

Ten Best Practices for Motor Freight Management

An LMS White Paper

Introduction

In the wake of rising freight costs and shrinking capacity, even the savviest of transportation professionals are struggling to reduce freight expenditures while keeping a keen eye on customer service. A combination of industry developments, including rising fuel costs, driver shortages and new Hours of Service (HOS) regulations, has raised the industry cost climate to an uncomfortable degree, especially for those held directly accountable for bottom-line performance.

Carrier negotiations once played a fundamental role in shippers' cost reduction initiatives. However, as shippers are often reminded, carriers are not immune to the same marketplace conditions that send shippers racing to the negotiation table. Transportation professionals must realize carrier negotiations can only take them so far; it is the shippers who must drive the initiatives that will produce the savings today's manufacturers demand.

Additionally, transportation practitioners cannot look to internal trade-offs, such as shipping less frequently or shifting to slower and cheaper transport. While minimizing transportation costs, these options increase inventories and/or decrease customer service levels.

Adding to this frustration is a record-setting capacity crunch that plays out the laws of supply and demand as shippers with increasing freight volumes vie for truck space amid a national trailer and driver shortage. As transportation professionals, we acknowledge our limited ability to create additional capacity in the marketplace. Conversely, we have an incredible ability to maximize our assets, as well as the assets we share with fellow shippers.

The purpose of this white paper is to provide logistics professionals with a means of reclaiming transportation costs savings and maximizing asset utilization. The goal of these "Best Practices" is to shift freight to a more economical mode, i.e. less-than-truckload (LTL) to truckload (TL), and build larger loads to make the most of available capacity. Freight optimization tactics are not new, but they continue to be a powerful tool for shippers seeking to diminish the affects uncontrollable market conditions.

Motor Freight Market Segmentation

Rail, ocean, barge, TOFC and air freight are largely homogenous modes. Conversely, motor freight is a heterogeneous, segmented market comprised of:

- Parcel/Minimum Charge Freight
- Small Mark LTL Freight
- Medium Mark LTL Freight
- Large Mark LTL Freight
- Less Than Full Capacity Truckload Freight
- Full Capacity Truckload Freight

Each of these segments is, in fact, its own mode within the motor freight market.

Asset utilization is maximized by:

1. Building larger, more economical loads within any one of these modes, or
2. Shifting from one mode to a more economical mode.

Best Practices

The Ten Best Practices below represent a portfolio of optimization strategies that target specific modes within the motor freight market and achieve one of these two asset utilization objectives. These are:

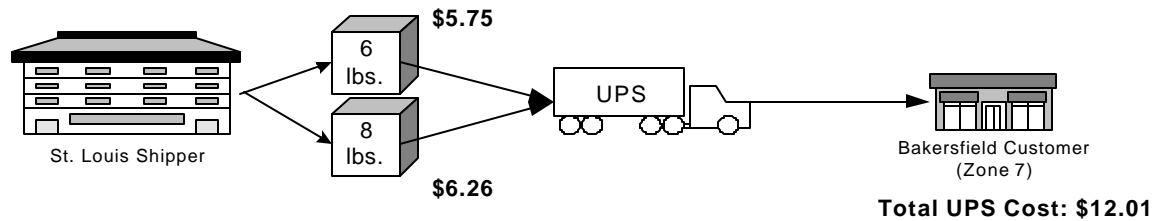
BEST PRACTICE	OBJECTIVE	TARGETED MODE					
		Parcel/ Min Charge Freight	Small Mark LTL Freight	Medium Mark LTL Freight	Large Mark LTL Freight	< Full Capacity TL Freight	Full Capacity TL Freight
1 Parcel Case Strapping	Build larger loads	X					
2 Parcel/LTL Min Charge Analysis	Mode shift	X					
3 Parcel Zone Jumping	Mode shift	X					
4 Cross Dock/Pooling	Mode shift		X	X			
5 Cross Dock/Merge-in-Transit	Mode shift		X	X			
6 Pooling	Mode shift		X	X			
7 Aggregation	Build larger loads		X	X	X	X	
8 Consolidation	Mode shift			X	X	X	
9 Co-loading	Mode shift			X	X	X	
10 Continuous Move Routing	Mode shift (from TL to "Tour" Mode)					X	X

1. Best Practice: PARCEL CASE STRAPPING

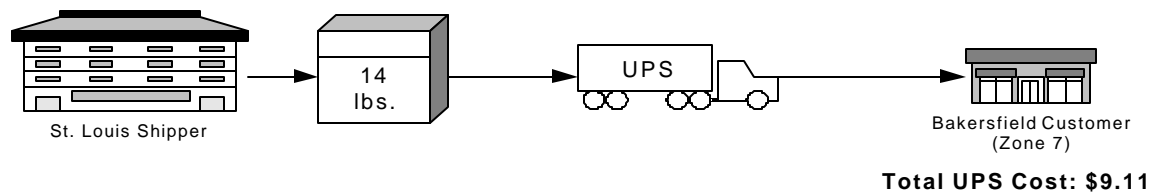
Target Mode: Parcel/Minimum Charge Freight

Consider two cases shipped UPS ground service from the same St. Louis, MO shipper to the same Bakersfield, CA customer on the same day. The customer is in UPS Zone 7 from St. Louis. The first case weighs 6 lbs. and the second case weighs 8 lbs.

Shipped individually, non-discounted UPS costs are:



But if these two cases are strapped into one 14 lb. shipment, the single UPS shipping cost is:



Savings = \$2.90 (\$12.01 - \$9.11), or 24%.

While savings from this simple parcel aggregation model are trivial on a per-shipment basis, they represent enormous cost reduction potentials for a volume parcel shipper with hundreds or thousands of daily parcel shipments.

2. Best Practice: PARCEL/LTL MIN CHARGE ANALYSIS

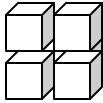
Target Mode: Parcel/Minimum Charge Freight

Many shippers impose a uniform, corporate-wide parcel/LTL routing policy. For example:

- From 1 - 150 lbs., ship UPS.
- Over 150 lbs., ship LTL.

The premise is that parcel shipping costs up to the weight break specified are less than alternative LTL Minimum charges. The inherent fallacy in this “static” parcel/LTL routing policy is that it is based upon *corporate-wide averages* - an average corporate LTL min charge, an average corporate case weight, and an average corporate ship-to parcel zone. Consider the following examples:

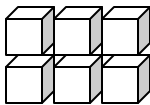
Four-Case, 140 lb. Order



Non-Discounted UPS Charge for Zone 7 (35 lb. Avg Case Weight) =	\$77.84
LTL Min Charge =	<u>\$65.00</u>
Lost Savings:	\$12.84

Routed according to the specified parcel/LTL weight break of 150 lbs., the 140 lb. order above would have shipped UPS at a cost of \$77.84. But the alternative LTL min charge was \$65.00. Lost savings were \$12.84, or 16%.

Six-Case, 162 lb. Order



LTL Min Charge =	\$58.00
Non-Discounted UPS Charge for Zone 3 (27 lb. Avg Case Weight) =	<u>\$47.16</u>
Lost Savings:	\$10.84

Again routed according to the specified parcel/LTL weight break of 150 lbs., the 162 lb. order above would have shipped LTL at a min charge of \$58.00. But the alternative UPS cost was \$47.16. Lost savings were \$10.84, or 19%.

A dynamic parcel/LTL routing application captures these savings in both examples. This is a six-step algorithm:

- 1) A parcel rating engine defines a “ Parcel/LTL Rating Range” - e.g., 75 - 500 lbs. Orders below the minimum threshold of this range (75 lbs. in our example) are “obvious” parcel orders and not subject to parcel/LTL rating. Similarly, orders above the maximum threshold of this range (500 lbs. in our example) are “obvious” LTL orders and again, not subject to parcel/LTL

rating. All other orders within the range are rated against both parcel and LTL minimum charges to determine the least cost routing.

- 2) The parcel rating engine stores a three-digit Zip to three-digit Zip parcel zone matrix. Based upon origin three-digit Zip and destination three-digit Zip entered, the rating engine assigns an associated parcel zone.
- 3) Case quantity and weight are entered. The parcel rating engine calculates the average case weight for the order.

Note: Using a calculated average case weight may sacrifice several percentage points in parcel rating precision. This is an acceptable error tolerance for dynamic parcel/LTL routing applications. Alternatively, if individual case weights are known, these may be entered for absolute parcel rating precision.)

- 4) The parcel rating engine stores a parcel zone/weight pricing matrix. Based upon the parcel zone determined in #2 above and the average case weight calculated in #3 above, the rating engine assigns an associated per-case parcel cost. This per-case cost is multiplied by the case quantity entered in #3 above to generate the parcel cost.

Note: If individual case weights are entered in #3 above, the parcel rating engine calculates the parcel cost of each case and sums all costs.

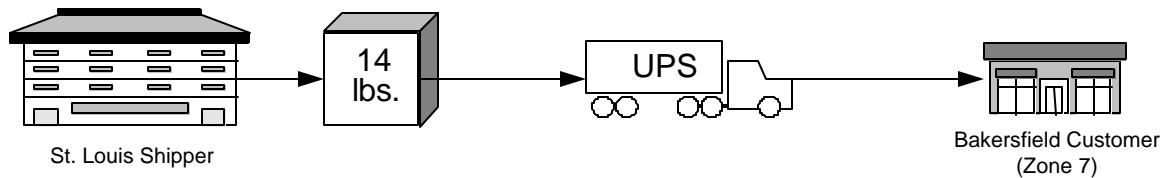
- 5) The parcel rating engine stores a three-digit Zip to three-digit Zip matrix of LTL min charges and associated carrier codes (e.g., SCAC's). Based upon origin three-digit Zip and destination three-digit Zip entered in #2 above, the rating engine assigns an associated LTL min charge.
- 6) The rating engine compares the parcel cost generated in #4 above to the alternative min charge in #5 above, and selects the least-cost carrier.

