

Design Project II

For the second design project, we had to use different methods in order to decide how GE should improve their current locomotives. The customer (GE Transportation) has provided some requirements which we must fulfill. Pittsdelphia must continue to meet EPA requirements, but our mission was to find a cost effective solution which reduces smog while maintaining or increasing freight capacity. To do this, they asked that we evaluate the suggestions made for fleet upgrade or alternate shipping methods.

We organized our raw data for each possible solution and each criteria in a table:

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Cost	>\$200 mil	\$42,500,000	\$5.5 bil	~\$250 mil	<\$100 mil	<\$150 mil	> \$150 mil
Emissions	1.3	4.75	2	10.44	4	0.02	4.75
Throughput	+++	+++	+++	++	-	+	+++
Public Opinion	+++	+	+++	--	+	--	+
On-Time Delivery	+	+	+	--	+++	++	+

We then used the Ideal Value Method to rank each solution:

	Cost: 5	Emissions: 6	Throughput: 4	Public Opinion: 4	On-Time Delivery: 4	Rating Value
Option 1	4	7	7	7	5	6.0
Option 2	9	4	7	5	5	5.96
Option 3	2	6	7	7	5	5.3
Option 4	3	3	5	3	2	3.17
Option 5	8	5	2	5	7	5.48
Option 6	7	8	4	3	6	5.87
Option 7	6	4	7	5	5	5.3

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In the end, Option 1 had the highest rating value and so is the best option. We made our recommendation to GE Transportation with a poster describing this process and its end result.

Our initial poster:

Improvement of General Electric Locomotives

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Problem

GE locomotives currently transport approximately 165,000 tons in and out of Philadelphia per day, but residents complain of smog and the current locomotives are approaching overhaul age. Locomotives need to be either updated or replaced to address these problems.

Goals

- Cost effective
- Smog-reducing
- Maintenance of/increase in freight capacity
- Positive public opinion
- On time or ahead of time delivery

A model of the Tier IV Train

Solutions

Primary:
Sell old Tier II Trains and buy new Tier IV Trains

Secondary: Upgrade Current Trains to Tier III

Option	Cost	Environment	Throughput	Public Opinion	On-Time Delivery	Rating Value
Option 1: Sell old; Buy Tier IV	4	5	5	5	5	20.0
Option 2: Upgrade current to Tier III	4	4	4	4	4	16.0
Option 3: Use Alternative Fuels	3	3	3	3	3	15.0
Option 4: Using Shipping Mode	3	3	3	3	3	15.0
Option 5: Using Air Mode	3	3	3	3	3	15.0
Option 6: Using Trucking Mode	3	3	3	3	3	15.0
Option 7: Sell old; Buy Tier III	4	4	4	4	4	16.0

Conclusions

The decision to upgrade and sell tier 2 trains in order to buy new tier 4 locomotives was made using the rating method. We rated the locomotives currently in use against planes, trucks and ships and also against new trains. We ruled out after treatment and alternate fuel as well. Our secondary option was still an upgrade, but only from tier 2 to tier 3.

In the end, buying Tier IV locomotives, though somewhat expensive, was worth it when emissions, throughput, public opinion, and on-time delivery were considered. The new train will reduce emissions by 76% and will increase throughput. Because of this, it has the highest public opinion, and so these locomotives are the best choice.

Difference in emissions between Tiers: Tier 2 → Tier 4
Update will improve NO_x Emissions by 76%