The Texago Corporation produces its oil in its three oil fields; Texas, California and Alaska. Imports the rest of what it needs from the Middle East. A distribution network is used to transport the oil from the oil fields to the company’s refineries, the refineries are New Orleans, Charleston and Seattle.

**Oil Fields**

Texas -> 80,000,000 barrels

California -> 60,000,000 barrels

Alaska -> 100,000,000 barrels

Middle East -> 120,000,000 barrels

**Refineries**

New Orleans -> 100,000,000 barrels

Charleston -> 60,000,000 barrels

Seattle -> 80,000,000 barrels

New One (Los Angeles or Galveston or St. Louis) -> 120,000,000 barrels

The Texago is continuing to increase market share so, we need to decide a city for opening a new refinery. We have three options for finding the new city by looking their distribution costs.

1: The new refinery is opened in Los Angeles.

2: The new refinery is opened in Galveston.

3: The new refinery is opened in St. Louis.

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| --- | --- | --- | --- | --- |
| Unit Cost per Shipped with Los Angeles (hij) | | | | |
| Source | New Orleans | Charleston | Seattle | Los Angeles |
| Texas | 2 | 4 | 5 | 3 |
| California | 5 | 5 | 3 | 1 |
| Alaska | 5 | 7 | 3 | 4 |
| Middle East | 2 | 3 | 5 | 4 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Unit Cost per Shipped with Galveston (dij) | | | | |
| Source | New Orleans | Charleston | Seattle | Galveston |
| Texas | 2 | 4 | 5 | 1 |
| California | 5 | 5 | 3 | 3 |
| Alaska | 5 | 7 | 3 | 5 |
| Middle East | 2 | 3 | 5 | 3 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Unit Cost per Shipped with St. Louis (eij) | | | | |
| Source | New Orleans | Charleston | Seattle | St. Louis |
| Texas | 2 | 4 | 5 | 1 |
| California | 5 | 5 | 3 | 4 |
| Alaska | 5 | 7 | 3 | 7 |
| Middle East | 2 | 3 | 5 | 4 |

|  |  |
| --- | --- |
| Site | Annual Operating Cost (Millions of Dollars) (f) |
| Los Angeles | $620,000,000 |
| Galveston | $570,000,000 |
| St. Louis | $540,000,000 |

We made a model upon available information, which is;

xij: # of units sent from oil field i to refineries j

cij: Cost of the new refinery chosen

f: Annual operating cost (fixed cost) of the new refinery chosen

Objective Function:

min z = ( )) + f

Subject to:

Demand constraints: xij ≥ Dj for each j of: 1,2,3,4

Supply constraints: xij ≤ Si  for each i of: 1,2,3,4

Non-Negativity constricts: xij  ≥ 0 for each i & j

First of all, we checked balance between the supply and demand. We saw that the total demand is equal to total supply. So; it is a balanced transportation problem. Which means that we don’t need to create a dummy supply or dummy demand node.

We have three options for problem, by using these three options we tried to find the minimum cost among them.