Note: If multiple parcel carrier zone matrices and pricing matrices are stored, the rating engine determines the least-cost parcel carrier and compares this parcel cost to the alternative LTL min charge.

3. Best Practice: PARCEL ZONE JUMPING (a.k.a. “Zone Skipping”)

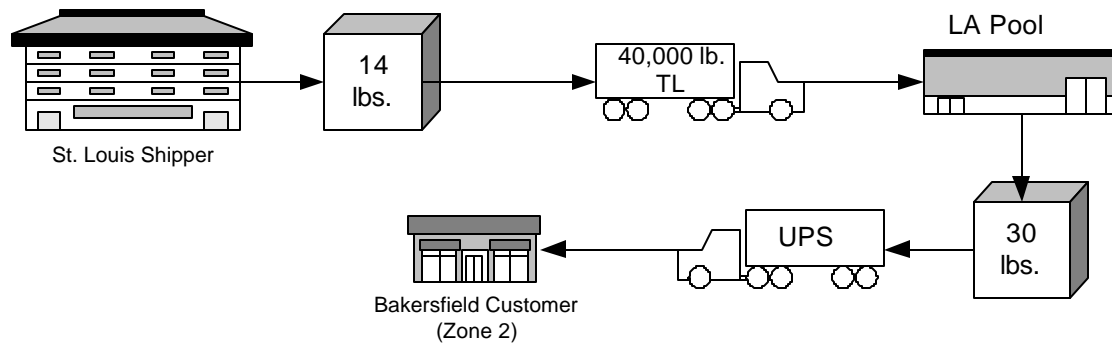
Target Mode: Parcel/Minimum Charge Freight

Consider the previous St. Louis, MO to Bakersfield, CA UPS shipment. The Bakersfield customer is in UPS Zone 7 from St. Louis and the shipment weight is 14 lbs. The UPS cost is **\$9.11**.



Now assume that this UPS Bakersfield order is merged with other UPS orders from St. Louis to the Los Angeles market totaling 2,000 lbs, and shipped in available vehicle capacity on a St. Louis to LA truckload run. Total truckload weight, including the 2,000 lbs. of UPS orders, is 40,000 lbs. There is a \$75 pick-up charge at the St. Louis origin. Truckload cost to Los Angeles is \$1.50 per mile for 1800 miles, or \$2,700.

The 2,000 lbs. of UPS orders are dropped at a pool distribution facility in LA for a stop-off charge of \$75. The LA pool assesses a \$1.00 per cwt handling fee. From the LA pool, individual orders ship via UPS. The Bakersfield customer is in UPS Zone 2 from the LA pool.



Total delivered costs incurred “jumping” from UPS Zone 7 to UPS Zone 2 are:

- Allocated portion of St. Louis pick-up charge: $14/2,000 \times \$75 =$ \$.53
- Allocated portion of St. Louis to LA TL cost: $14/40,000 \times \$2,700 =$ \$.95
- Allocated portion of LA pool stop-off charge: $14/2,000 \times \$75.00 =$ \$.53
- LA pool handling charge: $14 \times \$1.00/\text{cwt} =$ \$.14
- LA pool to Bakersfield Zone 2, 20%-discounted UPS cost (30 lbs.)=\$5.12
- \$7.27**

Compared to a Zone 7 direct cost of \$9.11, this fully loaded Zone 2 jumping cost of \$7.27 represents a 20% savings. We have effectively “mode-shifted” 2,000 lbs. of parcel freight to truckload freight for 1,800 miles.

4. Best Practice: CROSS DOCK/POOLING

Target Mode: Small and Medium Mark LTL Freight

When small and medium mark LTL freight is predominantly *long haul* in nature, a cross dock/pool distribution network is a viable Best Practice. LTL freight tends to be long haul under four scenarios:

Outbound Freight

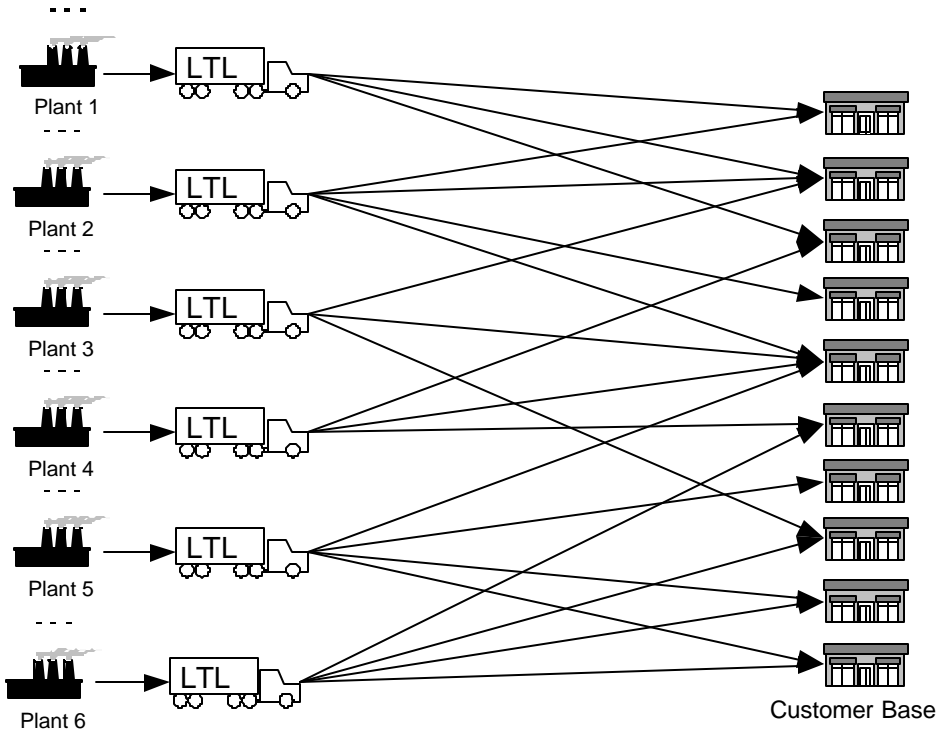
- Scenario 1: The shipper's customer base is national in scope and its outbound logistics network is a non-DC network. That is, the traditional DC "mixing center" role - combining multi-plant products to complete a single customer order - is not applicable. Since each plant manufactures, fills, and ships complete orders direct to any national customer, freight is by definition long haul.
- Scenario 2: The shipper's customer base is national in scope and its outbound logistics network is a "mega-DC" network. That is, there are only one or several mega-DCs serving as plant product mixing centers for subsequent customer shipment. Since DCs are generally not within close proximity of the customer base, DC-to-customer freight is long haul in nature.

Inbound Freight

- Scenario 3: The receiver's supplier base is national in scope and its inbound logistics network is a non-DC Network. That is, suppliers ship direct to receiver's plants or facilities. Since each receiving facility accepts shipments from any national supplier, freight is by definition long haul.
- Scenario 4: The receiver's supplier base is national in scope and its inbound logistics network is a "mega-DC" network. That is, there are only one or several mega-DCs serving as supplier product mixing centers for subsequent receiver (e.g., store) delivery. Since DCs are generally not within close proximity of the supplier base, supplier-to-DC freight is long haul in nature.

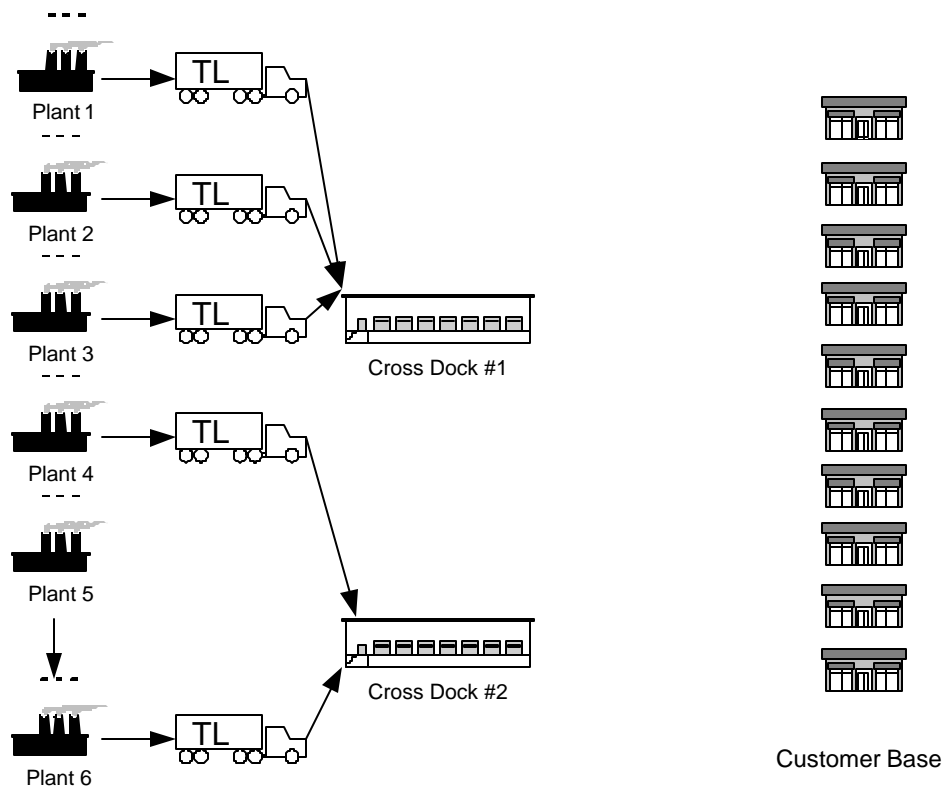
For purposes of our analysis, we will consider a hypothetical Scenario 1 shipper (outbound, non-DC network). The shipper has six manufacturing plants with a current LTL network depicted as follows:

Plant-to-Customer LTL Orders



Now assume a cross dock/pool distribution network replaces the plant-to-customer LTL network. Each day, plant orders are shipped to plant-assigned cross docks. Since all customer orders from a given plant may now be merged and shipped to a single cross dock, full plant truckloads are typically built. If not, multi-plant milk runs (Plant 5 to Plant 6 to Cross Dock 2 below) may be built.

