**Problem**: Find the distribution plan for Westvaco’s paper mill in Wickliffe, Kentucky that creates a least-cost assignment of truckloads to carriers within the necessary requirements

**Solution**: Minimize the total cost of distribution from Wickliffe to different destinations by meeting trips(truckloads) and intermediate stop requirements

**Inputs**: in blue in spreadsheet,

For each destination

* No of trips (truckloads) required
* No of intermediate stops required
* Distance (miles) travelled per trip
* Cost ($/miles) per Carrier
* Some destinations are not served by some carriers, set as 0 and highlighted in red
* Total 32 trips are required for distributing last night’s production

For each carrier

* Minimum truckload charge
* Intermediate stop-off charge
* Available trips(pulls)
* Minimum trips(commitment) required

**Objective function: Min** (**Total Transportation Cost**) **= ,** where

* Minimize the total transportation cost ($) to destination i by carrier j
* **Xij** – No of trips to destination i by carrier j
* **Cij** – Total Cost ($) to destination i by carrier j per trip
* **i (1…12)** for the 12 destinations
* **j (1…6)** for the 6 carriers
* **Cij = min [(CCij \* Di + SCj \* Si), MCj],** where
  + Total cost per trip is the minimum of Carrier Cost based on destination distance and no of stops or the carrier’s minimum truckload charge
  + This has been calculated in a separate table based on the input data
  + **CCij** – Carrier Cost in miles/$ to destination i by carrier j
  + **Di** – Distance in miles for each trip to destination i
  + **SCj** – Intermediate stop-off charge for carrier j
  + **Si** – No of stops for destination i trip
  + **MCj** – Minimum truckload charge for carrier j for each trip

**Decision variable**: **Xij** – No of trips to destination i by carrier j

**Constraints**:

1. **<= ATCj for all j,** where
   * **ATCi** – Available trips(pulls) for each carrier j
2. **>= MTCj for all j,** where
   * **MTCj** – Minimum trips(commitment) for each carrier j
3. **>= Ti for all i,** where
   * **Ti** – No of trips required to be made to destination i
4. **Xij  int,** must be integer to ensure 1 full trip/carrier
5. **<= 0,** where
   * **i,j**  {(1,1),(2,1),(3,1),(5,1),(6,1),(8,1),(9,1),(10,1),(12,1),(9,3),(5,4),(9,5),(5,6),(9,6)}
   * Total of all trips that are not served by carrier j to destination i should be 0, to ensure that they are not part of the distribution plan

**Result**:

* **The least-cost distribution** **plan** from Wickliffe to different destinations is given with **minimum total cost** of **$ 22,394.38**
* The results are given in **Case5.1** sheet