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Maximizing Milk run opportunities using Google Maps and Strategic Load Consolidation

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1. ABSTRACT

In a world where all industries are becoming more and more customer centric, delivery fulfilment is a tricky business. Orders need to be processed, picked, and packed as fast as possible. Whilst this secures a healthy serviceability, it makes a substantial dent in company's balance sheet.

'Milk-Run' is a technique that fulfilment centres can employ to diversify their mode of deliveries and save some money in the process.

2. INTRODUCTION

In the course of paper, we would try to explain what Milk Run opportunity is and how would does that help in reducing Transportation costs. In many of the centres, the sheer volume of deliveries makes the Milk Run formulations impossible for a human to compute [1]. Therefore, we would understand how we can leverage simple tools like Google maps to reduce complexity and incorporating its inputs to create a robust process to identify and create milk run opportunities.

2.1 Ways of Transport

Fulfilment centres either opt for courier services or book truck load delivery services to execute consignment delivery. Courier service usually opt hub and spoke model, though effective it can be a tad expensive and time consuming. Truckload shipping services however carry load in bulk, and usually follow a direct route to the destination, and hence are more time efficient. The decision to opt any service depends on the delivery load and such decisions must be taken judiciously to reduce outbound logistics costs. Since the charges of truckload delivery services are usually independent of load,

breakeven calculation would offer minimum load for which truckload services would offer better value than the courier services.

For example: Logistics requirement

Mumbai to Hyderabad

Courier cost – 6 rs/kg

Truck cost – 25,000 Rs

Back of the hand calculations suggest that if the load is above 4167 kg, it would make economic sense to send through a truck. This minimum load limit is the

breakeven point for choosing the Truck load way of transport.

2.2 What is a Milk Run?

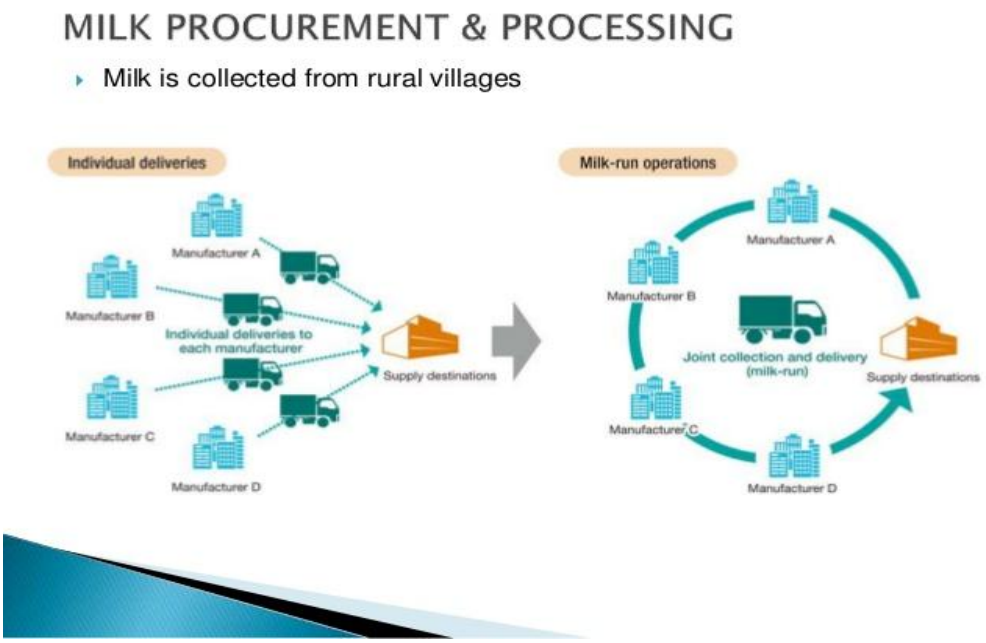


Figure 1: Milk procurement from various nodes

A Milk Run is a delivery method used to transport mixed loads from various suppliers to one customer. Instead of each supplier sending a truck every week to meet the needs of one customer, one truck (or vehicle) visits the suppliers to pick up the loads for that customer. This method of transport got its name from the dairy industry practice [2],

where one tanker used to collect milk from several dairy farms for delivery to a milk processing company [3]. (Refer Figure 1)

