Design Project II: General Electric Sponsored Project

Freight, Fuel, and Emission Project

The second design project in Engineering Design 100 is a project sponsored by a company. The fall 2015 semester design project was sponsored by General Electric Transportation.

The second design project involves around a fictional port city called Pittsdelphia. This city is an industrial city that has 165,000 tons of freight go in and out the city by train each day. One of the main problem of this system is that the city uses old, tier-2 locomotives that produces emission which no longer fulfills the EPA's tier-3 emission standards. GE transportation and the city of Pittsdelphia now look for a solution to solve this problem.

The solution that is to be developed has to take a few things into consideration. These things are:

1. Fulfilling the new, EPA tier-3 emission standards.
2. Maintaining or improving the carrying capacity of the current fleet
3. Maximizing the cost efficiency
4. Maintaining the public opinion
5. Maintaining on-time delivery

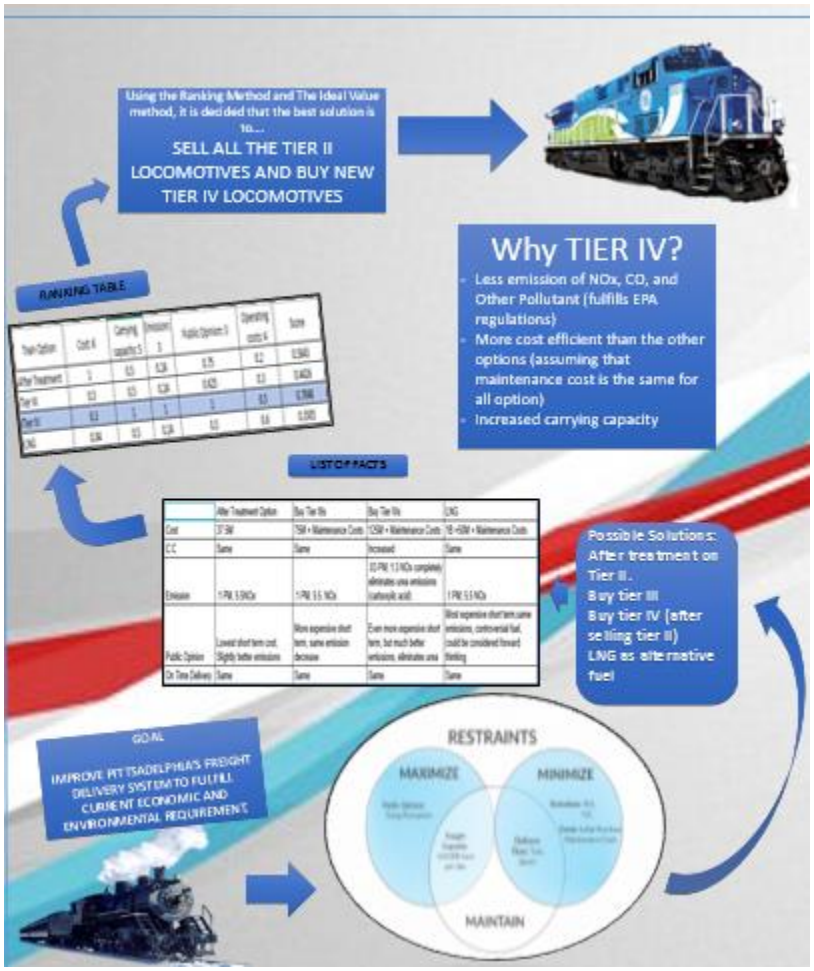
We were also given a few different solutions by the preliminary information from General Electric. These solutions include:

1. Selling the whole fleet of tier-2 locomotives and buying tier-4 locomotives
2. Installing an after-treatment system to the tier-2 locomotives and upgrading it to tier-3 specifications
3. Selling the whole fleet of tier-2 locomotives and buying tier-3 locomotives
4. Using alternative fuel to reduce emission
5. Changing the mode of transportation used for shipping.

Design Process

- In this design project, we used a similar method to the one that was used in the first design process. This time, we did not need to determine what key concepts were needed to solve this problem because the constraints and possible solutions that were presented to us.
- After doing our external research, we used the ranking method and ideal value method to rank the solutions.
- The ranking method is a method that is used to rank possible solutions by giving weights to the five constraints and ranking the solution on each category to find a total score for each solutions. Using the ranking method in conjunction with the ideal value method will make sure that the comparisons are on the same scale. Below is the ranking chart that we used

Train Option	Cost: 6	Carrying capacity: 5	Emission: 3	Public Opinion: 3	Operating costs: 4	Score
After Treatment	1	0.5	0.24	0.75	0.2	0.5843
Tier III	0.5	0.5	0.24	0.625	0.3	0.4426
Tier IV	0.3	1	1	1	0.5	0.7048
LNG	0.04	0.5	0.24	0.5	0.6	0.3505

- The solution that we selected was to sell the tier-2 locomotives and buy a whole new fleet of tier-4 locomotives. This solution was not the most cost effective solution (as seen in the chart above) but considering all the constraints, it's the best solution that can be produced. Our second best solution was to install the after-treatment system to the tier-2 locomotives.

- At this point, the solution is already selected. The next step was then to present this solution. One method of presenting this solution to the public is by using a poster. Below is a picture of our team's poster.