

Safety and Profit: A Symbiotic Relationship

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

The late 20th century saw a shift from American based textile manufacturing jobs to the emerging industrial power of China. This is portrayed by the sharp decline in the proportion of the employed population in the United States vs the population employed in manufacturing in the United States from roughly 25% in late 1948 to 9% as of early 2018 (Eriksson et al. 2019). A similar sequence of events happening as recently as 2023 repeated this with Bangladesh becoming the leading exporter of knitwear to the European Union having overtaken China (Uddin, 2023). Shifts in the location of major manufacturing hubs throughout the world can largely be attributed to the “production cycle, local education levels, and local manufacturing wages” of the receiving country (Eriksson et al. 2019). Areas with lower wages and lower education levels become the target of growing manufacturing fields. During the introductory stages of this shift in manufacturing jobs, the locations experiencing the growth will often have insufficient policies in place to regulate the operation of these fields. The lack of regulation coupled with readily available cheap labor serve as the perfect conditions for prioritizing profits at the cost of worker and community safety. It is as a result of this that safety and profits are often considered as rivaling focuses where prioritization of one necessitates the sacrifice of the other.

While such a relationship is not entirely baseless, the conditions which beget it are primarily the movement of ‘standardized labor’ to the aforementioned areas with cheap and uneducated labor. (Eriksson et al.2019). The presence of industrial capacity outside these conditions gives rise to alternative manners in which safety and profits are related. This paper seeks to identify the conditions which bring about a symbiotic relationship between safety and

profit by answering the question “How do the external factors such as policies, regulations, and public perception affect the manner in which safety and profits relate to each other?”. In the answer to this, a framework for coaxing a productive relation between safety and profits will ideally be present such that countries that might find their manufacturing fields growing can implement it to the benefit of those involved in such a field.

Background

Motivation & Significance

The early 1930s was a tumultuous period for economies worldwide. The great depression still maintained a grip on the world and pushed many people into desperate circumstances. One such group of people were the migrant workers of the United States who found themselves traveling around the country looking for any job that would take them (Moncaster, 2022). West Virginia saw many migrant workers with a large group working under contractors employed by Union Carbide. These contractors were tasked with producing an alternative path, through a mountain, for water intended to power the aforementioned company's new hydro electric dam at a site dubbed Hawk's Nest. Incentivized by money, these contractors expedited their work at the expense of their workers' health. Dry drilling was employed causing silica dust to linger in the air within the tunnel. As a result, an approximate 80% of workers died or fell too ill to work within 6 months (Evans 2023). Following the disastrous effects of this project, Union Carbide faced seemingly little backlash as it continued to operate for decades only to cause the disaster at Bhopal (Broughton, 2005).

The example set by the Hawk's Nest tunnel disaster exemplifies the extremely aggressive nature of profit chasing at the expense of safety. However, not all industrial disasters fall into such a morbid category where little is done to address the underlying causes. Italy's 1976 Seveso disaster is one such case. Although the impact was far reaching and devastating, European countries in the region took action to prevent and reduce the likelihood of similar disasters by creating the Seveso directive in response (Spanne, 2021). This has led to safer conditions in and around industrial plants processing harmful chemicals throughout the practicing European nations.

The widely different end results of the two disasters are quite intriguing. Union Carbide would go on, as previously stated, to fall into further more damaging disasters eventually leading to the company's purchase in 1999 (Warren, 1999). Conversely, although not a specific example, companies in Europe in the manufacturing industry have remained viable and competitive as a result of regulations that keep disasters from occurring. This coupled with my exposure to safety process design in chemical engineering has produced this interest in "how the commonly held belief that safety and cost are at odds is incorrect in certain circumstances and what leads to this phenomenon?".

Methodology

With the ultimate goal to prove the existence of the symbiotic relation between safety and profit, this paper will look into a case study of an industrial disaster and the memo published by policy making and emergency relief organizations. Ultimately, the conclusion will come in a form that expresses the strength of such a relationship should there be one.

In cases where the pursuit of safety and cost do come to clash, a limited utilitarian perspective will be applied on the analysis such that safety will be prioritized the needs of the many rather than the profit of the few.

In more detail, profit will be defined as a long term set of returns both monetary and otherwise. This is as a result of the commonly held belief that safety and profit are at odds is not always applicable in such circumstances where profit is pursued in the long term.

Sources and data that analyzed through these conditionally utilitarian methods will originate primarily from two different origins. Literature review will be conducted to analyze past case studies (particularly those pertaining to industrial accidents or major worker's rights infractions). The memos put out by regulatory or disaster relief organizations will also undergo similar literature review. Similarly, interviews with experts in the field of process safety in chemical engineering will be conducted to gain insight into the intricacies of safety while maintaining a profit that may not be initially so obvious to outside observers.