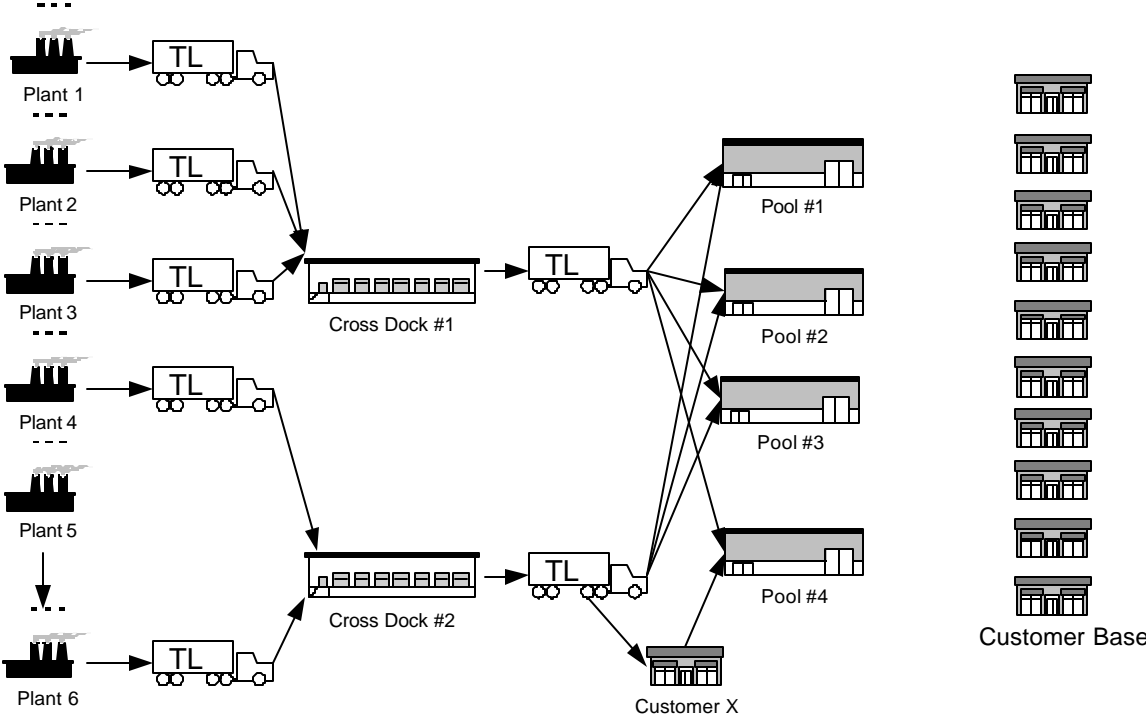
Plant-to-Cross Dock TL Orders



Each order is consigned to a customer-assigned pool distribution facility. Cross docks assemble same-pool orders and ship full truckloads to pools. These shipments may include one or more customer stop-offs in route from a cross dock to a pool (Cross Dock 2 to Customer X to Pool 4) as noted below.

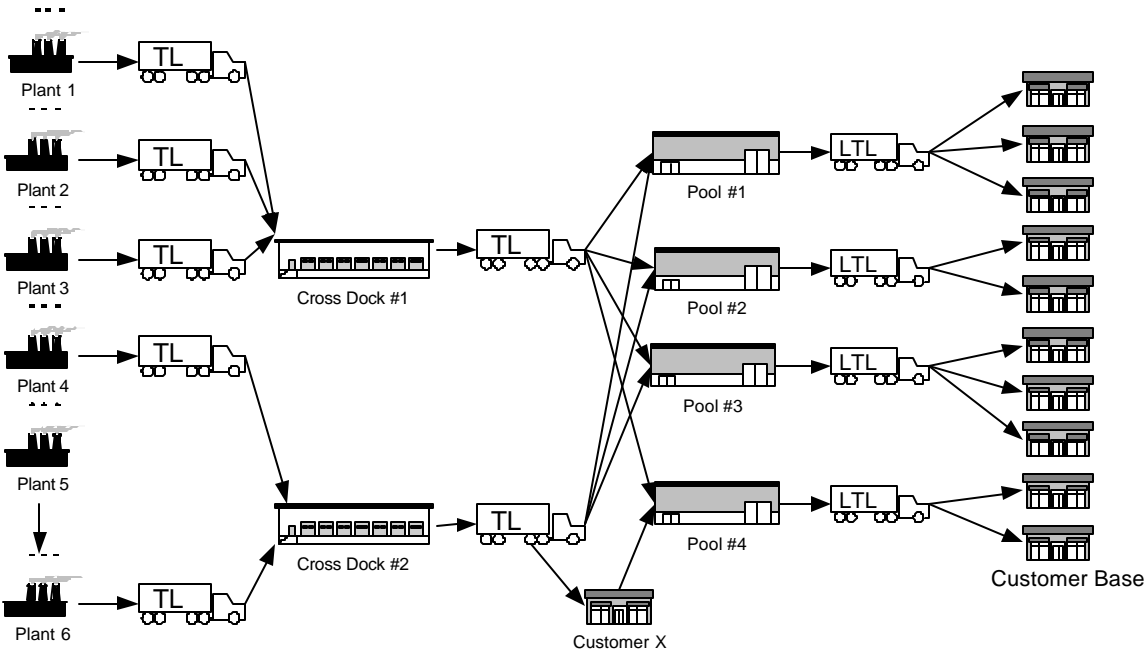
Plant-to-Cross Dock TL Orders

Cross Dock-to-Pool TL Orders



Pools then distribute final customer LTL orders.

Plant-to-Cross Dock TL Orders **Pool-to-Customer LTL Orders**
Cross Dock-to-Pool TL Orders



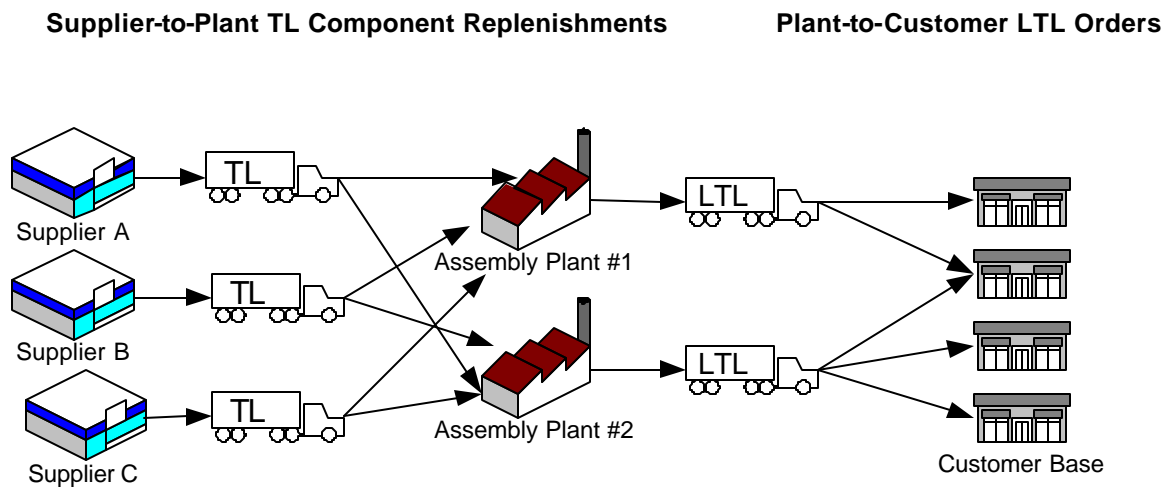
The entire objective of the cross dock/pool distribution network is to maximize distance shipped under lower truckload rates subject to existing customer order transit time constraints. We are “mode-shifting” from LTL freight to truckload freight for maximum feasible distance.

5. Best Practice: CROSS DOCK/MERGE-IN-TRANSIT

Target Mode: Small and Medium Mark LTL Freight

The previous cross dock/pool distribution network is a relatively familiar concept for transportation and logistics managers. A cross dock/merge-in-transit network is perhaps less familiar. Therefore, a brief overview of MIT operations is furnished below.

