" An Analytical Study on Reduction of fixed requirements on stable demand parts in Peninsular Auto parts"

Project Report

Submitted in partial fulfillment of the requirements for the award of the degree

PGDSCM

(*Post Graduate Diploma in Supply Chain Management*)

By
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020/01/2005

Under the guidance of

INSTITUTE OF LOGISTICS
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CHENNAI – 600032

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BONAFIDE CERTIFICATE

This is to certify that the Project report titled " **An Analytical Study on reduction on stable demand parts in Peninsular Auto Parts**" is a bonafide record of work carried out by "Ashim Kumar Rakshit" during the final semester from "July 2007 to Dec 2007" under my guidance, in partial fulfillment of the requirements for the award of the Post Graduate Diploma in Supply Chain Management by CII INSTITUTE OF LOGISTICS.

Rahul Sharma

Faculty Name:
(Project Guide) (Signature)

Director

(Head of Institute) (Signature)

DECLARATION

I, Ashim Kumar Rakshit hereby declared that this project report titled ***" An Analytical Study on reduction on stable demand parts in Peninsular Auto Parts"*** submitted in partial fulfillment of the requirement for the "Post Graduate Diploma in Supply Chain Management" is my original work and it has not formed the basis for the award of any other degree.

(Ashim Kumar Rakshit)

Place: Bangalore

Date: 22nd May 2008

Table of Contents

Acknowledgement

I have great pleasure in expressing our deep sense of gratitude to institution CII Institute of Logistics, which has provided us an opportunity to cherries, our long desire of gaining "Post Graduate Diploma in Supply Chain Management".

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I have the greatest pleasure to acknowledge the guidance and aid rendered by persons involved directly or indirect to the peak of success in our task.

At last but not least thanks to all.

(Ashim Kumar Rakshit)

Place: Bangalore

Date: 22nd May 2008

Project Guide: Rahul Sharma

Research Analyst

Abbreviations

ED = Expected Deviation

SS = Safety Stock

FR = Fixed Requirement

BOD = Bill of Distribution

DRP = Distribution Requirement Planning

OTO = One Time Order

MAO = Made as ordered

NPI = New Parts Introduced

DC = Distribution Center

Summary

Requirements consists of ED + SS + FR, Fixed requirements are used to increase or decrease the requirements for reasons which are not reflected in system generated stastics which are based on historical demands.

A fixed requirement can be anything like future dated orders ,seasonal requirements ,kit component etc and are used to supplement expected demand .As expected demand grows with demand fixed requirements ramps down which minimizes over-ordering.

This project is designed to identify, if there is any opportunity to reduce the fixed requirements for stable demand parts so that we can avoid the stocking of excess inventory. Normally a forecast on an item at a point or entry point on the bill of distribution is an estimate of normal demand for that part.

However in some occasion additional requirement are known to exists due to field failure problems, special marketing programme etc .A fixed requirements may be placed to reflect these additional requirements and they can be either positive or negative.

1. Introduction:

In any automobile service parts business huge amount of money is invested in inventory to meet the customer requirements and to manage the service level.

To fulfill the customer expectation sum amount of excess inventory we are keeping in the system in the form of safety stock and fixed requirements for all the parts in each point of the bill of distribution.

Generally there are three different types of points on a BOD.

ENTRY POINT: It is appoint where the parts which are sourced from supplier first enter into the system.

PARENTS POINTS: It is appoint where parts receive from the entry points and are responsible for replacing other child points.

CHILD POINTS: These are the points which do not replenish other points.

Fixed requirements is used to supplement expected demand and as expected demand grows with demand ,fixed requirements ramps down which minimize over-ordering. Ramping is a procedure by which a inventory analyst decrease fixed requirements and this helps in promoting schedule stability. If we do not ramps down the fixed requirements we will end up with excess inventory.

Fixed requirements have a start and stop date, a quantity and a reason code to record the purpose for setting it.

A fixed requirements provides a means of informing the system that special that special OTO system or departmental ordering or distribution requirements exists for a part during a given time period.

PROCUREMENT :

Fixed requirements behave like other requirements eg Expected demand, Assemble requirements, original equipment manufacturing when making procurement decision. In every DRP run all requirements are compared to the available to determine a need for a schedule. Fixed requirements are included in the appropriate time bucket based on their start date and travel times.

DISTRIBUTION :

According to a fixed requirement priority it is included in the facility distribution requirement when replenishment is determined.

MONITORING :

Depending on a fixed requirement reason code, its quantity will be proportionally reduced over its effective period by the forecast run. For instances if the period for start date to stop date is ten months then the quantity will be reduced from each month approximately 1/10 of the original quantity.