With this analysis conducted, the relationship of safety and profit will be established for long term cases. Should conflicting conclusions from separate sources be found, a separate

analysis will be conducted to determine how well the findings of each source can be applied to establish a formula for the wider manufacturing and economic systems in place.

Analysis

When attempting to determine the extent to which one can pursue operational safety while balancing profits, documents from the American Institute of Chemical Engineers (AIChE), the aforementioned case study of the 1976 Seveso disaster, the case study of the Texas City Refinery Explosion in 2005 point towards establishing measures that exceed the legal requirements in terms of safety in the work environment. This is because, in the end, operational safety will provide a return in the capital invested in it so long as the company operates for long enough.

AIChE – The Business Case for Process Safety

The American Institute of Chemical Engineering (AIChE) released case arguing the benefits of their approach to process safety. This was primarily split into 4 different arguments; 2 are quantitative and 2 qualitative. The labels for these arguments are as follows: Corporate Responsibility (Qualitative), Business Flexibility (Qualitative), Risk Reduction (Quantitative), Sustained Values (Quantitative).

The first argument, Corporate Responsibility, tackles the effects of prioritizing process safety on the image of the company. When process safety is first and foremost, AIChE states that the company's reputation and image will improve on both a global scale and a local scale. This, in turn, provides the company with lowered insurance rates and easier access to being insured as well as increased trust from the local community. Additionally, the workers under the company will experience greater morale and loyalty towards the company.

From the standpoint of Business Flexibility, AIChE argues that a company following process safety to not only the extent required by law but also going above that will benefit the company over time. Simply following the former suggestion of law-abiding operational safety, will provide the groundworks for legal operations via the acquisition of a license [Possible thing to add further in the essay or before: Assuming that the lowest standard of safety is just barely following legal working conditions is making assumptions, managers/owners can forego legality and operate in very unsafe conditions]. However, going above said legal requirements is argued to benefit operators by ensuring operation flexibility in several manners. First, reducing the likelihood of negative incidents in the work place will reduce the creation of further policy that limits the manner in which a company can operate. Second, the retention of skilled labor can increase the tasks and variability of goals the company can achieve. This retention is aided by improving the safety of working conditions the workers are subjected to. It is also argued that should the company need any permits or legal documents to expand, this process is made much easier by having the clean track record afforded to those following through on operational safety. Lastly, the managers of these companies can further focus on improving productivity and finances rather than focusing on previous incidents brought about by a lack of operational safety.

Both of these qualitative arguments are quite relevant to companies outside the scope of AIChE's argument's intended audience. As a result, this makes for a very important perspective in showing just how safety and economics are not always competing. The chemical manufacturing industry has some of the most far reaching and disastrous incidents when operational safety is not taken seriously as was the case in Bhopal (Broughton). The ever-present existence of many work hazards in the form of machines and chemicals necessitates a high capital investment from companies to ensure safe working conditions. In spite of this, the AIChE

make claims that these are offset by the increased revenue that better company image, lower insurance rates, and happier workers bring about. As such, it can be assumed that businesses that require a smaller capital investment to meet, and exceed, the legally required safety conditions are going to also see these results. That is to say, that from a qualitative perspective, evidence in the field of chemical engineering shows that operating above the legally required safety conditions yield benefits that surmount the cost of implementing said safety precautions.

The quantitative side of the case made by the AIChE on the benefits of operational safety start with Risk Reduction. It uses statistics such as cost of property damage from industrial accidents, fines, and anecdotal instances of positive changes once operational safety was implemented in different cases to prove that operational safety will reduce not only the downtime companies might face in the aftermath of an incident but also it will reduce the cost of said incidents.

This is followed by the Sustained Values argument reiterates many of the points made by the previous arguments such as lower insurance premiums and “productivity increases”. However, it also makes the argument that better values for the company allow for lowered oversight as the workers are held to proper procedures due to the company’s work image. Additionally, AIChE also argues that, specifically in the case of manufacturing endeavors, the lowered cost from having to “rework off materials” and “waste stream disposal” contributes to lowered expenses.

Unlike the qualitative arguments, these are more difficult to apply to other businesses that do not see disasters of the kind and size found in the chemical industry. However, these arguments still hold some important information when deciding what one should do when considering the costs of process safety implementation. The primary case made by the Risk

Reduction helps cement operational safety as necessary when prioritizing long-term profit as the aftermath of an incident often outweighs the costs of implementing systems to prevent such an occurrence. The specification of long-term profit as opposed to short-term simply stems from the increased likelihood of a company having experienced an incident that operational safety could have prevented as the company continues to operate.

