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PDII Tech Issues and Solutions
Final Assignment - Boston Molasses Disaster
1)

Provide a brief summary of the event/disaster. Describe at least 2 technical and 2 non-technical (e.g., human factors, social, economic, cultural, political, environmental) issues that contributed to the event/disaster.

On January 15, 1919, a large tank of molasses burst and sent a wave of molasses flooding the streets of Boston, killing 21 people and injuring 150. One technical reason for this disaster was the type of steel used. It had much less manganese than required, making the temperature at which the metal became brittle higher, allowing even a mild Boston winter to compromise its integrity. The metal sheets were also far too thin for the height of molasses behind it. It was only approximately .7" to .3", nowhere near the thickness that should have been used to hold in the weight and pressure of millions of gallons of fermenting molasses. One reason for these two factors was greed. The tank was built cheaply and construction was rushed to produce as soon as possible while demand was high, it continued to be used because demand was still high due to prohibition, and it failed because they didn't pay to maintain the tank besides the absolute bare minimum and to hide the underlying issues. Another factor was the negligent use of the tank. It should have only been partially filled to allow for CO2 production and heat, but it was filled to 92% capacity of what it could hold, with no room for expansion. Without this, there may have still been an eventual disaster due to its poor construction, but the failure was very likely due to the overfilling of the tank repetitively, weakening the steel to breaking point.

2) 5/7

In your opinion, who/what is primarily responsible for the event/disaster? Why?

I believe the United States Industrial Alcohol company holds primary responsibility for the disaster. They're responsible for the tank's rushed and poor construction, lack of safety checks and standards, improper usage of the tank by overfilling, ignoring warning signs and their employees, and misleading the public by covering up these issues. All of these important factors were easily preventable but were immorally ignored for the sake of profit. After five years, the court found these same results and held them responsible for their actions.

3) 5/7

What are the ethical issues or decisions involved in the event/disaster?

There were many unethical decisions made throughout the years of this tank's life. It was constructed with cost as the first priority and safety second at best, a trend that continued when obvious extreme safety issues were ignored to keep production running and keep profits flowing, and even continued after the event when they made claims found by the court to be false to avoid paying damages to victims and their families.

4) 5/7

What was the impact on society (on the culture, environment, economy, perceptions, etc)?

The Boston molasses disaster had the most significant effects on the future of accountability and safety in engineering, with new laws and regulations being created that continue to grow today, but I'll cover that in more detail in the next question. Besides these regulations and the change in engineering culture, the disaster also had significant impacts on the culture, environment, and economy of Boston. Even over a hundred years later, it's a notable part of the history that every tourist in the area will hear about, and still has local legends that you can still smell the molasses on a hot summer day. The economic impact on Boston can be seen as fairly temporary, as even with an equivalent of \$100 million in damages, the area was rebuilt and recovered before the court case with USIA was even over, but it can also be argued that this short term economic slump affected the city's long term growth in ways that couldn't be easily measured today. There was environmental damage to Boston Harbor, where sugar caused an algae bloom, stopping sunlight from reaching the bottom, killing the plants, and starving the ecosystem. It also had a large impact on the perceptions of industry, not only in Boston, but across the country, something that can be seen in the zoning laws enacted in reaction to the disaster.

5) 5/7

What changes were made after the event/disaster (e.g., laws/regulations)?

The regulations implemented after the Boston molasses disaster were one of the event's most significant and long-lasting effects. At the time there were very few zoning and safety regulations and nothing to check engineer's work or hold them accountable for any unethical actions. This all changed very soon after the disaster, starting in Boston with zoning laws to separate possibly dangerous industry from residential areas and regulations requiring engineers and architects to document and sign their work to be approved by the city, both of which and

more would quickly spread across the country. These were then expanded upon over time, leading to safety being the number one priority, and allowing for legal repercussions when it's not.

6) 5/7

List one positive and one negative outcome from this event/disaster.

One positive outcome of the event was the huge growth in safety regulations and accountability for the engineers and architects that are responsible for people's safety. But of course, the positive outcome is only a reaction to the negative outcome that was 21 lives lost, hundreds of injuries, and millions in damages.

7) 5/7

What are engineers ethical and professional responsibilities in the design/creation of the systems/products like the ones that contributed to the event/disaster?

The primary ethical and professional responsibility of engineers is always to put safety first, something that the engineers and upper management of the Boston molasses tank failed to do. There will always be hard decisions to make, as some things have inherent risks to life that are deemed necessary for the benefits, but the risks taken by the engineers in this event were simply unnecessary, easily preventable, profit-incentivized greed.

8) 5/7

What can/should have been done to prevent something like this from happening?

This disaster could have been prevented at any number of stages. Starting at the earliest stages, it could have been designed properly without cutting costs and it could have been inspected after construction. Management could have listened to the local residents or their employees when they came to them with complaints and safety concerns, even with clear evidence, and conducted proper maintenance or discontinued usage of the tank. Lastly, if the tank was to be used, they could have at least only filled it to the recommended capacity it was rated for instead of filling it well beyond what it was rated for. I'll also add that one could argue that laws should have been in place requiring the engineer's plans to be checked and for safety inspections to be conducted,

but I would argue that those shouldn't have been necessary if the engineers and management of USIA were to simply make moral decisions.

9)

Select a second disaster. Compare and contrast the two events/disasters in terms of primary causes (technical and non-technical differences and similarities).

I see this as very similar to the Hyatt Regency disaster. While I'd say their technical causes are distantly related at best, their non-technical causes are the same- greed. The technical causes of both disasters were caused by cost-cutting measures that brought the strength of the structures below what was required, leading to their eventual failure. The largest difference I see between the two is how that cost-cutting measure made its way through to the final product and to the disaster. At the Hyatt Regency disaster, the cost-cutting measure was made without approval, and seems to have slipped by without anyone knowing about its dangers until it was too late. In contrast, at the Boston molasses disaster, the engineers were likely aware they were cutting corners, and the issues were immediately apparent with constant leaks and eventually shards of the tank breaking off, but it managed to get by because management was too focused on profits and cutting costs to actually address the clear issues.