#### How to select certain number of suppliers from the pool to achieve the best colligation benefit

**Step 1: Calculate single supplier tour length**

DA, DB, … are defined as the total tour length for each supplier (A, B, …) to finish its delivery.

**Step 2: Calculate the allocated tour length for each supplier after optimization based on the number of order proportion.**

Di

Si

Si+1

Define and calculate the following variables between stop i and stop i+1:

* 1. Di  as the leg distance
  2. NAi , NBi , NCi … as the number of orders for each supplier (A, B, C…) on the delivery vehicle  
     N= NAi + NBi + NCi +… as the total number of orders on the delivery vehicle
  3. WAi = NAi /N, WBi = NBi /N… as the number of orders proportion for each suppliers
  4. We will then allocate the distance Di to each supplier based on its number of orders proportion on the delivery vehicle DAi = Di x WAi ,DBi = Di x WBi …

Then the total allocated tour length for each supplier after optimization will be

where M is the total number of tours, Kj is the total number of stops of tour j

**Step 3: Calculate the saved tour length for each supplier**

DA,save = DA – DA,opt , DB,save = DB – DB,opt

**Step 4: For each supplier, calculate the colligation benefit from other suppliers, e.g supplier A**

1. Calculate NABi= Di x (NAi + NBi ),NACi= Di x (NAi + NCi ) … as the total “shared order miles” for each pair of suppliers (A,B), (A,C)… from stop i to stop i+1
2. Calculate the total shared order miles for each pair (A,?) through the whole tour

….

where M is the total number of tours, Kj is the total number of stops of tour j

1. Calculate the total shared order miles for all the pairs involving A
2. Calculate the colligation benefit percentage of each other supplier with A

……

1. Calculate the colligation benefit of each other supplier with A

……

1. Calculate the colligation benefit for each pair of suppliers, e.g supplier (A, B)

**Step 6: Eliminate the least benefit suppliers from the supplier pools based on the following rank**

1. Calculate the benefit score for each supplier i  
   Score = isave + icontributed save to others

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D |  |
| A |  |  |  |  | **Asave** |
| B |  |  |  |  |  |
| C |  |  |  |  |  |
| D |  |  |  |  |  |
|  | Acontribute |  |  |  |  |

1. Rank the supplies based on the benefit score from high to low
2. Select the top **K** suppliers (**K** is a predefined constant, say 20) for the next step

**Step 7: Select the best group of J suppliers in terms of colligation benefit from the supplier pool (J <= K)**

1. Form groups of **J** suppliers from **K** suppliers pool, there will be groups
2. For each group, calculate the total colligation benefit, which is the summation of each paring benefit from step 4.6.

e.g **J=3,** for group (A, B, C)

Total colligation benefit

= AB + AC + BC

=

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | B | C |
| A |  |  |  |
| B |  |  |  |
| C |  |  |  |

1. Rank the group based on the total colligation benefit from high to low
2. Pick the top one as our recommendation