

Birds Eye was started in 1922 near the Fulton Fish Market in New York by Clarence Birdseye.

The success of the company was due to the realisation by Clarence that fish could be preserved by freezing. This freezing process allowed the fish to be stored and transported without going off.

This opened up an enormous frozen food market that previously never existed.

Birds Eye has two large fish processing plants located near major sea ports; one in the port of Fleet and one in the port of Black. Both plants produce cases of frozen fish which are then transported by road to distribution warehouses located some distance away. At present, Fleet processes X cases of fish per month and Black Y cases.

The demand for cases at these warehouses for month 1 is given in Table 1.

Note, if the total demand is less than the supply, the remaining cases can be sold locally to independent fish merchants. If demand is greater than supply then the Cobb warehouse must be the one to receive fewer cases than requested.

|  |  |
| --- | --- |
| Table 1 Warehouse | demand  (# of cases) |
| Abbey | A |
| Barn | B |
| Cobb | C |

Table 2

The transportation costs are given in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| The transportation costs are given in the following table: Warehouse | | | |
| Plant | Abbey | Barn | Cobb |
| Fleet | k1 | k2 | k3 |
| Black | k4 | k5 | k6 |

Transportation costs are given in £’s per case, and include all preparatory work, loading and fuel costs.

The refrigerated vehicles used for transportation are of various sizes, and are owned and maintained by Birds Eye.

Each journey from a plant to a warehouse is completed by a single vehicle with a maximum of one journey scheduled from a plant to a warehouse each month. The maximum capacity of these vehicles is D cases, and the minimum number of cases for any journey is currently set at M.

Part A - Optimisation Tasks

1. Describe how the cases should be shipped from the plants to the warehouses for month 1 at minimum cost?

2. What is the minimum total transportation cost1 for month 1?

1 Present all costs rounded to the nearest whole pound, using a suitable Excel function, e.g. £1,234.00

2 If there aren’t enough cases to satisfy demand, then how many cases will the Cobb warehouse be short (presented as a negative value)?

3. How many cases would be leftover to sell in the local market2?

4. Which port would these cases be sold in?

5. How much would the transportation costs1 at Black port be?

6. How much would the transportation costs1 at Fleet port be?

7. Month 2 will see Abbey demand increase by E cases, with Barn remaining the same as month 1.

What will the minimum transportation cost1 be?

8. How many cases would be leftover to sell in the local market2 in month 2?

9. Month 3 will see Barn demand increase by F case, with Abbey remaining the same as month 1.

What will the minimum transportation cost1 be?

10. How many cases would be leftover to sell in the local market2 in month 3?

11. Month 4 will see demand at Abbey rise by E cases and Barn rise by F cases.

What will the minimum transportation cost1 be?

12. How many cases will now be leftover to sell in the local market2 in month 4?

13. If the constraint on the number of journeys from a plant to a warehouse – currently set at a maximum of just one journey per month – is relaxed, such that two journeys can take place between a port and warehouse, how does this affect the minimum transportation cost1?

Base this cost on the high demand situation (month 4).

14. If the Black plant is closed and all fish processing is transferred to Fleet, how would this impact on the transportation costs1. Present both a low demand cost and a high demand cost.

As with Q13, you can assume that up to two journeys can take place between the port and any warehouse.

15. If the Fleet plant is closed and all processing is transferred to Black, how would this impact on the transportation costs1. Again, present both a low demand cost and a high demand cost.

As with Q13, you can assume that up to two journeys can take place between the port and any warehouse.

16. Briefly comment on whether you think closing a plant is a good idea, and if so, which one would you suggest closing?

Also comment on relaxing the vehicle trip constraint (Q13) – does this have a big influence on costs?

What practical issues may need to be considered when changing the number of trips?

Part B – Cobb Shortages

The manager at the Cobb warehouse has voiced concerns that far too often Cobb receives fewer fish than requested, and has suggested that Cobb is short of fish ‘more than half of the time’.

Based on the historical data from 2019 through to 2021, is there any evidence to support this claim?

If Cobb had been supplied all the fish they requested during this period, then how would this have increased the monthly distribution costs at Birds Eye?