Elements of Inventory Management

1. Inventory
   - Raw material
   - Purchased item & part supplies
   - Partially completed or work in process (WIP)
   - Any item which is being inventory
   - Tools & equipment

Inventory Mgt. is to determine the amt. of inventory to keep in stock, how much to order & when to replenish or order.

2. Demand

Forecasting & Inventory Mgt

Better forecasting leads to better Inv. Mgt.

Stock out/

Better forecasting

Poor forecasting

Stock out

under stock

Demand

Internal

External

Dependent Demand

item or raw material are used internally to produce final product

Independent demand

Item are final products demanded by external customer.

Dependent

Inventory cost :

Carrying cost

holding cost

ordering cost

Shortage cost

Shortage cost.

Carrying cost / holding cost.

- facility cost (Rent, depreciation, heat, power, lighting, security, taxes, insurance etc)
- labour cost
- Record keeping
- material handling / equipment cost
- Product deterioration, spoilage cost, breakages etc

Carrying cost can ranges from 10% to 40% of the value of a manufactured item.

2. Ordering cost : cost of replenishing inventory.

4 time in a year

- order 1
- order 2
- order 3
- order 4

3. Shortage cost :

temporary or permanent loss of

3. ...

temporary or permanent ...

sales when demand can not be met.

Stockout cost

Shortage $\propto$ $\frac{1}{\text{Carrying cost / holding cost}}$.

Shortage

EOQ

Inventory Control System

Continuous inventory system

Periodic inventory system

Continuous Inventory system (fixed order quantity)

... when

A constant amount is ordered when inventory declines to a predetermined level

Periodic Inventory level: (fixed time period system, inventory or periodic review system)

An order is placed for a variable amount after a fixed passage/period of time)

Economic Order Quantity model

EOQ

Moonchem

1. It was established in 1996 in Yangzhou China.
2. They renowned as leading mfg of
industrial chemical

b) Specialty Chemical (i.e
c) ~~Food additives~~
d) pharmaceutical chemical.

3. They have 8 mfg. plants & 40 distribution centres worldwide.

4. In the specialty chemical markets, Monsden has differentiated the US midwest region for laying out a new concept of consignment inventory.

Consignment inventory is a supply chain model in which product/unit is sold by a retailer, but ownership is retained by the producer/supplier until the product has been sold.

5. If consignment inventory model found to be profitable, Monsden plan to launch it at a national level.

Problem Overview of the case

1. Business review

1. Moonchem's year end business review meeting reveals the new inventory strategy of (c.c consignment inventory) has delivered low inventory turnover ratio (ITR).

$$ITR = \frac{\text{annual sale value of good sold}}{\text{avg. inventory value}}$$

- despite of a stable product demand from the customer
- Over 50% of moonchem inventory has been classified as cc consignment inventory.
- Only 20% of their total no. of customer use consignment inventory.
- Mr. John Kresge, VP of supply chain Dept of Moonchem Company decided to look how consignment inventory is being managed & to come up with an appropriate increase The ITR value.

managers
plan to increase The ITR value.

Question

1. What is the current Annual cost of Moonchem's strategy of sending full truck load to each customer in the peoria region to replenish Consignment inventory?

2. Consider different delivery option & evaluate the cost of each option. what delivery option do you recomend for moonchem?

3. How does your recommendation impact consignment for moonchem?

Solution Strategy

1. ITR = $\frac{\text{Annual sale value of good sold}}{\text{Average inventory value}}$

2. Moonchem can't influence the demand from its customer.

3. But it decrease the
by decreasing:
1. Cycle Inventory
2. Subsequently The total annual cost incurred.

- they conduct pilot study in the Peoria Region of US mid west Illinois state for the consignment Inventory distribution Strategy Analysis

Customer type	no. of customer	Total consumption lb/month
Small	12	1000 pounds/mo
medium	06	5000 pounds/mo
Large	02	12000 pounds/mo

Operational side

Logistic contractor — Golden Foodsing

Truck capacity — 40,000 pounds

	full truck, single customer Dropoff	full truck, multiple customer dropoff
Transportation cost	$400 / truck	$350 + $50 / dropoff

Holding Cost (h) = 0.25 (i.e 25%)

