Ethical Case Study: BP Texas City Refinery Disaster

A factory with smoke coming out of it

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**Abstract**

The purpose of this ethics report is going to study on the BP Texas City refinery disaster in 2005, discuss particularly the ethical issues that took place before the disaster happened. Furthermore, this report will investigate the proper moral obligations and the social responsibility at an individual and organizational level to prevent similar cases in the future. BP, formerly known as British Petroleum Product North America Inc, is one of the world’s leading international oil companies. A series of explosions happened in The BP Texas City Refinery. The incident was caused by organization and safety deficiencies. A raffinate splitter tower was overfilled with hydrocarbon, the overpressure forced the pressure relief device to open, thereby a large amount of flammable liquid geyser from the vent stack. In this incident, 15 employees were killed and another 180 were injured. It resulted in direct financial losses exceeding $1.5 billions. BP was found that it had activated equipment at the plant while knowing that some alarms and a level transmitter had failed, causing the device to explode. As one of the responsible parties, BP should have taken additional precautionary measures to prevent this disaster. And in the future, the risk management should be enhanced and set up more regulations to

**Background**

The British Petroleum (BP) Texas City Refinery, which was the third-largest oil refinery in the United States. It made an engineering failure, which led to a series of fires and explosions occurred at approximately 1:20 p.m. on March 23, 2005. The incident occurred during the restarting of a hydrocarbon isomerization (ISOM) unit. The explosion was caused by organization and safety deficiencies. Because of the wrong information transmitted from the alarm and the control system, the control room was unaware of the high liquid level in the raffinate splitter tower. The tower was overfilled with hydrocarbons liquid, the overpressure forced the safety relief valves to open, thereby the liquid transmitted to the blowdown drum through the pipeline and flooded the blowdown drum, eventually a large amount of flammable liquid geyser from the blowdown stack. When the leaked flammable liquid evaporates, it forms a vapor cloud. There was a truck nearby without the engine on, and the sparks from the engine ignited the flammable vapor cloud, triggering the unprecedented explosion. The incident took the lives of 15 employees and injured another 180. At the same time, people who work and live nearby have fallen victim to the smoke smudge from the explosion, the community was alarmed, and resulted in direct financial losses exceeding $1.5 billions (CSB, 2007). After the explosion, OSHA issued $21 million in proposed penalties to BP.

The ISOM unit was installed at the refinery in the mid-1980s, it consisted of 4 sections as shown in figure 1. To observe and maintain the liquid level in the raffinate splitter tower, this section was equipped with a level indicator which could measure the liquid level inside and transmitted this information to the control operators. In addition, there are two separate high liquid level alarms, one was set to 72% (a height of 7.6 feet in the tower) for the alarm value, the second one was set to 78% (a height of 7.9 feet in the tower). Once the liquid level reached the contrived alarm level, the alarm would be activated within the control room (CSB, 2007). I9, there is a fatal design flaw in the indicator itself. The indicator cannot measure the liquid level above the 10-foot mark (Stannous, 2008). In other words, the control room would have no information about the liquid level and how dangerous the level was if the liquid level exceeded 10 feet.

A close up of a device

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Figure 1: Raffinate section of the ISOM (CSB, 2007)

An environment investigations stated that, the blast released approximately 2500 pounds of benzene and 30,000 of other potentially dangerous air pollutants in the surrounding area. And according to a research report from University of Texas Medical Branch, the refinery incident had an important influence on both perceived mental and physical health of Texas City residents. From a table of data as shown in figure 2, there were significant declines in mental health scores from pre to post-explosion exist for many of the pre-accident variables. For instances, women had a 2-point decline in mental health and 3.9-point decline in physical health. Similarly, men had 3.7-point decline in mental health and 3.1-point decline in physical health (Peek et al, 2008).

A screenshot of a cell phone

Description automatically generatedFigure 2. Comparison of the change in the physical health for Texas City Residents (Peek, et al., 2008).

**The Engineering Failure**

After the explosion, the U.S. Chemical Safety and hazard Investigation Board (CSB) deployed a team to Texas City to investigate the root cause on March 27. Later the CSB released the results of its investigation, claimed that they found a couple of pre-existing latent conditions, the disaster was caused by “organization and safety deficiencies at all levels of the BP corporation” (CSB, 2007).