2.3 Milk Run in Logistics Industry

The process we are suggesting is devised keeping a logistics framework in mind. This framework includes a Primary Warehouse/Fulfilment centre, which is supply point for many secondary warehouses. And for sending the supplies Warehouse employs 3rd party logistics partner

Primary Warehouse can send supplies in two major ways

Courier – If the consignment is small it is sent through courier where it is charged per weight. E.g. – 10Rs/kg

Truck – If the weight of the supplies is high, it is sent through a separate Truck. Cost of a truck depends on the distance from the warehouse and the tonnage capacity of truck

Transit time – Time taken by the transporter to deliver the shipment's. As Courier delivery follow a Hub and spoke model and Truck directly delivers the supplies. The transit time is generally less while using the truck

Milk Run constraint – Adding an additional supply point does not come for free [4]. Each transporter has some constraints attached to their Milk Run offering.

For e.g. – Addition of supply point should not increase the total route distance by 50km

3500 Rs increase in logistics cost for every additional supply point [5]

These costs vary as per the contracts the logistic companies have set with the Fulfilment centre.

3. IDENTIFYING MILK RUN OPPORTUNITIES

In the assumed Logistics Industry, the dispatches originate from pre-decided locations. For the purpose of exercise, we would be working under the assumption of one Primary fulfilment centre. Below are the steps which would help us identify Milk Run opportunities the fulfilment centre can leverage.

Step 1

Considering the actual weight and volumetric weight, chargeable weight of the consignment is calculated. This chargeable weight is regarded for the breakeven calculations, where the decision is made whether to opt courier services or truck load delivery services. Consequently, a list of the dispatch locations is prepped which fulfil full truck load break even calculations.