1.1. Objectives and limitations:

The objective of the study is to bring down the inventory by reducing the fixed requirement for stable demand parts in the overall supply chain.

SCOPE OF THE STUDY :

Automobile service parts business, out of scope is all other business.

Limitation of the study:

1) Parts not having independent forecast group.
2) NPI parts
3) MAO Parts
4) RAO Parts
5) Parts which has been replaced (De- Stocked locked Parts)
6) Parts which has been discounted
7) Negative fixed requirements.

1.2 **Methodology:**

1) **Capture the total demand for first three, six and twelve months.**

2) **Once the total demand is captured Calculate, standard deviation and average of the demand for past one year.**

Standard Deviation:

It is used to describe the spread of distribution of numbers ,It is calculated in following steps.

- Determine the average set of numbers.
- Determine the difference of each number and mean.
- Square each difference.
- Calculate the average of squares
- Calculate the square root of the average.

Average:

Mean or Average is defined as the sum of all the given elements divided by the total number of elements.

2) Determine the co-variance with <=3

Coefficients of variation is calculated by using following formulae

Coefficient of variation = standard deviation / Mean *100

If coefficient of variation is less then it is more consistent.

3) Find the fixed requirement of the each part at point level.

(Fixed requirements is used to supplement expected demand and as expected demand grows with demand fixed requirements ramps down which minimize over-ordering)

4) Compare the average demand and standard deviation for the first three, six and twelve months.

5) If the demand is stable then there will be possibility to reduce the fixed requirements which will reduce inventory from the overall network.

Note : I have used scaled demand for this analysis, also if demand is less then zero for a month then it is reinitialized to zero.

2. Industry Profile:

The auto-component industry is roughly worth Rs 41,000 crore (Rs 410 billion),

According to the U.S. Commerce Department, Citizen of United states of America spend nearly $38 billion each year to repair their automobiles. They rely heavily on their cars, and they have grown to demand quick repairs. And quick repairs depend on availability of replacement parts.

To en-cash this opportunity worldwide Peninsular Auto Parts offers its customers all types of vehicular parts, accessories, tools, equipment, and supplies to its customer all around the world. They have more than 1,000 store locations and 10 distribution centers (DCs) and two entry points (ie Shanghai and Detroit) with annual revenues of nearly $5 billion

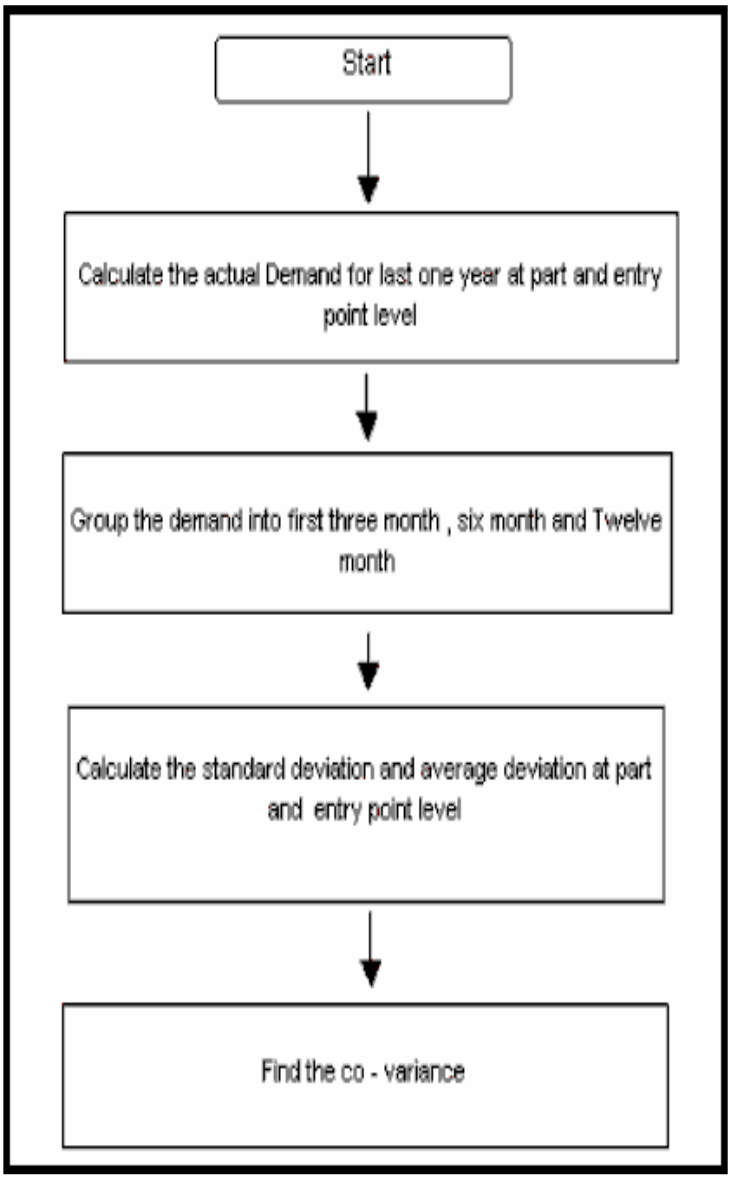
Peninsular Auto Parts experienced significant growth through acquisitions and sought to continue that expansion in the intensely competitive industry. In order to accomplish this goal, they were striving to increase replenishment efficiency and reduce inventory while elevating customer service, the company needed to better manage and distribute its growing number of products—approximately 310,000 parts.

