



On 23 March 2005, during the startup of an isomerization (ISOM) unit, the BP Texas City Refinery, Texas, experienced an industrial disaster. A massive explosion and fires killed 15 people and injured another 180.

Here are **12 quotes** that illustrate key human factors issues identified in the investigations.

“People can forget to be afraid”

Baker Panel, 2007, p.i

The Baker Panel’s charter was to make ‘*a thorough, independent, and credible assessment of the effectiveness of BP’s corporate oversight of safety management systems at its **five U.S. refineries** and its corporate safety culture*’.

The Panel stated that the deficiencies identified **likely apply more widely** and so this work is recommended for all major-hazard industries, as well as other complex organisations.

“Although actions or errors by operations personnel at the BP Texas City site were immediate causes of the March 23 accident, numerous latent conditions and safety system deficiencies at the refinery influenced their actions and contributed to the accident”

CSB, 2007, p.69

In documenting the human factors issues, the CSB investigation is clear that people were ‘set up to fail’ by system deficiencies and it would be inappropriate to focus on individual human errors.

“The disaster at Texas City had organizational causes, which extended beyond the ISOM unit, embedded in the BP refinery’s history and culture”

CSB, 2007, p.139

In the 32 years prior to the investigation, the BP Texas City refinery had **39 fatalities**, one of the worst rates of any U.S. workplace in recent history. On average, **one worker had died every 16 months**. In 2004 alone, three major accidents resulted in three fatalities.

The Texas City Refinery’s HSSE Business Plan warned in 2005 that the refinery would be likely to ***“kill someone in the next 12-18 months”***.

“Many of the safety problems that led to the March 23, 2005, disaster were recurring problems that had been previously identified in audits and investigations”

CSB, 2007, p.138

Incidents (including two previous startup incidents) were often ineffectively investigated and appropriate corrective actions were not taken. Incident investigations too often focused on **‘operator error’** as the root cause (and this may explain why staff were reluctant to report issues or near-misses). Management failed to create an effective reporting and learning culture.

“The Texas City site had an overly complex and changing organization which was not conducive to good communication and clear accountability”

Mogford Report, 2005, p.153

In the years prior to the 2005 incident, the company underwent many corporate, leadership and **organisational changes**. Major changes to the organisation, such as staff reductions, changes to the management structure, policy changes and budget reductions were generally **not assessed** for their impact on the management of process safety. Many of these changes led to a reduced emphasis on process safety.

“Inadequate training for operations personnel, particularly for the board operator position, contributed to causing the incident. The hazards of unit startup, including tower overfill scenarios, were not adequately covered in operator training”

CSB, 2007, p.91

There was inadequate operator training for **abnormal and startup conditions**; the hazards of overfilling distillation towers were not well understood. The refinery training budget was reduced over the years from 1998, and during the same period Learning and Development personnel were reduced from 28 to eight.

“The ISOM raffinate section startup procedure lacked sufficient instructions for the Board Operator to safely and successfully start up the unit”

CSB, 2007, p.75

A 2001 internal audit identified that several operating procedures did not accurately reflect **actual working practices**. Procedures did not include experience from previous startups.

There were **no procedures** for the calibration, inspection, testing, maintenance, or repair of the five instruments the CSB considered to be contributory causes in the incident.

“These deviations were not unique actions committed by an incompetent crew, but were actions operators, as a result of established work practices, frequently took to protect unit equipment and complete the startup in a timely and efficient manner”

CSB, 2007, p.70

Procedural deviations in start-ups were common and routine. Procedures were seen as guidance, rather than instructions.

Operators relied on knowledge of previous startups and developed **informal work practices**, partly to avoid delays in startup.

“BP had no policy for effective shift communication, nor did it enforce formal shift turnover or require logbook/procedural records to ensure communication was clearly and appropriately disseminated among operating crews”

CSB, 2007, p.77

Shift handovers were rushed and vague, or didn't happen at all. For example, on the day of the disaster, the experienced Day Supervisor arrived for his shift over an hour late and did not handover with the night shift.

“There was little investment in supervisory/management training, and an absence of role models within supervision, and, as a result, supervisory/management behaviors were inadequate. There were no clearly documented expectations for supervisors’ roles, including those stepping up to an acting supervisory role”

Mogford Report, 2005, p.153

The CSB found ineffective supervisory oversight and technical assistance during unit startup.

“the CSB concludes that fatigue of the operations personnel contributed to overfilling the tower”

CSB, 2007, p.289

On the day of the incident, several key staff (Day Board Operator, Night Lead Operator and Day Lead Operator) had worked between **29 and 37 consecutive 12-hour shifts.**

Some of these personnel rarely had breaks, and ate meals at the control panel.

“Simply targeting the mistakes of BP’s operators and supervisors misses the underlying and significant cultural, human factors, and organizational causes of the disaster that have a greater preventative impact”

CSB, 2007, p.19

Organisational failures included: cost-cutting, production pressures, inadequate process for shift handovers, inadequate operator training program, outdated procedures, recurring operational problems during startups, failure to address reported equipment malfunctions, not investigating previous major events, and a failure to assess organisational changes.

Further reading

Summary of key human and organisational factors:
humanfactors101.com/incidents/bp-texas-city-march-2005/

1. [The CSB report](#). Investigation report: refinery explosion and fire, U.S. Chemical Safety and Hazard Investigation Board (CSB), March 2007.
2. [The Baker Panel Report](#). The report of the BP U.S. refineries independent safety review panel, 2007.
3. [The Mogford Report](#). Fatal accident investigation report: Isomerization unit explosion final report, December 2005. (BP's internal investigation).

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