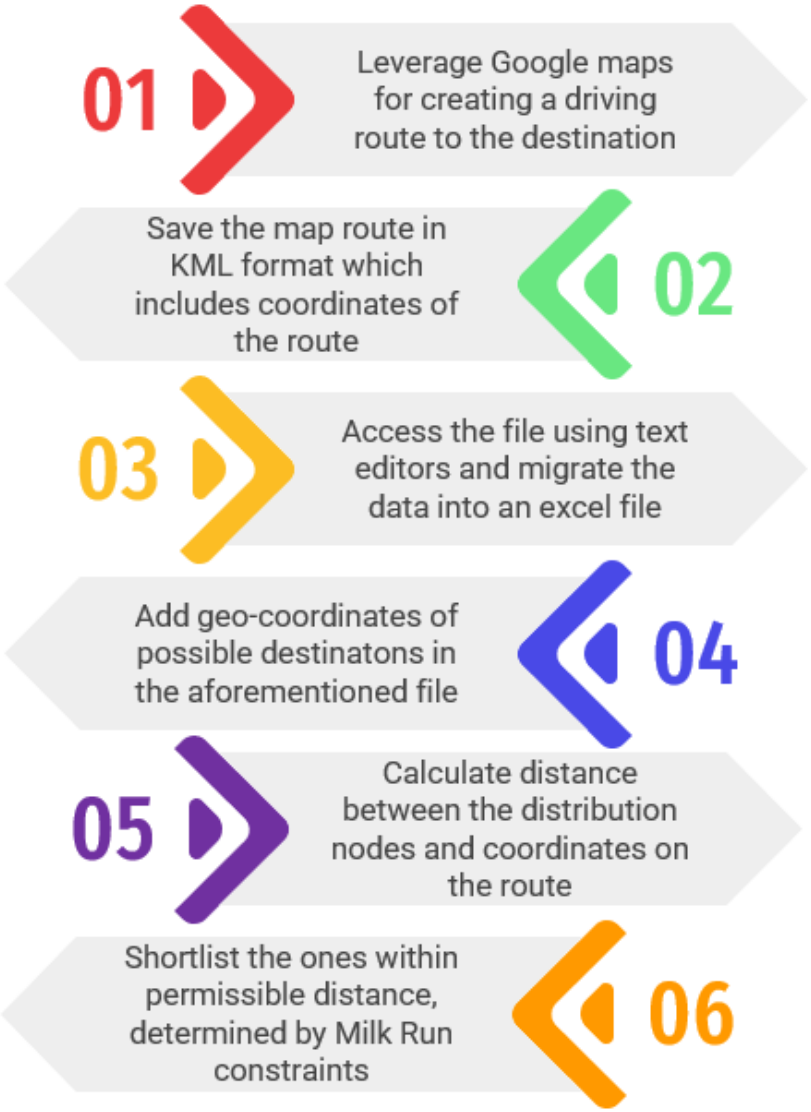
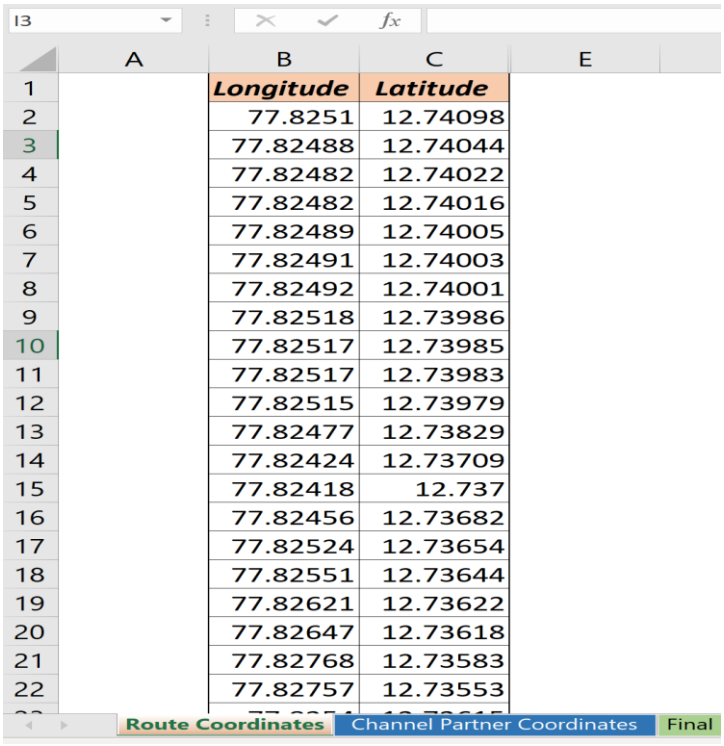


Figure 2: Process for proximity detection of other nodes

Step 2

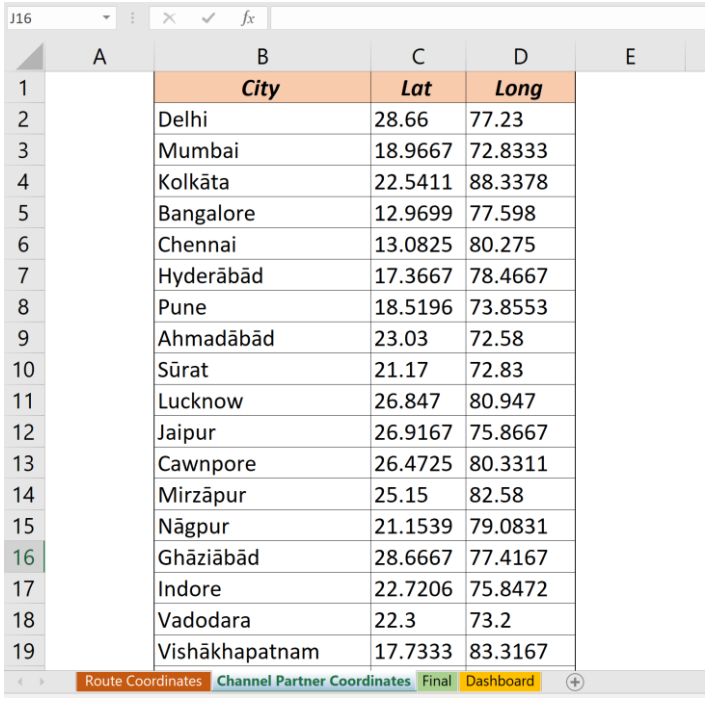
In order to get a list of dispatch locations which may qualify for additional node points, the fulfilment centre needs to follow the procedure mentioned in Figure 2. Once the route is finalised, calculate distance between route geo coordinates (Figure 3) and distribution nodes coordinates (Figure 4) [6]. The calculated distances (Figure 5) are then compared with permissible limit decided under Milk Run Constraints(e.g. 50 kms).