Lately their, growth rates had been so rapid that their old inventory system just couldn't handle it, and that's the reason they implemented new Inventory and Warehouse Management System provides complete visibility on the quantity, location, and status of inventory flowing in and out of a location or multiple warehouses which resulted in following.

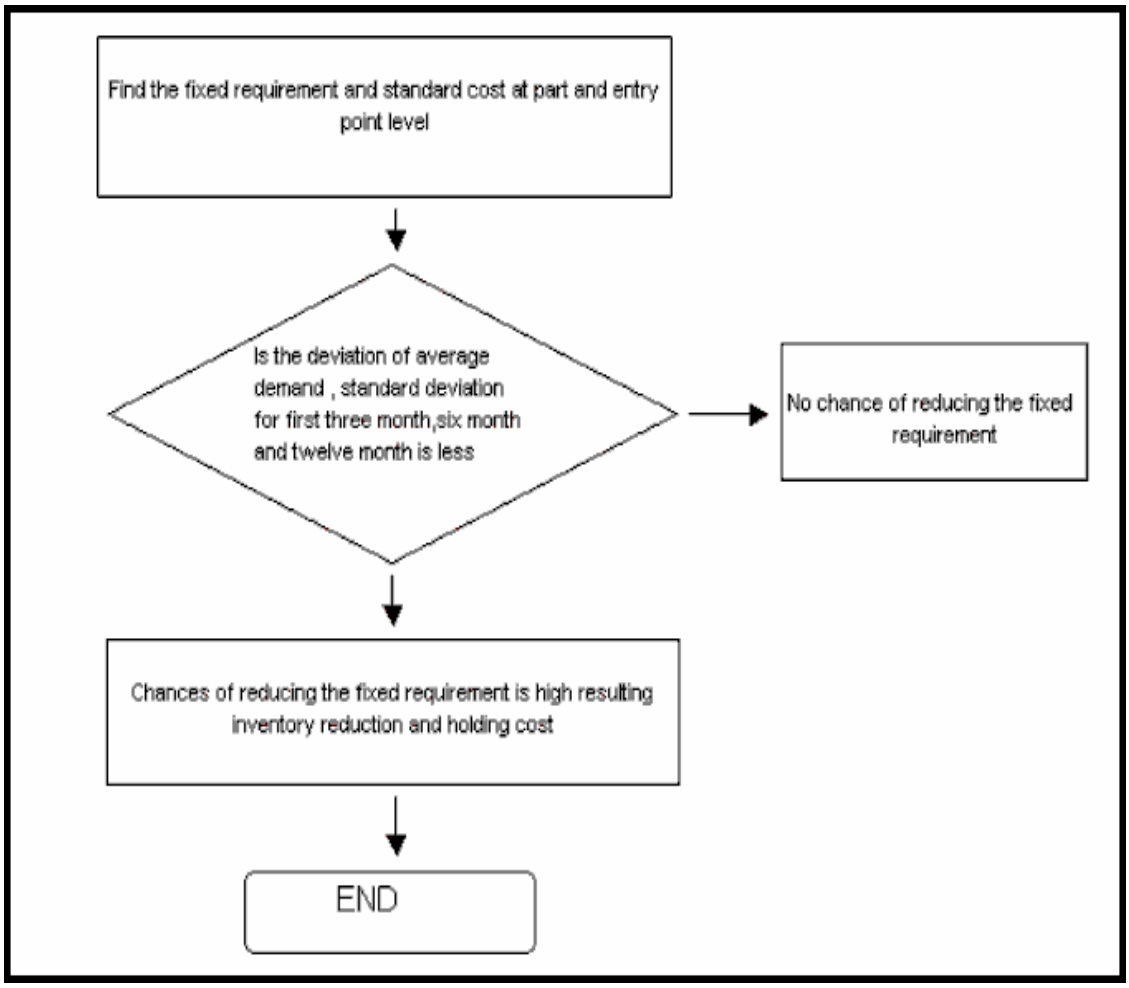
- Improvement in Customer Service
- Reduce Inventory Costs
- Eliminate Paperwork
- Improve Productivity

To further reduce the excess inventory which they were keeping in the system in the form of safety stock and fixed requirements for all the parts in each point of the bill of distribution, the inventory management team has decided to run a project to see that whether they can eliminate the fixed cost for the parts which have stable demand.