Consider a personal computer “manufacturer” - Company X. But Company X is really not a PC “manufacturer” at all. Company X outsources production of monitors to Supplier A, keyboards to Supplier B, and CPUs to Supplier C. Suppliers A, B, and C manufacture these components and ship full truckloads to Company X’s assembly plants to replenish component inventories. Assembly plants draw on these inventories to fill customer orders. PCs are assembled and shipped LTL to end customers or PC retailers. This network is depicted as follows:

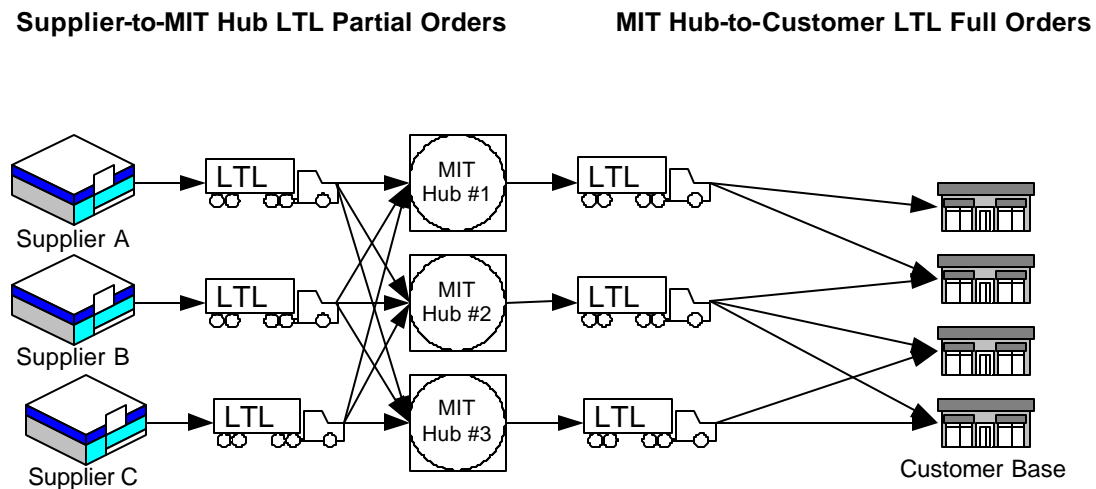


But for Company X, inventory carrying costs at assembly plants are significant. High-value components drive up interest, taxes, depreciation, and insurance costs. And obsolescence risk for PC components is huge. To reduce inventory carrying costs, Company X creates a merge-in-transit logistics network. Under this network design:

- Company X outsources PC assembly operations to regional, third party merge-in-transit hubs.
- Suppliers A, B, and C, with visibility to Company X’s customer order pipeline, no longer ship components to replenish assembly inventories. They now ship components as *partial customer orders* to regional merge-in-transit hubs, synchronized for same-time arrival.

- Merge-in-transit hubs merge partial orders, assemble finished PCs, and immediately ship LTL direct to customers.

This merge-in-transit network is depicted as follows:



If properly executed and synched, this “merge-and-assembly” operation is completed “in transit” from suppliers-to-customers, hence the name.

In this merge-in-transit scenario, Suppliers no longer manufacture to replenish inventories; they now manufacture to fill customer orders. For Company X:

- No component inventories and associated safety stock accumulate at any point in the supply chain.
- Since merge-in-transit hubs are third party-owned facilities, a variable cost structure is substituted for a fixed assembly plant cost structure.
- Large, static, and “fat” assembly plants are replaced by more but smaller, closer-to-market, and “leaner” merge-in-transit hubs.

The only disadvantage to Company X is an increase in total transportation costs since supplier-to-assembly plant TL replenishment shipments are eliminated. These are replaced with daily LTL shipments from suppliers to merge-in-transit hubs. (These cost increases are partially offset by lower MIT-to-customer LTL costs since there are more MIT hubs located closer to customer markets than former assembly plants.) But all in all, reduced inventory carrying costs and reduced assembly operating costs more than offset net transportation cost increases for Company X.

To date, MIT applications have been introduced primarily in inbound assembly networks where high-value, high-obsolescence components drive inordinately high inventory carrying costs. Yet the MIT concept is so intriguing that it is worth further exploration. Notably:

- 1) Does a merge-in-transit operation have any outbound applications?
- 2) Is it viable for lower-value, lower-obsolescence inventory?
- 3) Can associated increases in transportation costs be mitigated?

We believe that a network coupling merge-in-transit distribution with origin cross dock assembly is a potentially enormous logistics cost savings strategy for any current logistics network with the following characteristics:

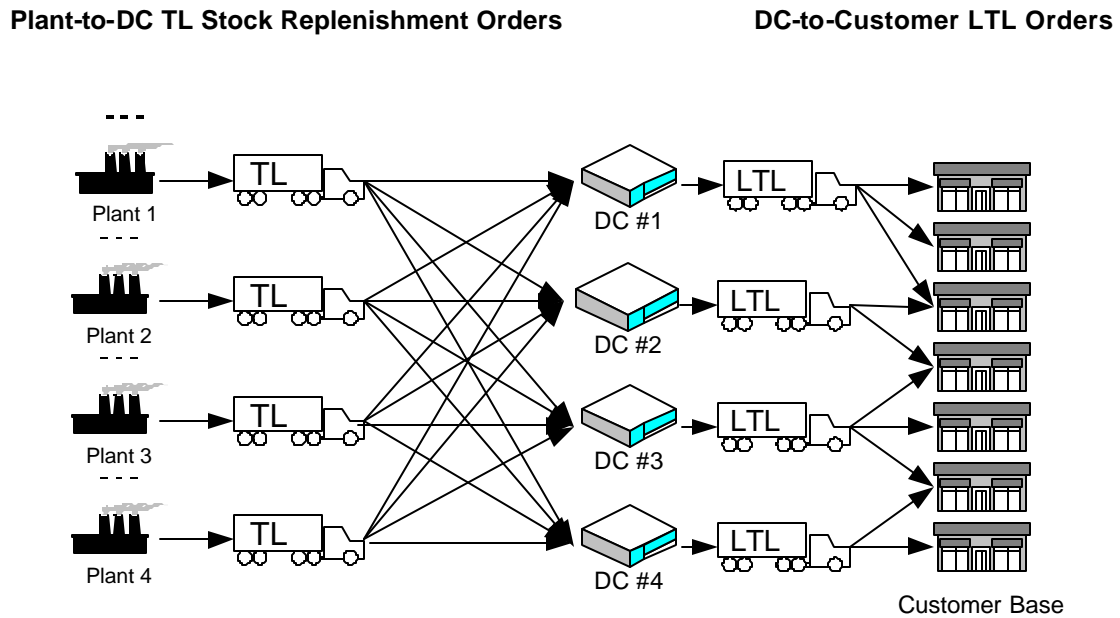
Outbound

- Package goods
- National customer base
- Regional DCs serving as multi-plant product mixing centers for customer order fulfillment and shipment
- DCs shipping relatively short haul, small to medium mark LTL freight to final customers
- Low- or high-value inventory with low- or high-value obsolescence

Inbound

- Package goods
- National supplier base
- Regional DCs serving as multi-supplier product mixing centers for receiver (e.g., store) order fulfillment and delivery
- Suppliers shipping relatively short haul, small to medium mark LTL freight to DCs
- Low- or high-value inventory with low- or high-value obsolescence

For purposes of our analysis, we will consider a hypothetical national outbound package goods shipper with four manufacturing plants and four regional DCs. This logistics network schematic is depicted as follows:



This shipper wishes to:

- Eliminate inventories and associated safety stock at DCs.
- Eliminate its fixed DC cost structure.
- Eliminate large, static, and “fat” DCs, replacing these with more but smaller, leaner, and closer-to-market third party-owned distribution points.

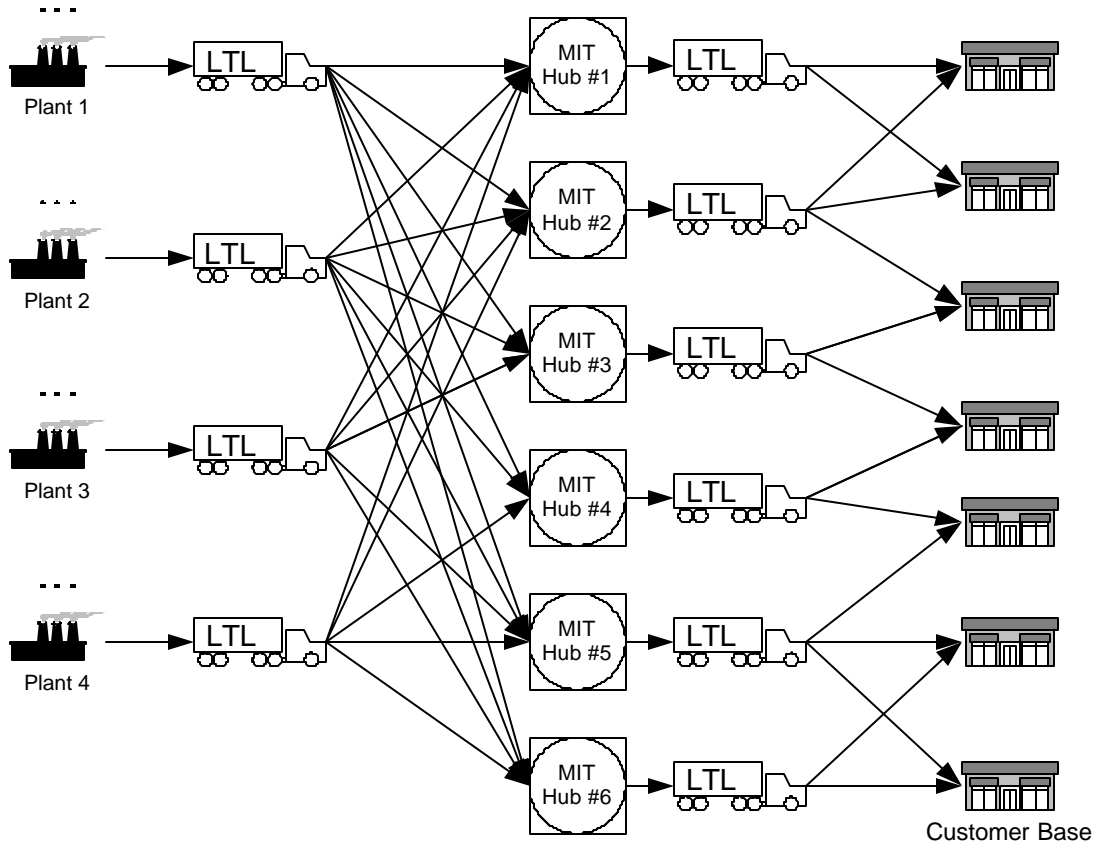
To do so, the shipper creates a merge-in-transit network.