Unit cost $(C_s) = (C_m) = (C_L) = \$1$ / pound

Ordering strategy

If Moonchem send full truck to each customer irrespective of customer type

$Q_s = Q_m = Q_L =$ 40000 pounds

Order frequency $= (n) = \frac{D}{Q}$

$AHC = \frac{Q}{2} \times h \times C$

$AOC = D * S$

AUC = $\frac{}{Q}$

ATC = AHC + AOC

Existing Strategy of moondhem for small retailer

Demand / year (D) = 12000 pounds. (1000/mo)

fixed cost / shipment (S) = $400

fixed order size = 40000 pounds

cycle inventory $\frac{Q}{2}$ = $\frac{40000}{2}$ = 20000 pound.

order frequency (n) 0.30

$\frac{Q}{2} hc$ = 0.3

n = $\frac{D}{Q}$ =

Annual holding cost (AHC) = $\frac{Q}{2} \times h \times C$

= 20000 × 0.25 × 1

= $5000

Annual Ordering cost = $\frac{D}{Q} \times S$

$= \frac{12000}{40000} \times 400$

$= \$120$

Annual total cost = $5000 * 120 = 5120$

for Medium

Demand = $5000 \times 12 = 60000$

fixed cost/ shipment (S) = $400

fixed size order = 40000

cycle time = $\frac{40000}{20000} = (Q/D)$

order freq (n) = $\frac{60000}{40000} = 1.5$

$AHC = \frac{Q}{2} \times h \times C = 2000 \times 0.25 \times 1$

$= \$5000$

$AOC = \frac{D}{Q} \times S = \frac{60000}{40000} \times 400$

$= 1.5 \times 400 = \$600$

ATC = $5600

for large refrals.

Demand (D) = 12×12000

$= 144000$

fixed cost / order(s) = $4000

fixed order size (Q) = 40000

cycle inventory = Q/2 = 20000

order frequency = 1/Q $\frac{144000}{40000}$ 3.6

ATC = $\frac{Q}{2} \times h \times C$ = 5000

AOC = $\frac{144000}{40000} \times 400$ = $1440

ATC = $6440

Total cost for this strategy

= 5120 + 5600 + 6440

= $17160

My strategy - that I'll go with is "no aggregation" model.

The products are delivered independly to each type of customer on a "Just-in-Time" basis where optimal order quantity for each type of customers is produced by using basic EOQ (economic order quantity) models.

$$Q^* = \sqrt{\frac{2 \times D \times S}{h \times C}}$$

$$n = D / Q^*$$

for small retailer

$D = 12000$

fixed cost/qty = \$400

Q^* (optimal order size) $= \sqrt{\frac{2 \times 12000 \times 400}{0.25 \times 1}}$

$= 6196$

cycle inv $= \frac{Q}{2} = \frac{6196}{2} = 3098$

order freq $= n' = \frac{D}{Q} = \frac{12000}{6196}$

$= 1.93$

$AHC = \frac{Q}{2} \times h \times C = \frac{3098}{6196} \times 0.25 \times 1$

$= 775$

$AOC = \frac{D}{Q} \times S = \frac{12000}{6196} \times 400$

$= 775$

$ATC = 775 + 775 = \$1550$

for medium

$D = 60000$

$\$ = \$400$

$$Q^* = \sqrt{\frac{2 \times 60000 \times 400}{0.25 \times 1}}$$

$$= 13856.41$$

$$n = \frac{D}{Q} = \frac{60000}{13856} = 4.33$$

$$AHC = \frac{Q}{2} \times h \times L$$

$$= \frac{13856}{2} \times 0.25 \times 1$$

$$= \$1732$$

$$AOC = \frac{D}{Q} \times S = \frac{60000}{13856} \times 400$$

$$= \$1732$$

$$ATC = 1732 + 1732 = \$3464$$

for large Scale

$D = 144000$

$S = \$400$

$Q^* = \sqrt{\frac{2 \times 144000 \times 400}{0.25 \times 1}}$

$= 21466$

Cycle time $= \frac{Q}{2} = \frac{21466}{2} = 10733$

'n' $= \frac{D}{Q} = \frac{144000}{21466} = 6.7$

$AHC = \frac{Q}{2} \times h \times C = \frac{21466}{2} \times 0.25 \times 1$

$= 2683$

$AOC = \frac{D}{Q} \times S = \frac{144000}{21466} \times 400$

$= 2683$

$ATC = 2683 + 2683$

$= 4366$

TC of delivery strategy with no aggregators.

5366 + 3464 + 1550

= ₹ 10380