	A	B	C	E
1		***Longitude***	***Latitude***	
2		77.8251	12.74098	
3		77.82488	12.74044	
4		77.82482	12.74022	
5		77.82482	12.74016	
6		77.82489	12.74005	
7		77.82491	12.74003	
8		77.82492	12.74001	
9		77.82518	12.73986	
10		77.82517	12.73985	
11		77.82517	12.73983	
12		77.82515	12.73979	
13		77.82477	12.73829	
14		77.82424	12.73709	
15		77.82418	12.737	
16		77.82456	12.73682	
17		77.82524	12.73654	
18		77.82551	12.73644	
19		77.82621	12.73622	
20		77.82647	12.73618	
21		77.82768	12.73583	
22		77.82757	12.73553	

Route Coordinates | Channel Partner Coordinates | Final

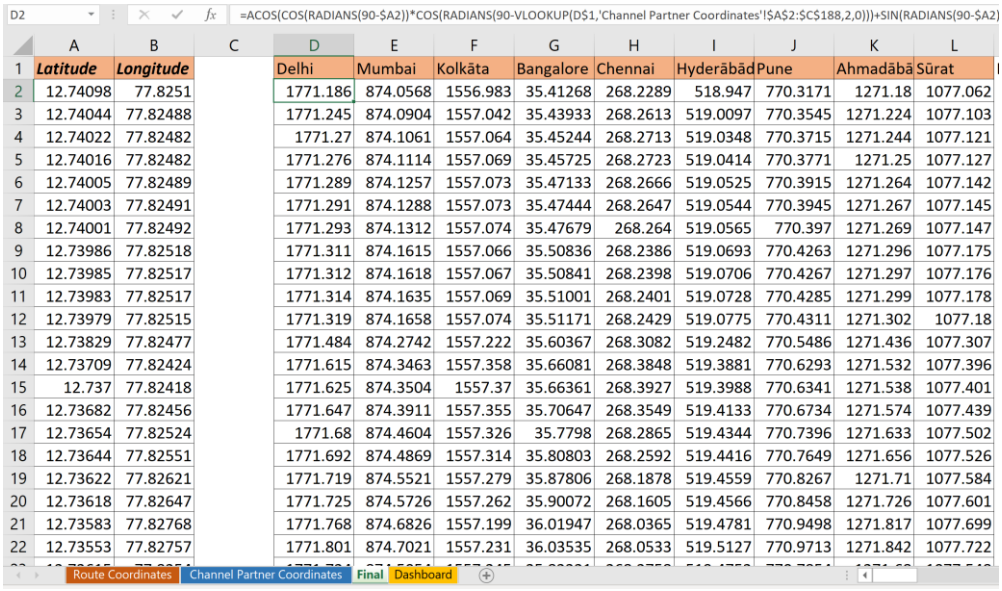
Figure 3: Geo coordinates of route



	A	B	C	D	E
1		***City***	***Lat***	***Long***	
2		Delhi	28.66	77.23	
3		Mumbai	18.9667	72.8333	
4		Kolkāta	22.5411	88.3378	
5		Bangalore	12.9699	77.598	
6		Chennai	13.0825	80.275	
7		Hyderābād	17.3667	78.4667	
8		Pune	18.5196	73.8553	
9		Ahmadābād	23.03	72.58	
10		Sūrat	21.17	72.83	
11		Lucknow	26.847	80.947	
12		Jaipur	26.9167	75.8667	
13		Cawnpore	26.4725	80.3311	
14		Mirzāpur	25.15	82.58	
15		Nāgpur	21.1539	79.0831	
16		Ghāziābād	28.6667	77.4167	
17		Indore	22.7206	75.8472	
18		Vadodara	22.3	73.2	
19		Vishākhapatnam	17.7333	83.3167	

