

Case 7 – Package Delivery

Case material for VBA Programming in Business Economics by Sanne Wøhlk

Please use the Excel file corresponding to this case. If the reader is not familiar with the Vehicle Routing Problem and the algorithms mentioned below we recommend that the reader consults the book's background material on that subject.

In this case we consider a newly started company PackTrans that delivers packages for companies. The owner of the company wants to know how many delivery trucks to buy and how to plan the routes of the trucks. He estimates that 200 companies will need their service and that each company will send between 1 and 9 packages daily. In the morning, the packages are collected from the companies. Thereafter, the trucks will meet at TransPack's location, sort the packages, and repack the trucks. The packages are then distributed (to the same 200 companies) in the afternoon. Therefore the operation of TransPack can be considered to be two separate vehicle routing problems. In the following we only consider the process of picking up the packages.

The vehicles to be bought can carry up to 100 packages and to even out the workload among the drivers each vehicle should make no more than 24 stops besides the company address.

The Excel file of the case contains a sub for generating a set of customers including the number of packages to be sent from each. The location of the companies are given in a 100 by 100 coordinate system and the Euclidean (straight line) distance can be used. TransPack is located in the center of the area.

The routes of the trucks are generated using the Savings algorithm or the following strategy: First generate a TSP tour using the Nearest Neighbor algorithm. Then follow the tour until at least one of the two constraints is met. At this point, the route is ended and a new route is started with the next customer. Note that there are two constraints on the tours: The number of packages and the number of stops must be considered.

Write a number of procedures to plan the routes using the two strategies. Next, perform a simulation study to determine the number of trucks to buy in order to be able to pick up packages with the strategy that results in the smallest routing cost.