety and Hazard Investigation Board investigated for two years and concluded that poor organisational safety was the number one reason for the disaster. The report was the first by the board to go beyond

technical and systemic problems to blame on the culture of an organisation for failures.

The investigation uncovered a history of cost-cutting and inadequate safety management at both the Texas City refinery and BP facilities across the world. BP managers relied on the wrong statistics to measure safety, responded incorrectly to safety audits and made spending cuts without assessing the safety impact of their decisions. Supervisory investigator Don Holmstrom said: "BP managers and executives attempted to make improvements but they were largely focused on personal safety – such as slips, trips, falls, and vehicle accidents – rather than on improving process safety performance, which continued to deteriorate."

"Effective organisational practices such as encouraging the reporting of incidents and allocating adequate

resources for safe operation are required to make safety systems work successfully."

This view is echoed by Anderson who can list, seemingly endlessly, major accidents where poor safety culture – organisational failure – was found to be among the contributing factors: the Herald of Free Enterprise ferry disaster, the Kings Cross Underground fire, Space Shuttles Columbia and Challenger, Kegworth air crash, and Three Mile Island nuclear incident are but a few.

The factors that contributed to these and many other accidents are known and well-understood. He is so confident in the knowledge he says he could write a dozen reasons for an accident happening, seal them in an envelope, open it when the next major accident occurs in say, 10 years, and the reasons would still apply.

Despite this he says it is often a



► struggle to get engineers to pay attention to the importance of safety culture. Anderson, a Fellow of the Ergonomics Society, which seeks to promote the consideration of human factors in engineering, admits culture is often seen as a "woolly" subject.

"Industry in general doesn't treat this very well," he says. "People would have heard of it but wouldn't know what it is, couldn't define it and wouldn't begin to know how to change it."

Safety culture is usually explained in terms of trust and the shared values and attitudes that all members of an organisation have. Even then, things can get complex. As was found with the Texas City refinery, cultures change when companies merge and get acquired, and even different departments within a company can have different internal identities.

Talk about safety culture and people normally assume you are talking about the behaviour of front-line employees. This detracts from the wider organisational issues that are probably underlying employee behaviour. In this situation Anderson suggests performing something he terms the substitution test. After an incident, if you substitute a worker with a different one but the same incident could still occur, it is probably an organisational issue rather than an individual fault.

When asked to judge the safety culture in their company, it is common for management to commission expensive questionnaires to produce graphs and charts. These "safety climate" surveys do serve a purpose and can provide a snapshot of attitudes towards safety, says Anderson, but there may be other ways of attaining the same results.

"Sometimes companies have a 'learning disability'. They are not learning from the indicators freely available to them. I can go in, talk to people, and find 20 things that the management doesn't know about. It's not anything special or magical," he says.

Sometimes carrying out behavioural studies can even leave a firm worse off: "It's easy if you don't know what you are doing to make a hash of it. If you don't act on what you find, the workforce can end up



**What went wrong? In the 2008 Texas City accident, one person was killed**

more disillusioned, and morale can take a dive."

Not responding to your workforce is one of the strongest indicators of a poor safety culture, he adds. A dismissive attitude by management, for example if workers raise the issue of a broken piece of equipment but management does not fix it, can have a hugely detrimental effect on morale and behaviour.

There are several other negative "cultural" effects that management should be aware of, he says. One is dilution. This phenomenon is when reports of problems are downplayed as they travel upwards through the management hierarchy. An example

conflict with safety considerations.

So if you suspect your company has a poor safety culture, what steps can you take to change it? Anderson suggests that the simplest way for engineering managers to improve safety culture is to learn from previous incidents. Not just accidents that have happened in their company but ones that occurred elsewhere and are well documented. Engineers should also not restrict themselves to studying only their own sector. Often the underlying causes of major accidents are the same across different industries.

"People in different industries don't normally learn from incidents in other industries. The technical detail will always be different and sector-specific but the organisational factors will be the same. The things that affect NASA also affect oil refineries," he says.

Many firms can also learn from high-reliability organisations, such as air traffic control and nuclear power stations, organisations that don't get it wrong because the consequences if they do are too terrible. There should also be people at board level responsible for driving safety themes, he says. Leading from the top is a key HSE message and it ran a conference

last year to educate senior managers about the importance of leadership and promoting an effective safety culture.

The ideal safety culture is one where safety is the priority and managers demonstrate by their actions that they mean it, says Anderson. The most desirable management attitude is one of "chronic unease".

"You should never feel too comfortable," he says. "If you can sleep at night and you are a refinery manager, there is probably something wrong. You need to be worried about things, constantly thinking of what could go wrong and how you can improve."

Whatever steps you take the important thing is to make a sustained effort. Changing your safety culture, Anderson suggests, is like dieting. Go on a diet for a few months and lose a few pounds. Come off the diet and you'll soon find yourself back to your original weight. If you want to keep the weight off you have to change your lifestyle, if you want to change your safety culture, you need to show it as a new way of life inside your company.

For more information see [www.ergonomics.org.uk](http://www.ergonomics.org.uk), [www.hse.gov.uk/humanfactors/index.htm](http://www.hse.gov.uk/humanfactors/index.htm), and [www.hse.gov.uk/leadership/index.htm](http://www.hse.gov.uk/leadership/index.htm)

## Sometimes companies are not learning from the indicators freely available to them

is when London Underground management were told of "smouldering" beneath escalators in the years prior to the Kings Cross tube station fire in 1987. Another common effect is bottlenecks in middle management, where financial and production pressures