Route Coordinates | Channel Partner Coordinates | Final | Dashboard

Figure 4: Geo coordinates of distribution nodes

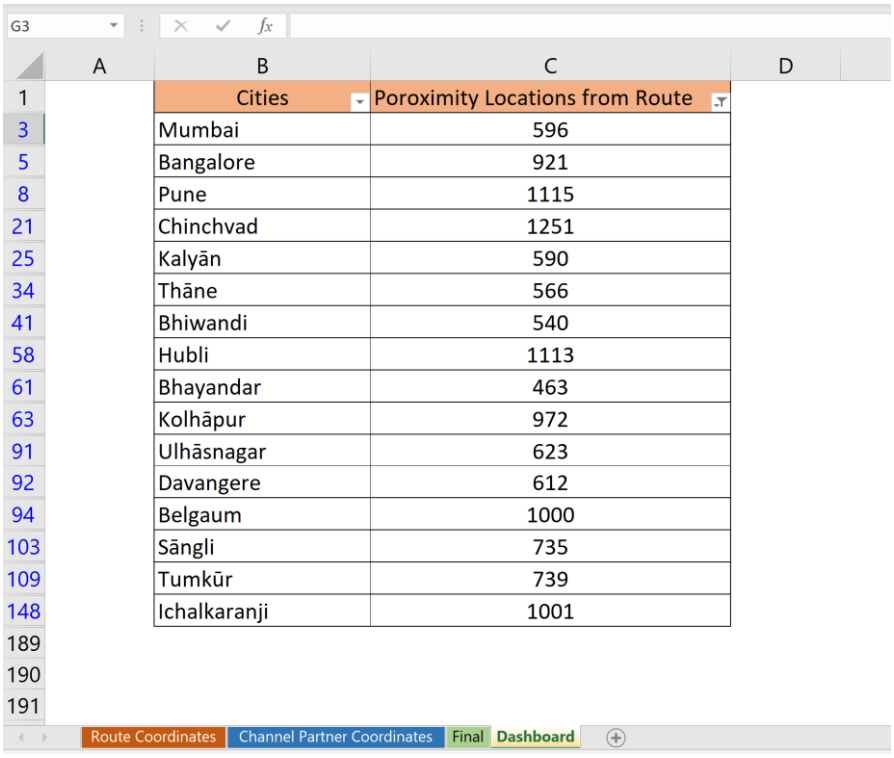


D2 =ACOS(COS(RADIANS(90-$A2))*COS(RADIANS(90-VLOOKUP(D$1,'Channel Partner Coordinates'!$A$2:$C$188,2,0)))+SIN(RADIANS(90-$A2)