3. Flow Chart:


Start
Calculate the actual Demand for last one year at part and entry point level
Group the demand into first three month , six month and Twelve month
Calculate the standard deviation and average deviation at part and entry point level
Find the co - variance

Flow Chart Cont.



4) Tabulation of Data :

- Total numbers of parts in the supply chain system of Peninsular Auto parts is 3,10,000 parts.
- In the year 2007 the demand which we captured through our methodology described earlier, we came with following fixed requirements details .

Total number of parts identified having fixed requirements: (33328)
Part entry point having positive fixed requirements: **32562** (97.7%)
Part entry point having negative fixed requirements: 766 (2.3%)

- In our further analysis we will concentrate on those parts which has positive fixed requirements ie 32562 parts as shown below.

	Data	
FCST_MDL	Count of Parts	Sum of TOTALVAL
2	21756	8419122.264
3	872	341404.516
4	9934	3922163.756
Grand Total	32562	12682690.54

5. (Programme Code in PC SAS)

```
PROC SQL;
CONNECT TO DB2(SSID=D7P2);
CREATE TABLE PART AS
SELECT *
FROM CONNECTION TO DB2
(SELECT  B.ID_PART     AS ID_PART
,B.SRC_CUST_CD         AS POINT
,B.SCALED_DMND         AS DMND
,B.DMND_TYP            AS DMND_TYP
,B.DMND_PRD            AS PERIOD
,D.ENT_PT_SRC_CUST_CD  AS ENTRYPT

FROM
 D7FC005$.V_DW_DMDSRC_MO2        B
,D7FC005$.V_DW_FRCST_GRP_DMD     C
,D7FC005$.V_DW_PT_SRC_INVCTL     D
,D7FC005$.V_PART_ENT_SRCUS       E

WHERE
B.ID_PART                        =  D.ID_PART
AND B.ID_PART                    =  E.ID_PART
AND B.PART_TYP_ID                =  D.PART_TYP_ID
AND B.PART_TYP_ID                =  E.PART_TYP_ID
AND B.DMND_TYP                   =  C.DMND_TYP
AND B.SRC_CUST_CD                =  D.SRC_CUST_CD
AND D.ENT_PT_SRC_CUST_CD         =  E.SRC_CUST_CD
```

```
AND C.FRCST_GRP                  =  'IND'
AND B.FRCSTBL_IND                =  'Y'
AND E.FULL_PROD_DT               <= '2006-01-01'
AND E.FLG_MAO                    =  'N'
AND E.FLG_RAO                    =  'N'
AND D.ENT_PT_SRC_CUST_CD NOT IN ('Y303','Y751')
AND B.DMND_PRD BETWEEN '2007-01-01' AND '2007-12-31'
AND E.REPL_NTCE_CD NOT IN ('1','4')
WITH UR FOR FETCH ONLY);
%PUT &SQLXMSG;


PROC SORT DATA = PART;
BY ID_PART ENTRYPT PERIOD;
RUN;

PROC MEANS DATA = PART NOPRINT;
VAR  DMND;
BY ID_PART ENTRYPT PERIOD;
OUTPUT OUT = FINAL
SUM = TOT_DMND;
RUN;

DATA FINAL1;
SET FINAL;
IF TOT_DMND<=0 THEN TOT_DMND =0;
RUN;

DATA XYZ;
SET FINAL1 (KEEP = ID_PART ENTRYPT);
PROC SORT DATA = XYZ NODUPKEY;
BY  ID_PART ENTRYPT ;
RUN;
```

```
DATA DATES;
SET XYZ;
KEEP ID_PART ENTRYPT PERIOD TOT_DMND I;
START = TODAY();
DO I = 1 TO 12;
PERIOD = INTNX('MONTH',START,-I);
TOT_DMND = 0;
OUTPUT;
END;

FORMAT PERIOD MMDDYY10.;
PROC SORT DATA = FINAL1;
BY ID_PART ENTRYPT PERIOD;
RUN;



PROC SORT DATA = DATES;
BY ID_PART ENTRYPT PERIOD;
RUN;

DATA STOCK2;
UPDATE DATES (IN=IN1) FINAL1 (IN=IN2);
BY ID_PART ENTRYPT PERIOD;
IF IN1;
RUN;
PROC SORT DATA = STOCK2;
BY ID_PART ENTRYPT;
RUN;
```

```
DATA MONTH3;
SET STOCK2;
IF I IN (1,2,3);