The first error is that the fluid level indicator in the splitter tower was not calibrated and it was designed with a serious flaw. As mentioned before, the maximum liquid level measurement in the indicator is 10 feet, which is 100% of the value of the height on the control gauge. When the liquid level exceeded 10 feet, the indicator even showed a decreasing height. The improper reading misled the operators to the liquid level in the tower. According the table record of timeline of event from ISOM unit shutdown to the incident, at 11:50 a.m., the transmitter read 88%, showed that the flammable fluid level was 8.4 feet which was still dropping. However, the actual tower level is 98 ft and it was still increasing (CSB, 2007). The liquid continued increase, and until 1:04 p.m. the liquid level has been increased to 158 feet. However, the computerized control system read 78% (7.9 feet) to operators (CSB, 2007). Although there was a standby alarm at 10 feet, it was found that the alarm had failed before the explosion but had not been maintained. The high-level alarm on the blowdown drum didn’t go off during the incident as well.

To ensure safe plant operation, the OSHA PSM Standard [1910.119(d)(2)(i)(D) & (E)] required firms to set safe upper and lower limits for process parameters such as pressure and evaluate the consequences of deviations including those affecting the safety and health of employees. The vapor pressure of the liquid is required to be less ‘than 275.8 kPa, as determined by ASTM Standard D323-06. However, BP set an incorrect operating limit for safe operation of the raffinate splitter, which is listed at 482.6 kPa.

Undermanned crew as many experienced workers were fired led to only a junior control board operator running three separate units on the accident day.

The above causes ultimately pointed to the unscrupulous cost reduction where the safety of the employees had been severely compromised. The root cause of the tragedy was the poor risk management of BP group. Risk management refers to the management process of how to minimize the risks in projects or workplace. BP group lacked focus on controlling major hazard risk. The improper operation, equipment not repaired in time, senior executives didn’t provide effective safety culture leadership, these human errors directly led to the incident.

**Ethical Analysis**

To analysis the ethical issues for the disaster, applying an ethical framework is a systematic and helpful approach. One such framework is deontology, a term comes from the Greek work *deon*, meaning duty (Ali, 2013), thus it is also known as duty ethic. The best-known system of duty ethic has been developed by Immanuel Kant. In Kantian ethics, the only thing unqualifiedly good is the good will, which requires people’s actions are led by the categorical imperative (Kant 1785). According to Kant, duty ethics concerns if the human actions followed the absolute moral code (doing the good thing), even if that products less good than doing the wrong thing.

Deontology ethics consists of two main principles, which are helpful to analyze the 2005 tragedy. One of the principles in duty ethics is that no one should be regarded as a means to another’s end, everyone can only be a unique end in itself.

As one of the world’s leading international oil company, BP was supported to provide a safety environment for its employees. However, BP chose to ignore the repeatedly warning about the potential hazards, fail to enhance its risk management, and put profit in higher priority than safety. Although some warning signs of possible disasters have been present for several years and local engineers have asked for safety upgrades, the BP board of directors didn’t pay attention.

**Recommendations**

To prevent such incidents in the future, an independent panel of experts to examine BP’S corporate safety management systems and safety culture should be set. The safety of the workplace needs to be improved, including setting up a common management system with precise safety rules and training for all facilities.

One non-technical solution is to enhance the risk management. Effective risk management can provide enterprises a better understanding of the risks they will face, the nature and severity, thereby take proper measurements in time to avoid or reduce risk losses, then quickly return to normal production and operation activities. There are some additional benefits:

* Create a safe and stable workplace for all workers.
* Increase the stability of business operations while also decreasing legal liability.
* Provide protection for all involved people and assert from potential hazards (Rouse, 2016).
* Create conditions for company to better fulfill the social responsibilities.
* Establish a good social image for the company.

And to approach the effective risk management, the company is supported to learn a couple of strategies such as risk identification and analysis, risk assessment and evaluation, risk monitoring (Rouse, 2016).

**Conclusion**

The study of the BP Texas City Refinery Disasters has shown that sufficient researches and preventive measures are important for chemical manufacturing. In this incident, there were many failures that could have been prevented through proper engineering. Without an effective risk management, a massive damage to the plant may happen due to a seemingly insignificant mistake and the accompanied consequences may expose workers in a dangerous situation. Setting an effective risk management and the commitment to safety are business imperative for all fields of companies. The companies have the responsibilities to protect its employees no matter how much it cost. A strong safety culture and high corporate standards can be extremely beneficial for organizations, it does not only mean a safety and security operation environment, but also operate more professionally and more profitably. It matters all company because

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