On March 23, 2005, there was a catastrophic explosion at a Texas City, TX, oil refinery, owned by British Petroleum (BP), that killed 15 people and injured 180, including both BP employees and contractors. The subsequent investigation found that hydrocarbon vapors that ignited during the start-up of an isomerization unit were the direct cause of the explosion. The below excerpt is taken directly from a BP press release dated May 17, 2005, describing the incident.

“A series of failures by BP personnel before and during the startup of the Isomerization (ISOM) process unit in the Texas City refinery led to an explosion and fire which claimed the lives of 15 workers and injured more than 170 people, according to BP Products North America’s interim fatal accident investigation report made public today.

The investigation team determined the explosion occurred because BP ISOM unit managers and operators greatly overfilled and then overheated the Raffinate Splitter, a tower that is part of the ISOM unit. The fluid level in the tower at the time of the explosion was nearly 20 times higher than it should have been.

The presence of water or nitrogen in the tower at startup may have also contributed to a sudden increase in pressure that forced a large volume of hydrocarbon liquid and vapor into the adjacent blow down stack, quickly exceeding its capacity. The resulting vapor cloud was ignited by an unknown source.

If ISOM unit managers had properly supervised the startup or if ISOM unit operators had followed procedures or taken corrective action earlier, the explosion would not have occurred, the investigation team said.

The number of deaths and injuries was greatly increased by the presence of workers in temporary trailers near the blow down stack and the failure to evacuate personnel when it became apparent pressure was building in the ISOM unit and that vapors were being vented to the atmosphere.

The decision to place the trailers near the blow down stack was preceded by hazard reviews that did not recognize the possibility that multiple failures by ISOM unit personnel could result in such a massive flow of fluids and vapors to the blow down stack.

The investigation team also concluded the use of a flare system, instead of a blow down stack, would have reduced the severity of the incident.”

The incident was one of America’s most serious workplace accidents in decades and brought with it waves of criticism on BP’s executive management and the Occupational Safety & Health Administration (OSHA) for failing to provide proper process safety leadership and regulatory oversight, respectively.

For those who follow events in the field of environment, health, and safety (EH&S) management, it has been difficult to miss the spectacle created by the Texas City disaster and the subsequent investigations. A 335-page report published by the U.S. Chemical Safety Review Board (CSB) in March 2007 (www.csb.gov/completed_investigations/docs/CSBFinalReportBP.pdf) details a wide range of technical and process failures that contributed to the incident. There are countless learning opportunities from the details of this study in areas such as process safeguards and human factors. No doubt volumes of future position papers, graduate theses, and journal articles will be based upon the Texas City disaster. Professionals in the process industries who pay attention to the lessons will benefit from the context it provides.

But, for those of us who spend our time in business sectors outside of the umbrella of the Process Safety Management (PSM) Standard (29 CFR 1910.119; www.OSHA.gov), a word of caution: Do not ignore the Texas City disaster just because it was a refinery issue. There are broad lessons in this disaster that go to the heart of environment and safety management challenges faced by all industries.

On August 17, 2005, the CSB recommended that BP’s board of directors commission a blue ribbon panel to investigate the state of BP’s corporate process safety culture and oversight. In October of that year, an independent safety review panel, chaired by Former Secretary of State James A. Baker, III, was chartered. Primary participants included notable engineering scholars, union safety officials, former congressmen, and process safety and petroleum industry experts.

In short, the panel was formed to investigate the big picture management culture that allowed the circumstances at Texas City to exist. Since the CSB was already investigating the details of the Texas City explosion, the blue ribbon panel was specifically excluded from looking into events leading up to the incident. Instead, BP’s process safety infrastructure and institutional understanding of process risk were the main targets of the independent safety review panel.

**THE BAKER REPORT**

In January 2007, the review panel headed by Baker released its final report on BP’s process safety management culture, commonly referred to as “The Baker Report” (www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/SP/STAGING/local_assets/assets/pdfs/Baker_panel_report.pdf). The 300-plus-page report produced volumes of evidence, indicating that BP PSM infrastructure and awareness was weak in critical areas. The report drew heavily on employee interviews, surveys, and company records. Of particular interest to investigators were preventative maintenance records, process risk assessments, and internal audits. Based upon its findings, the panel made 10 recommendations to BP’s Board of Directors for improving the company’s safety oversight and management culture and preventing a repeat of the Texas City disaster (see sidebar).

*The Baker Report’s* findings offer every company, regardless of business or industry type, a chance to reflect on their own safety management culture, goals, and risk management. EH&S professionals, engineers, and managers with safety responsibility can all learn and benefit from this report. The report can be used as a case study to educate management on risk management

---

**Recommendations of the Independent Safety Review Panel**

1. Process safety leadership from BP’s executive management.
2. Integration of a Process Safety Management system into business practices.
3. Process safety knowledge must be established as a key requirement for the entire management structure, including executives.
4. Process safety culture must be developed to include trusting and open relationships with respect to process safety.
5. Clearly defined accountability and expectations for process safety at all levels of management and technical support.
6. Support for line management must be coordinated and robust.
7. Leading and lagging performance indicators specific to process safety should be created.
8. Process safety auditing function must be improved.
9. Board monitoring of the recommendations of the blue ribbon panel and third-party auditing for a period of at least five years to assure proper and timely implementation.
10. BP should use its Texas City experiences to transform itself into a recognized industry leader in process safety management.
or as a memory jogger for EH&S staff to refocus their own efforts on the fundamentals of safety management. The Texas City disaster has given industry a gift of knowledge and an opportunity to make some positive impacts by learning from BP’s misfortune.