There is an argument to be made that the scale of the numbers shown in the quantitative part of AIChE's argument makes the application of their findings questionable for smaller operations. However, it is important to the cost and scale of incidents is not the only thing linked to the size of a company. As a company grows the potential funds which they have to deal with incidents grows as well and vice versa. As a result, seemingly small incident for the likes of corporations like Google, Walmart, British Petroleum, etc. are possibly catastrophic for smaller businesses. Additionally, the possible 'points of failure' that could bring about such a result are decreased given the smaller scale of operations in small businesses. This reduces the cost required to mitigate and prevent such incidents. Given this, it is possible to extrapolate that these findings in AIChE's argument are still relevant for smaller businesses.

The Texas City Refinery Explosion (2005)

As was established previously, adherence to safety can provide economic benefits on top of the clearer positive effects of reducing incidents. These benefits generally arose from positive publicity and heightened productivity from workers amongst other things. These aforementioned points serve as encouragement to pursue safety as a means of also turning a profit. However, encouragement also exists in the form of consequences should a company choose to sacrifice

safety in the pursuit of profits. These consequences were touched upon in the AIChE article. In delving deeper, it is evident that the consequences after major incident at a company generally come from some government policy or law being violated. As such, it can be said that in attempting to balance profits and safety, one should pursue the latter as a means of obtaining the former due to the consequences posed by government policy should safety be ignored. This is no clearer than in the case of the 2005 refinery explosion of Texas City.

In 2005, the Texas City Refinery suffered from a terrible incident that caused 15 deaths and 180 injured (BP America). This incident was an explosion caused by the ignition of hydrocarbons due to an overflowing vessel. The aftermath of this was devastating costing a total of \$21.1 million in settlements with the victim's families alone.

This massive loss of life, equipment, and property deeply impacted the community and company involved in it. Improvement efforts were undertaken soon after with Ronald J Unnerstall heading them. The implementation of new operational safety measures had significant impact and brought the facility to a point of being considered top of the line in safety amongst US refineries. Despite this, BP eventually sold the plant for \$2.5 billion to cover costs for another safety mishap in the Deep-Water Horizon Spill (Fahey). All this is to say, the fines, settlements, and repair costs incurred by an incident can easily cut into the operations capabilities of a company to a very significant extent.

The laws and policies that allow those affected by the incidents a company can cause by ignoring process safety create a link between safety and profit by prohibiting profit from existing without safety. As a result, it is then possible to state that when operating in areas where laws and policies can provide significant backlash for possible incidents, process safety should be pursued

such that the minimum legal safety measures are met and to a further extent until risk has been minimized to a level deemed acceptable by those that could be affected by such incidents.

The Seveso Disaster of 1976

Lessons revealing the nature of the relationship between safety and profit are not limited to American based institutions and case studies. The previously mentioned Seveso disaster, and particularly the regulatory aftermath, are key examples of how policies can establish rigid boundaries for safety such that the pursuit of profit cannot blatantly and haphazardly forsake the former.

July 10th, 1976 marked the day when the ICMESA chemical plant underwent a critical failure. The nearby town of Seveso was clouded by a mixture of “sodium hydroxide, ethylene glycol, and sodium trichlorophenate”. Although damaging and toxic, the slow acting effects of this release did not prompt the authorities to evacuate the town in a timely manner (Spane, 2021).

The initial response to such a disaster was widely believed to be insufficient. However, looking past the mechanical failures, the root cause for such a terrible event can be pinned on the inefficient communication between ICMESA officials and local authorities regarding safety and evacuation procedures for the nearby community. This fact was not missed by those in charge and the wider public. The wider European community saw the implementation of the Seveso Directive in 1982 (Industrial accidents). This established a framework for plants dealing with hazardous substances having proper communication with local authorities on evacuation and safety response for surrounding communities and the facility itself.

These policies and set of laws ensure that should a business try to operate at all, an act required to generate any profit, the safety measures outlined by the Seveso Directive must be

followed. Furthermore, given that the plant was operating under the safety guidelines established at the time and those were subsequently shown as insufficient, it is safe to assume that going beyond what is legally required is in the best interest of companies wishing to operate for prolonged periods of time.

Conclusion

In conclusion, balancing safety and profits is an entirely misleading endeavor born from a short term pursuit of profits over anything else. Safety and profit are linked via encouragement and discouragement akin to a carrot and stick approach. The benefits of positive public perception that can be earned by implementing robust safety measures that go above what is legally required can lead to lowered insurance premiums, more customers, and operational flexibility when expanding operations. On the other hand, failing to meet even the bare minimum safety requirements, in the eye of the law, carries many consequences as is shown by the loss of life and cost of the Texas City Refinery Explosion. The legal and societal ramifications of such a disaster can lead to the complete shutdown of enterprises. Combined, these set of benefits to following safety regulations and drawbacks for not coax safety and profit to situation where prolonged pursuit of profit is impossible without focusing on safety. It is as a result of this, that the strategies to optimize profit should include ways to surpass the legal expectations for safety in the work environment.

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