- Plants, with visibility to the customer order pipeline, no longer manufacture to replenish inventories; *plants now manufacture to fill customer orders.*
- But since no single plant produces a complete line of products, and since the DC product mixing role is eliminated, plants now ship *partial customer orders* to regional, third party merge-in-transit hubs. These partial plant orders are shipped and synchronized for same-time arrival at the MIT hub.
- MIT hubs merge partial customer orders and immediately ship LTL to customers.

This merge-in-transit network is depicted as follows:

Plant-to-MIT Hub LTL Partial Orders

MIT Hub-to-Customer LTL Full Orders



Total transportation costs have increased in this MIT network, however, since plant-to-DC TL replenishment shipments are eliminated. These are replaced with daily TL shipments from plants to more MIT hubs. (These transportation cost increases are partially offset by lower MIT-to-customer LTL costs since there are more MIT hubs located closer to the customer market than former DCs. But the net impact is an overall increase in total transportation spend.)

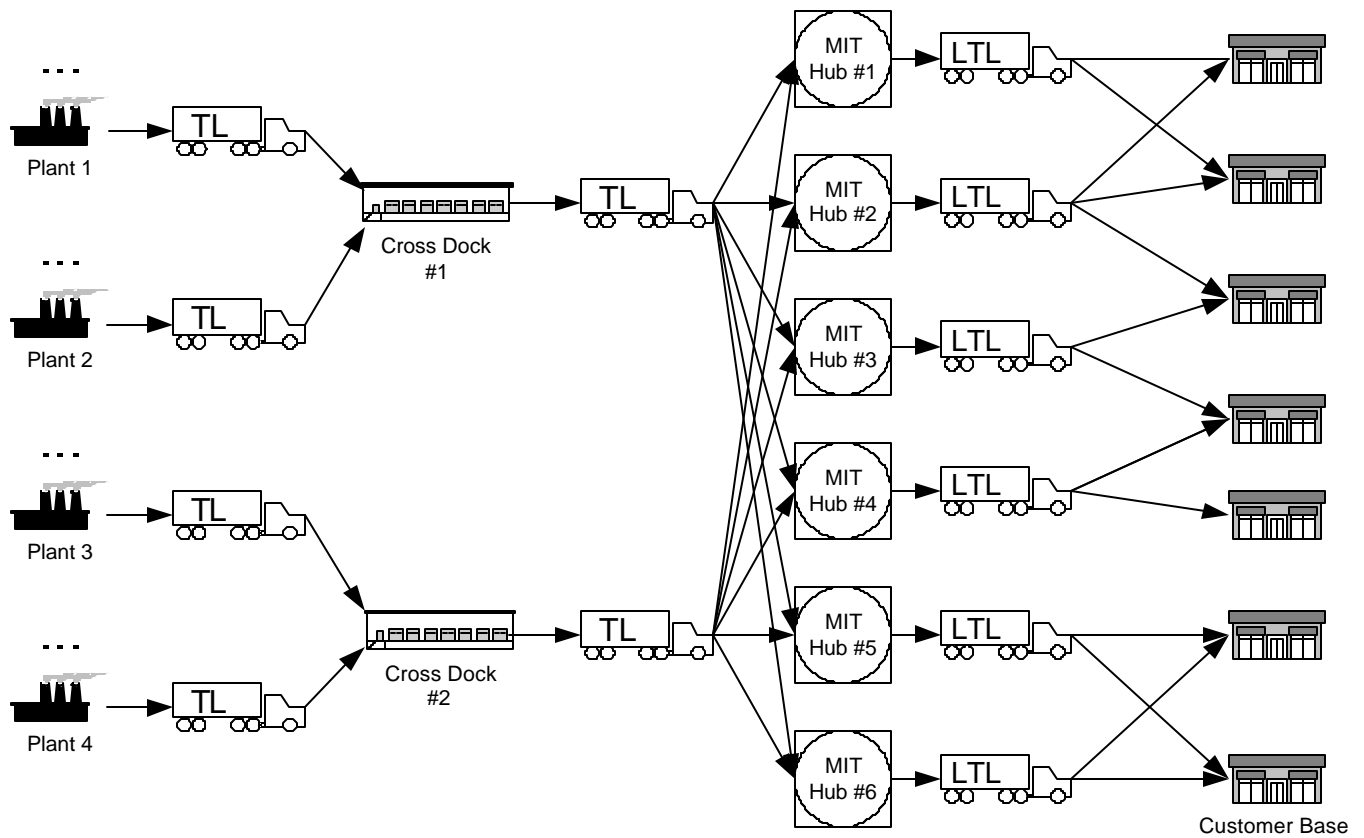
The success of a merge-in-transit network is dependent upon the success of holding inherent transportation cost increases in check. We believe that coupling a merge-in-transit distribution network with an origin cross dock assembly network meets this objective.

This network is depicted as follows:

Plant-to-Cross Dock TL Orders

Cross Dock-to-MIT Hub TL Orders

MIT Hub-to-Customer LTL Orders



- Under the cross dock assembly portion of this network, plant partial orders are shipped to plant-assigned cross docks. Since all partial customer orders for a given plant may now be shipped on a single truck to a single cross dock, *full truckloads* are typically built.
- Each partial order is consigned to a customer-assigned merge-in-transit hub. Cross docks assemble same-MIT hub partial orders and ship *full truckloads* to these hubs.
- Then, under the merge-in-transit distribution portion of this network, MIT hubs merge full customer orders from plant partial order receipts and distribute final orders as customer LTL shipments.

In summary, a combined cross dock assembly/merge-in-transit distribution network is an exciting new concept that holds tremendous opportunities to dramatically reduce DC inventories, safety stock, and fixed operating costs while simultaneously mitigating significant transportation cost increases typically associated with an MIT operation.

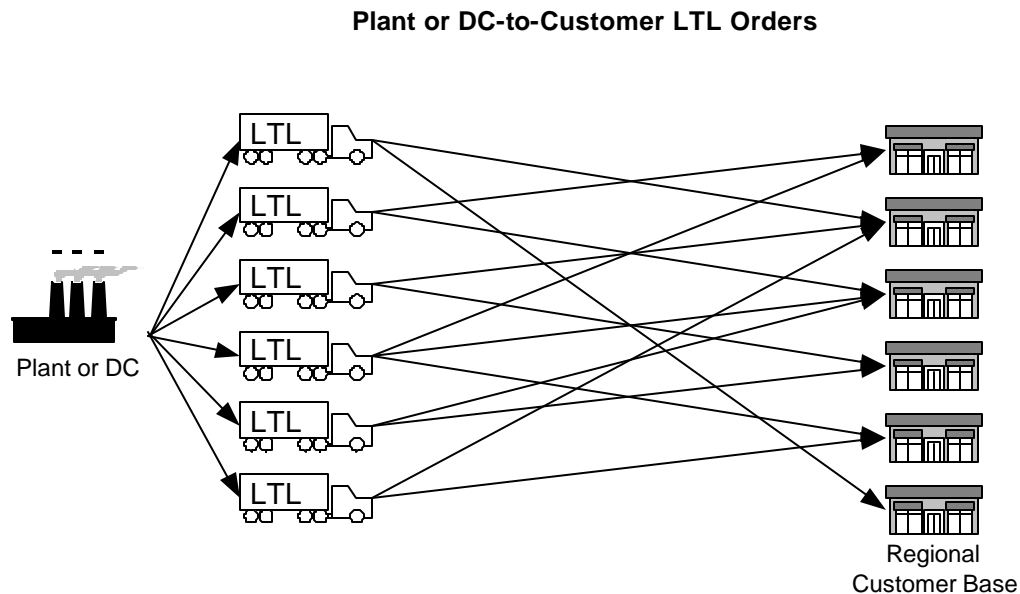
6. Best Practice: POOLING

Target Mode: Small and Medium Mark LTL Freight

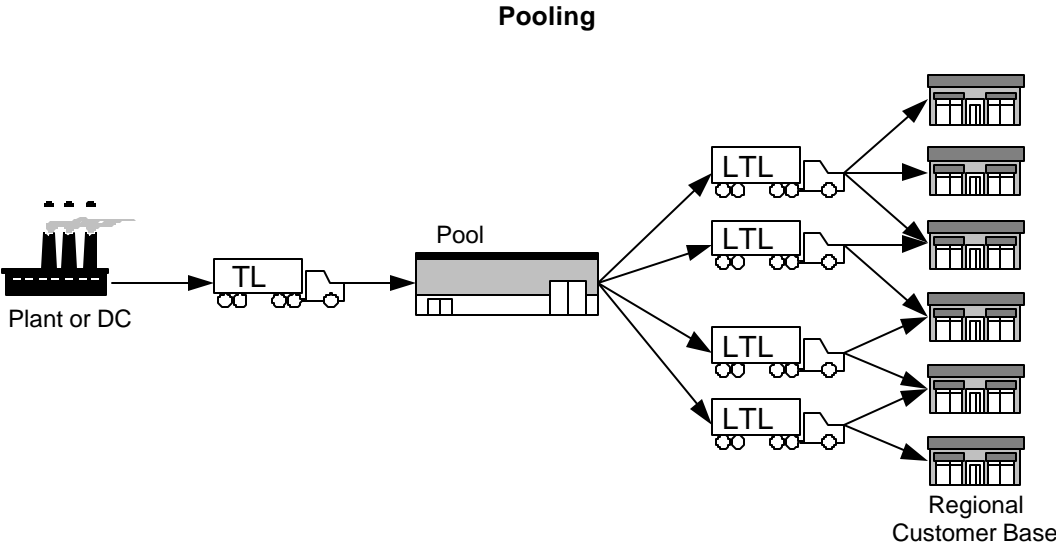
“Pooling” was previously considered as the final distribution leg of a cross dock/pool operation. But pooling also stands by itself as an independent Best Practice. In general, long-haul LTL orders are viable pooling candidates if a sufficient number of these orders, destined for the same geographic market, can be merged to create a truckload shipment to a pool distribution facility serving this market. From the pool, orders are shipped as LTL “beyonds” to final customers.