RUN;

DATA MONTH6;
SET STOCK2;
IF I IN (1,2,3,4,5,6);
RUN;

PROC MEANS DATA = MONTH3 NOPRINT;
VAR  TOT_DMND;
BY ID_PART ENTRYPT ;
OUTPUT OUT = MONTH3F
MEAN=AVE3;
RUN;


PROC MEANS DATA = MONTH6 NOPRINT;
VAR  TOT_DMND;
BY ID_PART ENTRYPT ;
OUTPUT OUT = MONTH6F
MEAN=AVE6;
RUN;


PROC MEANS DATA = STOCK2 NOPRINT;
VAR  TOT_DMND;
BY ID_PART ENTRYPT ;
OUTPUT OUT = FINAL2
SUM = TOT_DMND STD=STDDEV MEAN=AVERAGE;
RUN;
```

```
DATA FINAL2;
MERGE MONTH3F (IN=A) MONTH6F (IN=B) FINAL2 (IN=C);
IF A AND B AND C;
BY ID_PART ENTRYPT;
RUN;

DATA FINAL3;
SET FINAL2;
IF AVERAGE =0 THEN COV=4;
ELSE
COV = STDDEV/AVERAGE ;
IF COV<=3 THEN OUTPUT;
RUN;
PROC SORT DATA = FINAL3;
BY DESCENDING TOT_DMND;
RUN;


DATA _NULL_;
SET FINAL3;
FILE OUTDD;
PUT @1  ID_PART $CHAR7.
@9  ENTRYPT $CHAR4.
@14 TOT_DMND 12.3
@28 STDDEV 10.3
@40 AVE3 10.3
@50 AVE6 10.3
@60 AVERAGE 10.3
@70 COV 10.3
;
RUN;
```

```
PROC SQL;
CONNECT TO DB2 (SSID=D7P2);
CREATE TABLE FIXRQT AS
SELECT *


FROM CONNECTION TO DB2
(SELECT
A.ID_PART                          = AS ID_PART
,SUM(A.FIX_REQT_QTY)               = AS FIXQTY
,B.ENT_PT_SRC_CUST_CD              = AS ENTRYPT
,C.PART_COST                       = AS STDCOST

FROM
D7FC005$.V_DW_PT_FIXREQT         A
,D7FC005$.V_DW_PT_SRC_INVCTL   B
,D7FCGL01.V_DW_PART_COST       C


WHERE
A.ID_PART                          = B.ID_PART
AND A.ID_PART                      = C.ID_PART
AND A.SRC_CUST_CD                  = B.SRC_CUST_CD
AND A.START_DT                     < CURRENT DATE + 2 MONTHS
AND A.STOP_DT                      >   CURRENT DATE

GROUP                                                          BY
A.ID_PART,B.ENT_PT_SRC_CUST_CD,C.PART_COST
ORDER                                                          BY
A.ID_PART,B.ENT_PT_SRC_CUST_CD,C.PART_COST
WITH UR FOR FETCH ONLY);
%PUT &SQLXMSG;
```

```
DATA INVTRY;
INFILE INDD;
INPUT @1  ID_PART $CHAR7.
@9  ENTRYPT $CHAR4.
@14 TOT_DMND 12.3
@28 STDDEV 10.3
@40 AVE3 10.3
@50 AVE6 10.3
@60 AVERAGE 10.3
@70 COV 10.3
;
IF COV<=.3;
RUN;


PROC SORT DATA=INVTRY;
BY ID_PART ENTRYPT;
RUN;

DATA FORDATA;
INFILE INDD1;
INPUT

@1 ID_PART    $CHAR20.
@23 ENTRYPT    $CHAR6.
@29 FCST_GRP  $CHAR3.
@32 FCST_DT   YYMMDD10.
@42 EFFIN_DT  YYMMDD10.
@62 SFTY_STK  PD5.3
@82 EP_ED     PD4.1
@86 SFTY_FCT  PD5.3
@93 FCST_MDL  $CHAR2.
```

```
;




IF EFFIN_DT = FCST_DT;
IF FCST_GRP='IND';
RUN;


PROC SORT DATA = FORDATA;
BY ID_PART ENTRYPT;
RUN;

DATA INVTRY1;
MERGE INVTRY (IN=A) FIXRQT (IN=B) FORDATA (IN=C);
BY ID_PART ENTRYPT;
IF A AND B AND C;
IF FIXQTY > 0;
TOTALVAL = STDCOST*FIXQTY;
RUN;


PROC MEANS SUM  DATA=INVTRY1;
VAR TOTALVAL;
OUTPUT OUT=INVNTY2 SUM=SUMT;
RUN;
PROC SORT DATA = INVTRY1;
BY DESCENDING TOT_DMND;
RUN;
PROC PRINT DATA = INVTRY1 (OBS = 50);
RUN;
```

```
DATA _NULL_;
SET INVTRY1;
FILE OUTDD;
PUT @1  ID_PART $CHAR7.
@9  ENTRYPT $CHAR4.
@14 TOT_DMND 12.3
@28 STDDEV 10.3
@40 AVE3 10.3
@55 AVE6 10.3
@70 AVERAGE 10.3
@85 COV 10.3
@100 FIXQTY 10
@110 STDCOST 10.3
@125 FCST_GRP $CHAR3.
@130 SFTY_STK 10.2
@145 EP_ED 10.2
@160 SFTY_FCT 10.5
@175 FCST_MDL $CHAR2.
@180 TOTALVAL 10.3
;
RUN;
```