	A	B	C	D	E	F	G	H	I	J	K	L
1	***Latitude***	***Longitude***		Delhi	Mumbai	Kolkāta	Bangalore	Chennai	Hyderābād	Pune	Ahmadābā	Sūrat
2	12.74098	77.8251		1771.186	874.0568	1556.983	35.41268	268.2289	518.947	770.3171	1271.18	1077.062
3	12.74044	77.82488		1771.245	874.0904	1557.042	35.43933	268.2613	519.0097	770.3545	1271.224	1077.103
4	12.74022	77.82482		1771.27	874.1061	1557.064	35.45244	268.2713	519.0348	770.3715	1271.244	1077.121
5	12.74016	77.82482		1771.276	874.1114	1557.069	35.45725	268.2723	519.0414	770.3771	1271.25	1077.127
6	12.74005	77.82489		1771.289	874.1257	1557.073	35.47133	268.2666	519.0525	770.3915	1271.264	1077.142
7	12.74003	77.82491		1771.291	874.1288	1557.073	35.47444	268.2647	519.0544	770.3945	1271.267	1077.145
8	12.74001	77.82492		1771.293	874.1312	1557.074	35.47679	268.264	519.0565	770.397	1271.269	1077.147
9	12.73986	77.82518		1771.311	874.1615	1557.066	35.50836	268.2386	519.0693	770.4263	1271.296	1077.175
10	12.73985	77.82517		1771.312	874.1618	1557.067	35.50841	268.2398	519.0706	770.4267	1271.297	1077.176
11	12.73983	77.82517		1771.314	874.1635	1557.069	35.51001	268.2401	519.0728	770.4285	1271.299	1077.178
12	12.73979	77.82515		1771.319	874.1658	1557.074	35.51171	268.2429	519.0775	770.4311	1271.302	1077.18
13	12.73829	77.82477		1771.484	874.2742	1557.222	35.60367	268.3082	519.2482	770.5486	1271.436	1077.307
14	12.73709	77.82424		1771.615	874.3463	1557.358	35.66081	268.3848	519.3881	770.6293	1271.532	1077.396
15	12.737	77.82418		1771.625	874.3504	1557.37	35.66361	268.3927	519.3988	770.6341	1271.538	1077.401
16	12.73682	77.82456		1771.647	874.3911	1557.355	35.70647	268.3549	519.4133	770.6734	1271.574	1077.439
17	12.73654	77.82524		1771.68	874.4604	1557.326	35.7798	268.2865	519.4344	770.7396	1271.633	1077.502
18	12.73644	77.82551		1771.692	874.4869	1557.314	35.80803	268.2592	519.4416	770.7649	1271.656	1077.526
19	12.73622	77.82621		1771.719	874.5521	1557.279	35.87806	268.1878	519.4559	770.8267	1271.71	1077.584
20	12.73618	77.82647		1771.725	874.5726	1557.262	35.90072	268.1605	519.4566	770.8458	1271.726	1077.601
21	12.73583	77.82768		1771.768	874.6826	1557.199	36.01947	268.0365	519.4781	770.9498	1271.817	1077.699
22	12.73553	77.82757		1771.801	874.7021	1557.231	36.03535	268.0533	519.5127	770.9713	1271.842	1077.722

Route Coordinates | Channel Partner Coordinates | Final | Dashboard

Figure 5: Distance of distribution nodes from the route



G3

	A	B	C	D
1		Cities	Poroximity Locations from Route	
3		Mumbai	596	
5		Bangalore	921	
8		Pune	1115	
21		Chinchvad	1251	
25		Kalyān	590	
34		Thāne	566	
41		Bhiwandi	540	
58		Hubli	1113	
61		Bhayandar	463	
63		Kolhāpur	972	
91		Ulhāsnagar	623	
92		Davangere	612	
94		Belgaum	1000	
103		Sāngli	735	
109		Tumkūr	739	
148		Ichalkaranji	1001	
189				
190				
191				

Route Coordinates | Channel Partner Coordinates | Final | Dashboard

Figure 6: Distribution nodes within proximity distance

Step 3

User to determine the additional distance the truck would need to cover if we plan to add any of the shortlisted nodes in step 2 (Figure 7). This increment in the total distance should be under a permissible limit, outlined by the Milk Run constraints