Pooling does not increase order handling costs since it substitutes pool assembly/distribution costs for an LTL carrier’s terminal assembly/distribution costs. It does not increase total transit times since again, assembly/distribution operations are incurred under both LTL and pooling scenarios. The value proposition of pooling is again “mode-shifting” from LTL freight to truckload freight for maximum feasible distance.

Consider the following:



Now assume a pool distribution network is substituted. Orders destined to the same geographic market are shipped on a master bill of lading to a pool point servicing this market. The pool then distributes final customer LTL “beyond” shipments as follows:

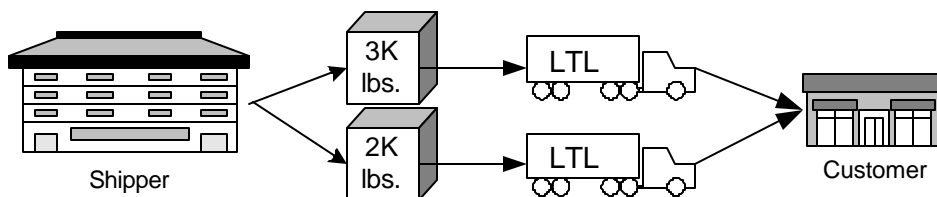


7. Best Practice: AGGREGATION

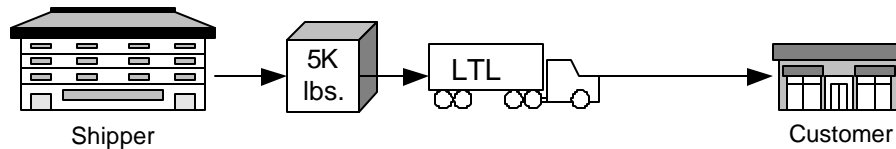
**Target Mode: Small, Medium, and Large Mark LTL Freight
Less Than Full Capacity TL Freight**

Aggregation is a viable strategy for all LTL freight and less than full capacity TL freight. Aggregation is the creation of a single shipment of two or more orders from the same shipper to the same receiver on the same day that would otherwise have been released as individual shipments. Consider the following:

Individual Routing



Aggregation



In this example, shipped individually, both orders would have moved under the less than 5000 lb. LTL rate. Aggregated, these orders now move under the more favorable 5,000 lb. LTL rate.

Two LTL trucks are illustrated in the un-aggregated example above. But in reality, both orders would, in all likelihood, have shipped on the same truck. Doing nothing more than issuing an aggregated bill of lading reduces transportation costs.

While same-day aggregation would appear elementary, US business logistics cost savings lost each day from failures to execute this basic strategy are significant, particularly for supplier failures to aggregate inbound collect freight.

Optimization models can carry aggregation beyond this simple same-day scenario. These models build new, less frequent shipping schedules and then aggregate on these new schedules. But this multi-day aggregation strategy does not meet our test of “minimizing total corporate logistics costs without adversely impacting existing customer service and inventory policies.” (See Appendix 1 for the inventory carrying cost trade-off in a multi-day aggregation model.)

8. Best Practice: CONSOLIDATION (STOP-OFF/PICK-UP ROUTING)

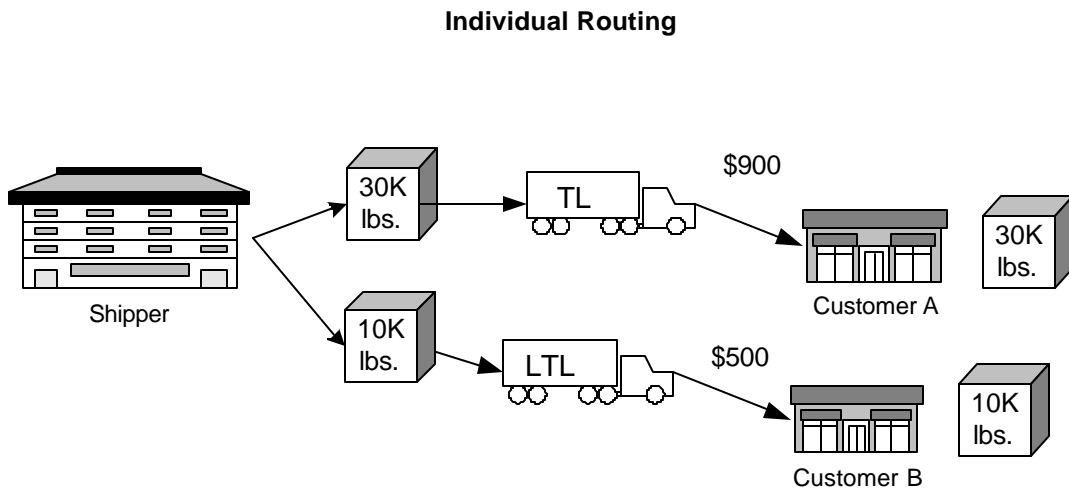
**Target Mode: Medium and Large Mark LTL Freight
Less Than Full Capacity TL Freight**

In general, long-haul LTL orders are viable consolidation candidates if one or several of these orders can be combined with a less than full capacity TL order, and stopped-off in route to the final TL destination.

In constructing potential consolidation routes, optimization is constrained by:

- Distance shipped in total and between stop-offs/pick-ups to meet required delivery times.
- Total out-of-route (circuitous) miles incurred.
- Stop-off/pick-up charges incurred.

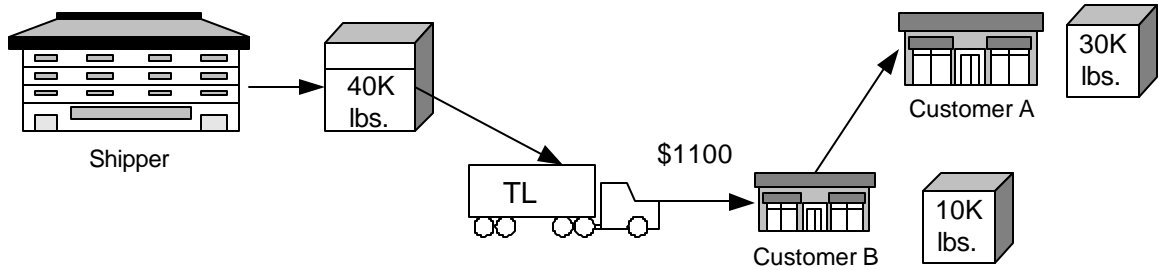
Consider the following:



In this individual routing scenario, the less than full capacity truckload order of 30,000 lbs. ships 600 miles at \$1.50 per mile to Customer A for a cost of \$900. The medium mark LTL order of 10,000 lbs. ships at \$5.00 per Cwt to Customer B for a cost of \$500. Total transportation cost incurred is **\$1,400**.

Now consider the following consolidation scenario:

Consolidation



Assume total route distance in this consolidation scenario is 700 miles. Total transportation costs are now:

$$\begin{aligned} & \$1,050 \text{ Line Haul Cost (700 miles @ \$1.50/mile)} \\ + & \$ 50 \text{ Stop-off Charge at Customer B} \\ = & \mathbf{\$1,100} \end{aligned}$$

Transportation cost savings are \$1,400 - \$1,100, or \$300 - a savings of 21%. Effectively:

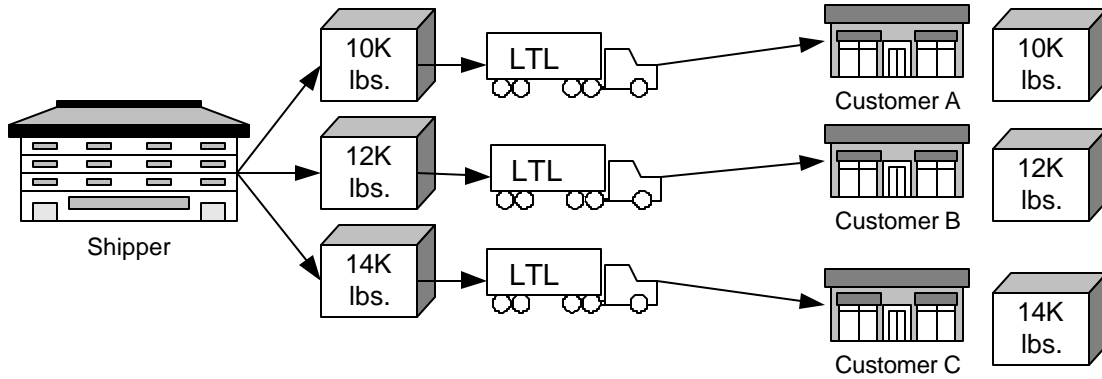
- The 10,000 lb. order has been mode-shifted from a large mark LTL shipment to a full capacity TL shipment.
- The 30,000 lb. order has been mode-shifted from a less than full capacity TL shipment to a full capacity TL shipment.

In the above example, a large mark LTL order was merged with a less than full capacity truckload order and stopped-off in route. But we could as easily build a consolidation scenario with three large mark LTL orders as follows:

Customer A: 10,000 lbs.
Customer B: 12,000 lbs.
Customer C: 14,000 lbs.