6. Analysis:

Note : From the project methodology above programme code we have extracted first twenty five parts in the system which has co-variance of <=.3 and has positive fixed requirement in the demand at entry point level for the year 2007 as shown below..

OBS	ID_PART	ENTRYPT	TOT_DMND	STDDEV	AVE3	AVE6	AVERAGE	COV	FIXQTY	STDCOST	GROUP	SFTY_STK	EP_ED	SFTY_FCT	MODEL	TOTALVAL
1	16523017	SHANGHAI	7135954.83	45547.29	582416	578166.1	594662.9	0.077	906137	0.151	IND	227915.88	605837	1.98	4	136826.69
2	16500205	SHANGHAI	6922182.97	28229.74	548678	559941.9	576848.6	0.049	901243	0.223	IND	205936.32	563345	1.924	4	200977.19
3	51226869	SHANGHAI	5742648.87	113130	429369	515827.5	478554.1	0.236	1127568	0.103	IND	105264.81	174114	3.463	3	116139.5
4	5P07679	SHANGHAI	5703656.86	106616.4	511191	560828.9	475304.7	0.224	262568	0.011	IND	495812.62	525905	4.962	4	2888.25
5	16500212	SHANGHAI	5227886.69	55136.99	459634	432528.1	435657.2	0.127	548778	0.269	IND	262722.88	423897	3.262	4	147621.28
6	12268873	SHANGHAI	4696654.13	81642.79	368165	403982.7	391387.8	0.209	484884	0.076	IND	247546.68	344677	3.78	4	36851.18
7	5P020161	SHANGHAI	4504315.64	51113.35	314764	348109.7	375359.6	0.136	132311	0.091	IND	144527.12	398439	2.175	2	12040.3
8	5M289492	SHANGHAI	4446601.17	15929.58	357899	360166.2	370550.1	0.043	277924	0.01	IND	31994.04	381514	3.139	2	2779.24
9	6V074596	SHANGHAI	4288629.85	37003.23	337704	337571.4	357385.8	0.104	161474	0.011	IND	235157.48	325189	3.806	4	1776.21
10	6V074423	SHANGHAI	3993024.09	21365.54	313743	322385.9	332752	0.064	98241	0.007	IND	50585.06	342394	3.506	2	687.69
11	16500164	SHANGHAI	3961434.31	36450.63	326886	320463.4	330119.5	0.11	522542	0.152	IND	122993.81	343797	2.175	2	79426.38
12	12268893	SHANGHAI	3862192.61	28871.56	299246	319724.3	321849.4	0.09	455748	0.075	IND	190741.73	263907	3.804	4	34181.1
13	12268672	SHANGHAI	3343389.19	51092.08	277450	304096.2	278615.8	0.183	631201	0.087	IND	134226.36	292634	3.417	2	54914.49
14	12268907	DETROIT	3102813.66	30707.77	258838	249440.3	258567.8	0.119	356055	0.079	IND	186869.48	260191	3.78	4	28128.34
15	5P020263	DETROIT	3019178.4	27569.85	265602	259123.5	251598.2	0.11	37118	0.17	IND	13237.04	255784	0.641	2	6310.06
16	12268702	DETROIT	2881327.62	43009.58	257759	248237.9	240110.6	0.179	313559	0.111	IND	150598.87	209689	3.78	4	34805.05
17	5P020321	DETROIT	2802060.94	48934.77	207283	214301.3	233505.1	0.21	11844	0.206	IND	74890.08	236033	1.45	2	2439.86
18	6V074610	DETROIT	2796783.55	25404.56	200233	217591.1	233065.3	0.109	141480	0.013	IND	174833.22	241770	3.806	4	1839.24
19	16500238	DETROIT	2659518.22	37926.83	239091	222294.9	221626.5	0.171	48729	0.325	IND	83555.6	194673	2.259	4	15836.93
20	7K118136	DETROIT	2520006.95	13484.25	204756	207722.5	210000.6	0.064	139483	0.047	IND	246386.41	194769	6.658	4	6555.7
21	4K036721	DETROIT	2299543.13	13563.08	199530	196167.3	191628.6	0.071	92451	0.075	IND	171103.3	199279	4.519	4	6933.82
22	101247369	DETROIT	2273149	27308.89	189420	178912.1	189429.1	0.144	70776	0.005	IND	122739.04	182124	3.547	4	353.88
23	5P824521	DETROIT	2265380.26	7149.51	180812	184500.5	188781.7	0.038	126873	0.025	IND	20702.18	189518	3.75	2	3171.83
24	122687230	DETROIT	2181152.85	10696.06	186236	183795	181762.7	0.059	220534	0.179	IND	119349.34	166178	3.78	4	39475.59
25	2J350645	DETROIT	2143200.55	12657.89	164892	177529.8	178600.1	0.071	89454	0.114	IND	223114.95	178328	6.585	4	10197.76