CRITICAL LESSONS LEARNED
For the sake of brevity, this discussion is limited to two of the report’s findings, both of which are applicable to a broad swath of U.S. industry.

Finding #1 — Reliance on Personal Injury Rates (Recordable) as an Indication of Overall Risk Management Success
Panel investigators found that BP’s top management valued and perceived personal safety as a priority for the company. OSHA recordable rates (i.e., slips, falls, ergonomic injury, road safety) were tracked as key lagging indicators by executive and group management and aggressive actions were taken to reduce personal injuries (e.g., implementing a defensive driving program, Lockout/Tagout [LOTO] procedures, which refer to specific practices to safeguard employees from the unexpected startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities). And BP management took comfort in the fact that injury rates were reduced significantly as a result of company initiatives. Investigators found this laudable, but noted middle and upper level management appeared to have been blind to the distinction between process/equipment safety and personal safety. The lack of perceived risk from process safety hazards resulted in a loss of focus on critical process risk reduction programs, such as preventative maintenance and corrective actions for high-risk PSM audit findings. In the years leading up to the explosion at the Texas City oil refinery, there were no leading or lagging indicators for tracking PSM performance.

“There are broad lessons that came out of Texas City that go to the heart of environment and safety management challenges faced by all industries.”

Several factors appear to have contributed to the management’s inability to perceive the level of risk...
from process related hazards. First, investigators noted that executive-level managers tended not to have extensive background in the refining business and, therefore, lacked working knowledge of PSM. This in not to say that executive or middle level management must be process safety experts, but rather that much of the BP management lacked sufficient background to understand the risks or set appropriate performance measures that would reflect true PSM performance.

Making matters worse, according to the report, BP had no consistent, high-level technical process safety voice to provide executives or the board with input on goals or resource allocation for PSM. Therefore, budget allocations and cost-cutting initiatives were allowed to go forward without respect to process safety risks. With no standard process safety measures being tracked for the North American refineries, an additional result was a complete lack of individual performance measures related to process safety for plant managers, line supervisors, or engineering functions.

The cumulative effect of this silence from the top management on PSM was that the North American workforce, faced with meeting short-term production and financial goals, took the absence of a strong message on process safety to mean that it was of lower importance.

Recommendations for correcting this issue included providing training in PSM principles for executives to give them a general awareness of the issues; communica
ting the corporate vision from the top, including proactive goals that apply directly to PSM performance; and holding line managers directly accountable for PSM performance.

The Lesson Learned. Most EH&S professionals will at some point in their career be faced with working for a management regime that does not fully grasp the role of EH&S professionals or the technical aspects of maintaining a safe, clean, low-risk process. The antidote for such a situation is ongoing education and involvement of management in discussions of risk. When management has an understanding of what the true risks to people and processes are it is more likely to appreciate performance measures beyond basic regulatory numbers and financial indicators.

Finding #2—Resourcing Critical Safety Functions
BP records indicate that in the years following BP’s purchase of the Texas City oil refinery from Amoco, a 25% reduction in fixed spending was implemented. This along with aggressive outsourcing of PSM-related engineering operations led to high attrition among the most qualified engineers at both the refinery level and at group (division) levels, according to investigators. The result was that engineering responsibilities for PSM-related maintenance, change management activities, and quality assurance were spread among various line and group staff divisions. Employee surveys produced by the panel of investigators indicated that large percentages of workers from all PSM-related departments recognized that preventative maintenance and testing suffered from the loss of experience and dilution of the technical resources. Many engineers also voiced concern about “initiative overload.” At a time when numbers and experience levels of technical support staff was lowest, the corporation was pushing numerous production and personal safety initiatives down to the division and plant levels with no additional funding. The result was a further loss of focus on PSM.

The splitting of safety-related engineering functions among several plant and division levels led to confusion and a loss of continuity. Beginning in 2002, BP commissioned a series of third-party safety audits. The audit reports indicated that significant evidence of maintenance and change management problems existed. However, the message does not appear to have been elevated to the board or executive management level, where further action may have been taken.

The Lesson Learned. For engineering and EH&S professionals, there will always be more demands on their time than resources available. It is, therefore, critical to avoid the “flavor of the month” programs and apply resources (i.e., time, staff, budgets) to those issues that present highest risk to the organization. Saying “no” to lower priority projects may not always be a comfortable position to take, but it is an acquired and necessary skill.

Downsizing is a challenge for many organizations. EH&S functions are not and should not be immune from the phenomenon when a company’s financial situation demands it. However, a strong and consistent voice from safety and environmental professionals is absolutely critical to ensure that management has a true understanding of the risks and loss of capability that can result from trimming staff and budget. While acting the part of a squeaky wheel may not be a desirable role, an EH&S professional who avoids the role is doing a disservice to the organization and its employees.

SUMMARY
The findings discussed here are only a small sample of what The Baker Report contains. It provides an excellent lesson in safety management in a broad sense. Any organization that is concerned about managing and communicating safety and environmental risks within its ranks will benefit by applying some of the recommendations listed.

The 2005 Texas City disaster was a tragedy for the BP organization, the surrounding community, and the company’s stakeholders. If even a small number of organizations pay attention to the report findings and apply some of the lessons to their activities, then some small amount of good will have come from such a sad event. em