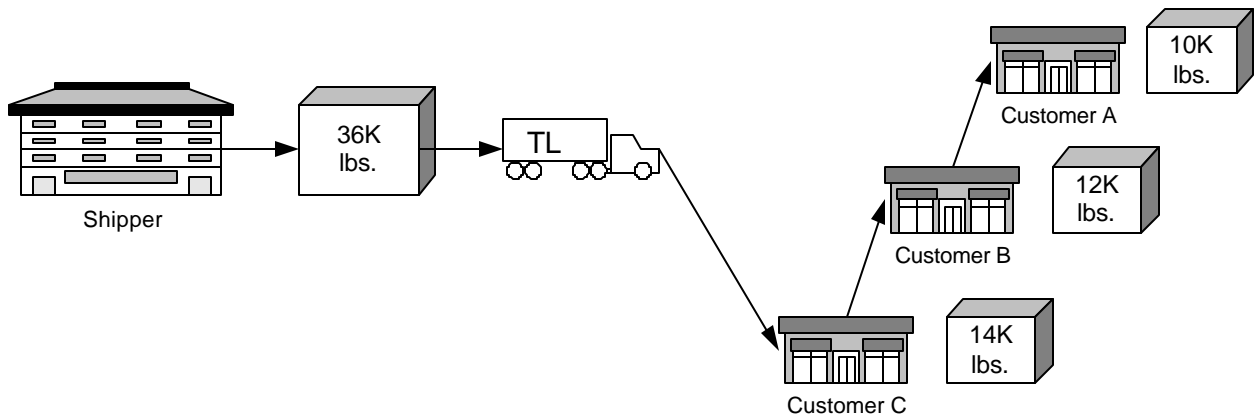
Shipped individually, no order above qualifies for a volume truckload rate. All orders would ship as large mark LTLs as follows:

Individual Routing



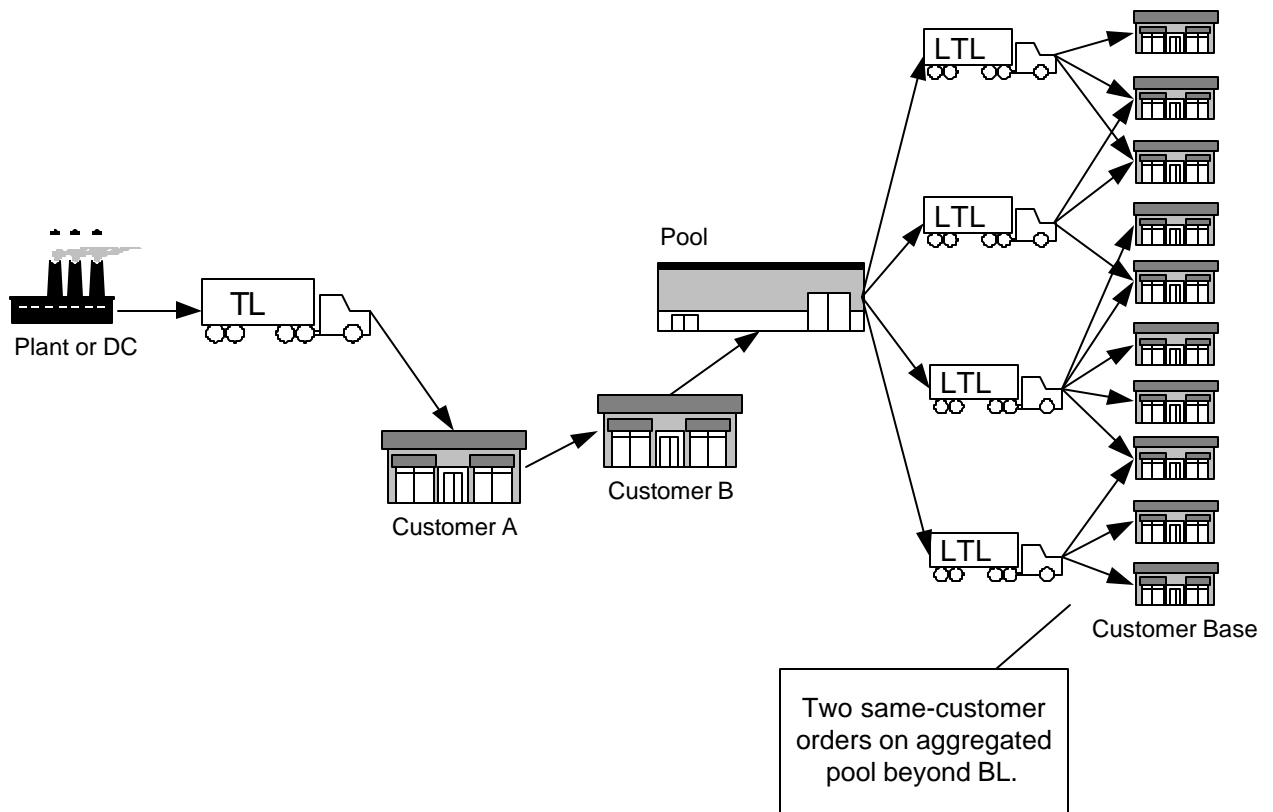
But combined on a consolidated route, we "mode-shift" all large mark LTLs to a less than full capacity TL shipment as follows:

Consolidation



As a final note, three of the Best Practice strategies reviewed above – pooling, consolidation, and aggregation – may be combined to build complex distribution networks. In the example below, a master bill of lading is created from a DC to a pool, with multiple “Beyond” BLs from the pool to customers for final LTL delivery. One of these beyonds represents an aggregated BL consisting of two same-customer orders. Additionally, in route to the pool, multiple customer stop-offs are scheduled.

Combined Pooling, Consolidation, and Aggregation

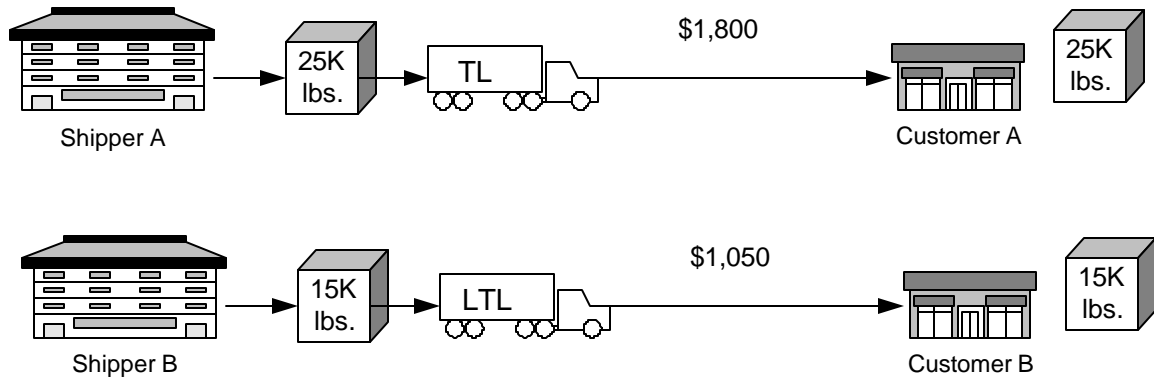


9. Best Practice: CO-LOADING

**Target Mode: Medium and Large Mark LTL Freight
Less Than Full Capacity TL Freight**

Increasingly, shippers/receivers are looking beyond their own supply chains for collaborative cost savings opportunities. Co-loading is one of these opportunities. Co-loading is simply non-collaborative consolidation (Best Practice 8) executed in a multi-shipper (or receiver) collaborative environment. Consider the following:

Individual Routing

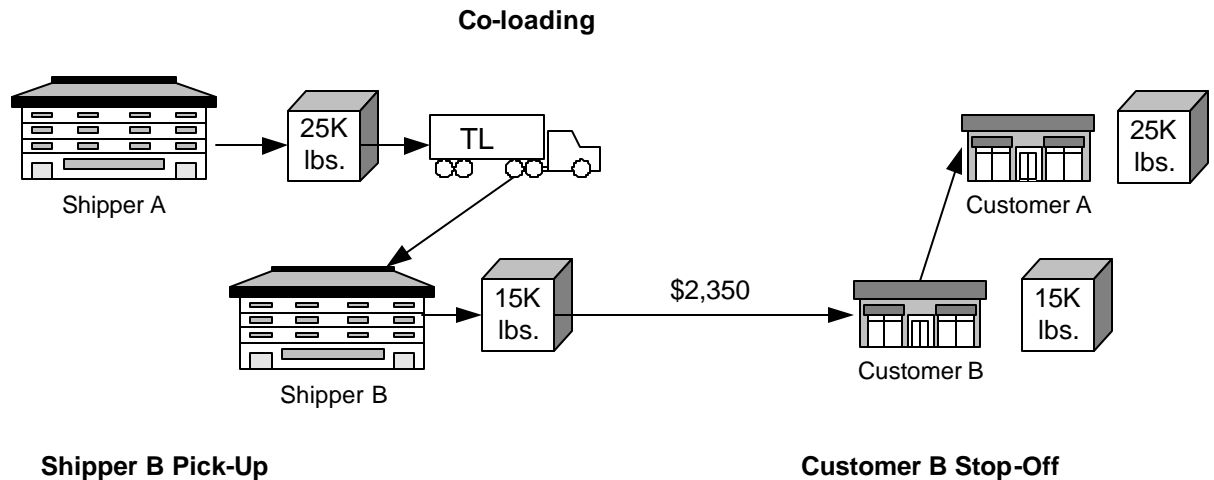


In this Individual routing scenario:

- Shipper A's 25,000 lb. order ships 1,200 miles at a TL rate of \$1.50 per mile, for a cost to Shipper A of \$1,800.
- Shipper B's 15,000 lb. order ships at an LTL rate of \$7.00 per cwt, for a cost to Shipper B of \$1,050.

Combined transportation costs to Shippers A and B are **\$2,850**.