Table 1

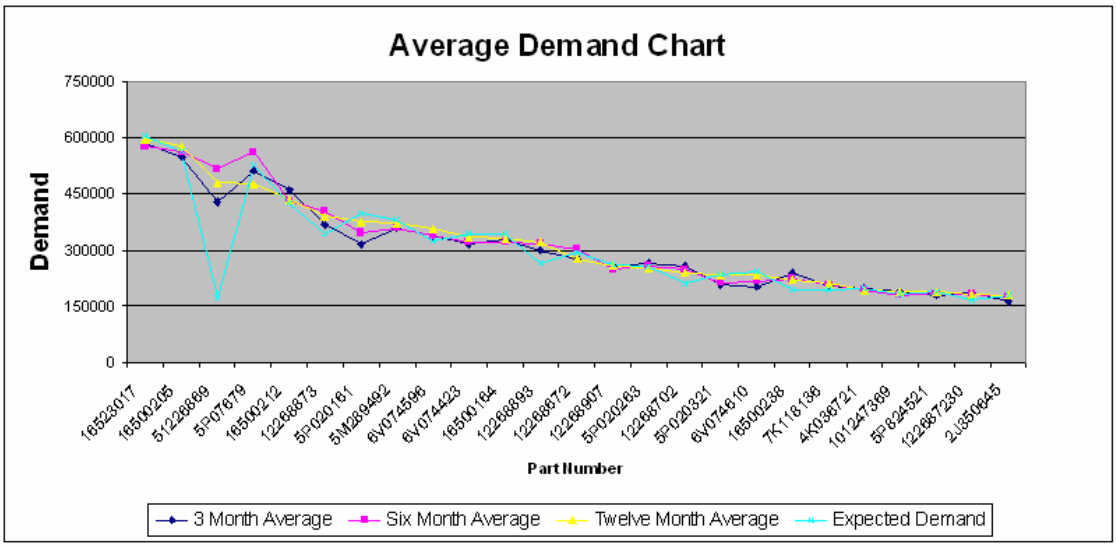


Table - 2

Note :

1) In the above graphical representation we can see that the average demand for three , six and twelve month is quite similar .

2) The expected demand for the year is almost matching with actual demand.

3) If we analyze the table 1 we can found that two component Expected demand and safety stock combine together is sufficient to full fill the average demand, if we have Stable demand history for parts.