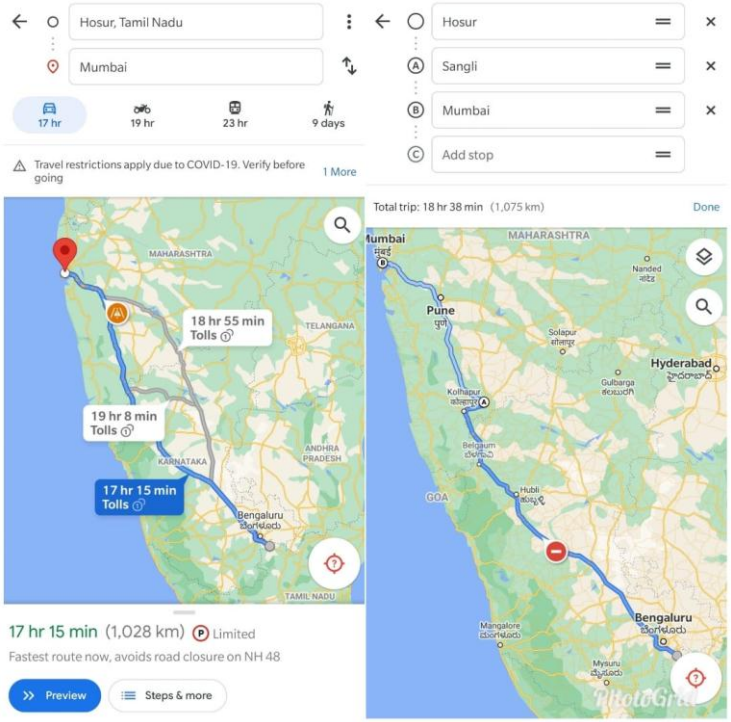


Figure 7: Distance with distribution node added in the route.

Step 4

For adding an additional node in the route, Warehouse is required to pay an extra amount to the transporter (e.g. – 5,000 Rs). Therefore, to finalize the node to be used in the Milk Run, user would need to do a cost benefit analysis for each node.

Cost Benefit = Courier rate of the distribution node x (Load – Breakeven load)

Load: Actual Load requirement of the node

Breakeven Load: Minimum load requirement where courier costs equals the additional milk run costs (e.g., 5000 Rs).

4. STRATEGIC LOAD CONSOLIDATION

The above explained process is certain to fail if there are not enough dispatch locations which passes the load Break Even calculations. This might be due to low delivery load in the dispatch. To solve this problem, we need to employ Strategic Consolidating for Selective dispatch locations, in turn creating Milk Run opportunities.

Retrospective Load Conversion Analysis

Step 1

Get a list of locations which contribute 80% to revenue, using Pareto principle. These locations are the potential locations which should be further analysed to consolidate load.

Step 2

Prepare a database of delivery load on each day of a month for all shortlisted locations. (Refer Figure 8)

Step 3

Difference between the transit time of courier load and truckload delivery, can be utilised to consolidate load. This is done to reduce the logistics costs without hampering end-to-end serviceability. For the next step, user would need to prepare a database which outlines the retrospective consolidated load if we would have had employed strategic consolidation in that time period. The number of times the consolidated load meets the breakeven criteria is captured in the 'Load Conversion %' This metric is critical in deciding the Distribution nodes for Strategic consolidation.

F8 =COUNTIF(D3:D31,">=3000")/29

	A	B	C	D	E	F	G
1		**Date**	**Load**	**Consolidated load**			
2		01-04-2020	1610			*Breakeven Weight for truck load*	
3		02-04-2020	1743	3353		**3000**	
4		03-04-2020	1794	3537			
5		04-04-2020	2338	4132			
6		05-04-2020	1599	3937			
7		06-04-2020	2219	3818		*Load Conversion Percentage*	
8		07-04-2020	1890	4109		**93.10%**	
9		08-04-2020	1250	3140			
10		09-04-2020	2413	3663			
11		10-04-2020	1901	4314			
12		11-04-2020	2172	4073			
13		12-04-2020	2081	4253			
14		13-04-2020	2174	4255			
15		14-04-2020	2500	4674			
16		15-04-2020	1699	4199			
17		16-04-2020	2406	4105			
18		17-04-2020	2124	4530			

Load Conversion

Figure 8: Load Conversion Analysis.

5. CONCLUSION

Implementing milk run routine in the supply chain operations is essential in driving the logistics costs down [7], because it directly translates into improving bottom line of the organisation. In case of large scale of Operations, Google maps API can be leveraged to automate some of the steps involved in identifying Milk-run opportunities. The processes discussed in the paper are effective, because of their lack of complexity and accessibility of the tools involved. They Help the organisations to make their operations lean without hampering serviceability, which is a necessity in today's changing landscape.

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