Now assume Shipper A and Shipper B are in relatively close proximity to each other and their respective customers are also in close proximity to each other. Under a collaborative shipping program, both orders may be “co-loaded” under a single pick-up/stop-off bill of lading as follows:



Assume total route distance in this co-loading scenario is 1,500 miles. Total transportation costs are now:

\$2,250 Line Haul Cost (1,500 miles @ \$1.50/mile)
 + \$ 50 Pick-up Charge at Shipper B
 + \$ 50 Stop-off Charge at Customer B
 = **\$2,350**

Combined transportation cost savings to Shippers A and B are \$2,850 - \$2,350, or **\$500 – a savings of 17.5%**.

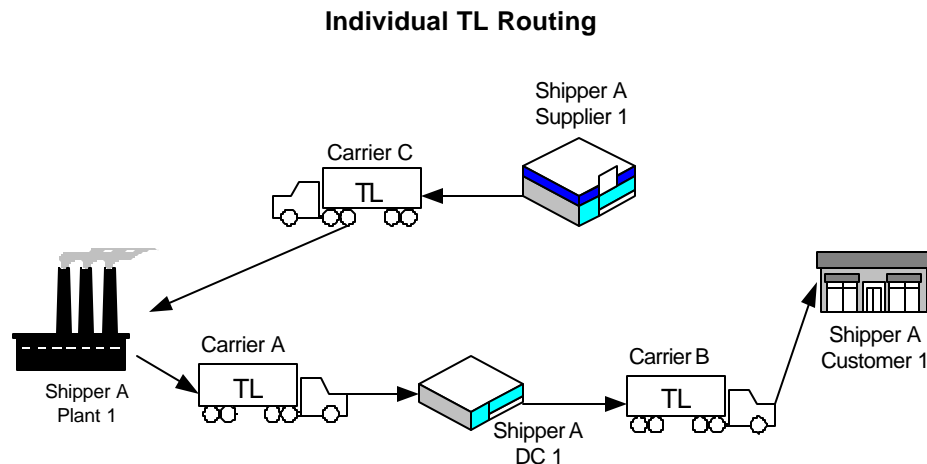
Asset utilization has been maximized by mode-shifting the 15,000 lb. order from a large mark LTL shipment to a full capacity TL shipment, and mode-shifting the 25,000 lb. order from a less than full capacity TL shipment to a full capacity TL shipment.

10. Best Practice: CONTINUOUS MOVE ROUTING

Target Mode: Less Than Full Capacity TL Freight Full Capacity TL Freight

We previously noted that the majority of Best Practices presented herein focus upon asset utilization – specifically, maximizing vehicle capacity. But assume that for a given TL shipment, all applicable Best Practice strategies – aggregation, consolidation, and co-loading – have failed to fully maximize vehicle capacity. No further vehicle optimization can be made and the truck must ship as loaded.

Continuous move routing employs a different strategy to optimize carrier asset utilization – minimizing empty (dead head) miles. To do so, former individual TL shipments are assembled as component legs of a continuous move. Consider the following network of three distinct carrier truckload shipments for Shipper A:



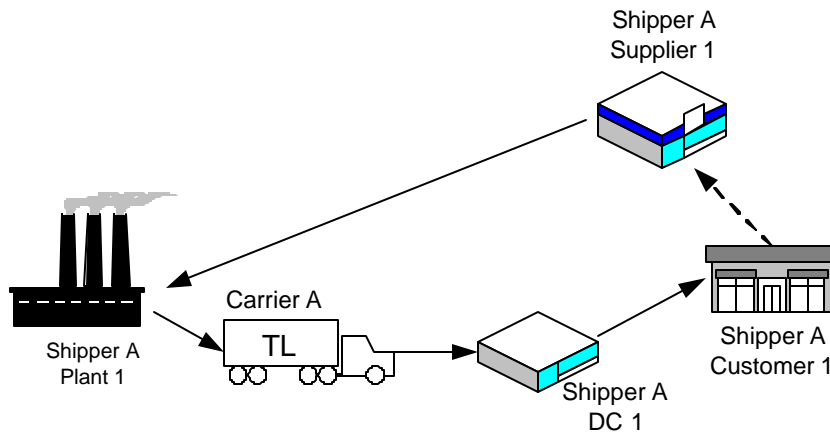
- Carrier A ships a stock replenishment TL order from Plant 1 to DC 1 for 700 miles at a cost of \$1.50 per mile, or \$1050.
- Carrier B ships a finished goods TL order from DC 1 to Customer 1 for 300 miles at a cost of \$1.50 per mile, or \$450.
- Carrier C ships a raw materials TL order from Supplier 1 to Plant 1 for 800 miles at a cost of \$1.50 per mile, or \$1,200.

Network costs are $\$1,050 + \$450 + \$1,200 = \$2,700$

A carrier's rate structure recognizes empty miles in its network. It also recognizes unfavorable back-haul rates that may be accepted at or below operating costs in lieu of returning empty. To cover non-revenue empty miles and below-cost backhaul miles in its system, carriers "inflate" favorable front-haul rates.

Assume that if a carrier could operate near a 100% revenue-mileage ratio, the carrier could do so at an average rate of \$1.10/mile and still meet its target gross profit margin. In our example, it would be advantageous for a single carrier to assemble these individual TL shipments as component legs of a continuous move as follows:

Continuous Move Routing



In this continuous move or “tour,” assume 200 dead head miles are incurred from Customer 1 to Supplier 1. Total system miles are then:

700 miles from Plant 1 to DC 1
 + 300 miles from DC 1 to Customer 1
 + 200 dead head miles from Customer 1 to Supplier 1
 + 800 miles from Supplier 1 to Plant 1
 = 2,000 system miles

If the carrier charges its target rate of \$1.10/mile for the entire tour’s mileage, network cost to Shipper A is now \$2,200 (2,000 tour miles x \$1.10/mile). Transportation cost savings to Shipper A are \$2,700 (individual TL routing cost) – \$2,200 (continuous move cost), or \$500 – a savings of 19%.

Conclusion

The Ten Best Practices presented above focus solely upon the motor carrier freight costs that corporate transportation managers control. They represent a portfolio of optimization strategies, each targeting one or more segments or “modes” of motor freight. Each Best Practice meets our objective of minimizing total corporate logistics costs without adversely impacting existing customer service and inventory policies.

Finally, we would note that with one exception, these Best Practices were presented as individual corporate initiatives. Co-loading, as a specific collaborative strategy, was the exception. But collaboration may be extended beyond Co-loading to other Best Practices as well. In a subsequent LMS White Paper, we consider the enormous impact of “leverage” and the “Network Effect” operating on these Best Practices in a collaborative shipping model.

Appendix 1: Inventory Carrying Cost Trade-off in Multi-Day Aggregation

We previously stated that any Best Practice defined above must meet the test of “minimizing total corporate logistics costs without adversely impacting existing customer service and inventory policies.” If we temporarily suspend this constraint, we can measure the trade-off of increased inventory carrying costs against transportation savings in a multi-day aggregation model. Assume the following:

- A contemplated consolidating program that will ship on a M-W-F schedule instead of the current daily schedule.
- Approximately equal tonnage currently shipped each day.
- An average inventory carrying cost (to include interest, taxes, obsolescence, depreciation, and insurance) of 23%. (This is the 2001 national average reported by Bob Delaney in his annual “State of Logistics Report.©”)

The net gain in inventory days – new shipping schedule vs. old shipping schedule – is then:

Shipping Day of Week - Old Schedule	Shipping Day of Week - New Schedule	Net Gain in Inventory Days
Monday	Monday	0
Tuesday	Wednesday	1
Wednesday	Wednesday	0
Thursday	Friday	1
Friday	Friday	0

Over a seven day period, two additional days of inventory are incurred, or an increase in average inventory levels of .29 days (2/7).

Assume the results of an optimization program that aggregates on the new M-W-F schedule above yields 100 new aggregation opportunities for a given week totaling 500,000 lbs. and saving \$10,000 in transportation costs (\$100 per new aggregation). Further assume the average product valuation per pound is \$8.00. Total valuation for the 100 new aggregations is then \$4,000,000 (500,000 lbs. x \$8.00/lb.).

Additional inventory carrying costs for these 100 new aggregation opportunities are \$4,000,000/365 x .29 x 23%, or \$731. Net logistics cost savings for the week are then \$9,269 (\$10,000 transportation cost savings minus \$731 increase in inventory carrying costs).

About LMS

Logistics Management Solutions (LMS) is a non-asset-based, third party logistics firm specializing in transportation optimization, execution and data management. By combining the latest technology with proven logistics practices, we offer optimization studies, software solutions and execution services that help companies significantly reduce transportation costs while meeting or exceeding customer service goals.

Emerging from a transportation logistics division at Monsanto in 1996, LMS began as an execution company – specializing in developing and executing logistics strategies. Soon thereafter, LMS' client base grew to include Fortune 500 companies. In servicing these accounts, LMS worked with a variety of transportation management systems, but none offered an effective means of managing shipping data. To help clients best manage this data, LMS developed a Web-native TMS (transportation management system), TOTAL.

TOTAL enables companies to gain visibility of vital transportation data and control costs without a large investment or system commitment. The system performs a multitude of functions, including freight rating, rate management, performance reporting, optimization and shipment tracking and tracing. Through TOTAL, LMS offers unprecedented technology flexibility. We do not promote a “one-size-fits-all” solution, recommend unnecessary technology and services, or attempt to take over a company's transportation operations. Instead, we work with our clients to meet their specific needs.

As a rapidly growing company, we are well poised to quickly develop new strategies and technologies to keep pace with shippers' evolving needs. Today, LMS brings analytical studies, technology, freight management solutions and millions of dollars in savings to some of the world's best-known companies, including BASF, Monsanto and The Scotts Company.

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