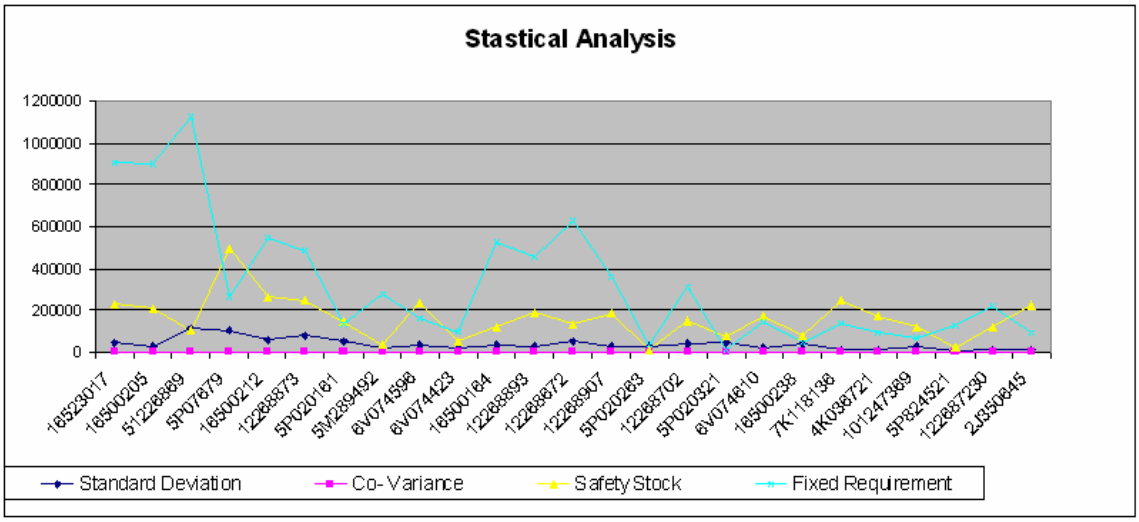


Table - 3

Note :

1) In the above graphical representation we can see that co – variance is very less which states that demand is consistent.

The coefficient of variance (CV) can be used to determine how much variance there is in the data. It allows us to compare the standard deviation to the average for the data set.

Co – Variance = (Standard Deviation /Mean) * 100

2) As the co-variance is less we can avoid Fixed requirement for the first twenty five parts having stable demand which we have identified earlier.

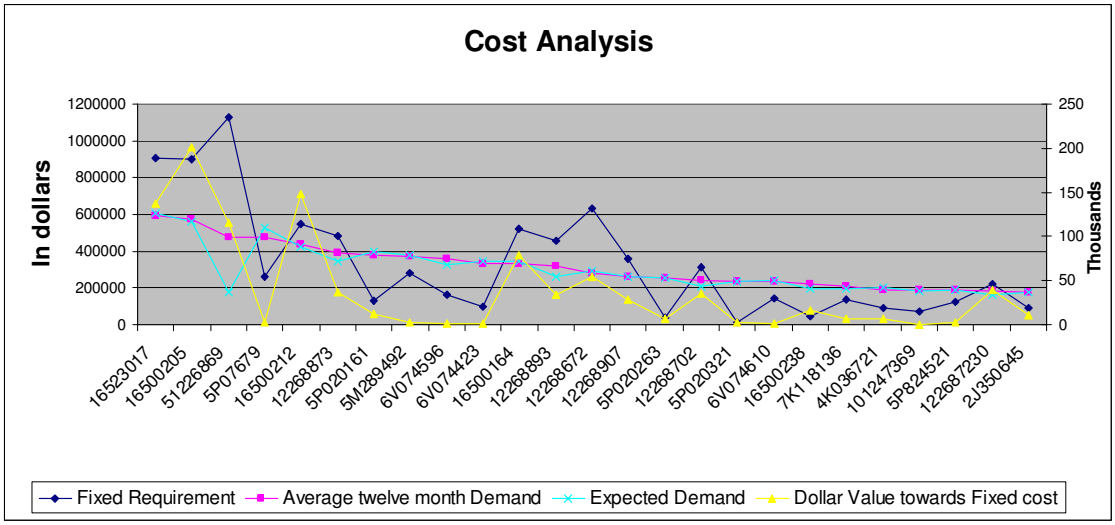


Table 4

Note :

1) In the above graphical representation we can conclude that if we avoid fixed requirement for the first twenty five parts from the supply chain system we can save around Nine lakhs eighty thousand dollars which is a considerable saving amount .

2) By implementing the fixed requirement reduction we can increase the average working inventory turnover.

7. Conclusions

1) With the above analysis we can come to the conclusion that the first twenty five parts has a constant demand history thus we can save inventory holding cost by decreasing the quantum of safety stock and avoiding fixed stock.

2) Stastically we have concluded that in above analysis when we have kept the co-variance <= 3 we can see that the demand Pattern is quite consistent.

3) We can conclude that if we avoid fixed requirement for the first twenty five parts from the supply chain system we can save around Nine lakhs eighty thousand dollars which is a considerable saving amount.

8. Reference:

1.) The Little SAS book By Lord D. Delwiche and Susan J. Slaughter.

2.) SAS Programming by Example by Ron Cody and Ray pass.