Chapter IV

Existing and Proposed Gasoline Distribution

This chapter describes and shows the comparison between existing gasoline distribution and proposes gasoline distribution with information sharing or vendor managed inventory idea. Scopes of studied data are included

1) Gasoline distribution from central depot to service station.
2) Study in forty service stations where locate in Bangkok only.
3) Historical sales data of year 2006.
4) Transportation mode uses is road mode.
5) Four types of gasoline which studied are include
   - Benzene oil 91 or product SKU 500021
   - Benzene oil 95 or product SKU 500025
   - Diesel oil or product SKU 500033
   - Gasohol or product SKU 500041
6) Delivery lead time is equal to one day

4.1 Existing Gasoline Distribution and Inventory Management Policy

This paper study gasoline distribution and inventory management in one depot and 40 gasoline stations where located in Bangkok. Four types of gasoline that are taken in to account are Benzene91, Benzene95, Diesel and Gasohol. The existing policy of gasoline distribution from central depot to gasoline stations has the work flow and distribution policy as shown below.

- Inventory is monitored and managed by each gasoline station.
- Sales forecast is based on individual experience and own common sense of scheduler at each gasoline station.
- Orders are placed to central depot in order to reach stock target level.
- Stock target level is the maximum of each underground fuel tank capacities.
- Purchase order from each service station placed via telephone.

- Point of sales data are update and transfer to central depot in 3-4 days later.
- Point-of-sale system is not used for forecasting and replenishment planning purpose but only use for accounting system.
- Transportation management based on service station purchase order in stead of end customer consumption.

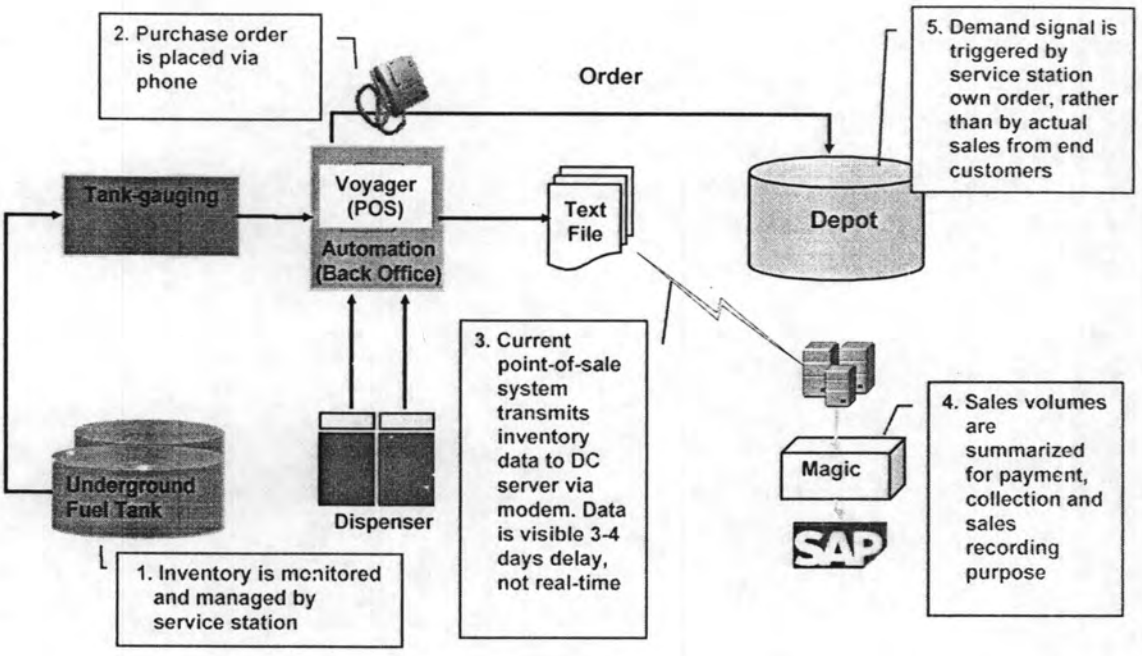


Figure 4.1 As-Is gasoline distribution system

Figure 4.2 below show the annual inventory quantities (Liters) of each plant which separate by product sku.

NO.	PLANT	500021	500025	500033	500041	Grand Total
1	6101	1,783,990	4,333,410	9,459,370	3,585,290	19,162,060
2	6103	5,942,680	3,946,340	5,371,600	3,699,090	18,959,710
3	6105	7,285,450	7,749,620	1,428,150	5,573,600	22,036,820
4	6108		4,453,970	4,396,940	3,868,530	12,719,440
5	6113	1,961,000	5,786,230	3,622,810	4,529,790	15,899,830
6	6116	7,898,990	3,384,060	2,641,740	6,709,300	20,634,090
7	6117	5,013,320	9,256,640	4,189,330	3,944,210	22,403,500
8	6119		3,419,310	7,266,960	2,832,980	13,519,250
9	6120	6,256,790	2,677,030	6,682,900	4,295,360	19,912,080
10	6121	4,373,720	4,576,560	3,741,650	4,744,700	17,436,630
11	6126		4,616,160	4,375,150	6,348,890	15,340,200
12	6128		4,327,300	4,254,380	3,731,490	12,313,170
13	6129		4,252,850	4,163,370	3,721,470	12,137,690
14	6131		5,164,550	3,692,780	3,169,330	12,026,660
15	6132	1,981,050	1,589,960	3,868,800	3,024,850	10,464,660
16	6133	2,356,250	4,274,090	4,329,770	8,479,180	19,439,290
17	6134		5,013,900	7,879,420	6,449,080	19,342,400
18	6136		3,115,780	3,109,560	3,092,910	9,318,250
19	6137		1,716,540	1,591,520	2,329,300	5,637,360
20	6139		4,099,260	4,233,770	5,885,510	14,218,540
21	6142	3,428,590	6,941,790	7,063,050	6,430,890	23,864,320
22	6143	3,483,540	4,132,760	8,742,630	5,412,210	21,771,140
23	6144	1,705,570	4,658,860	4,742,480	6,400,200	17,507,110
24	6146		7,846,630	4,605,480		12,452,110
25	6147		4,862,920	4,413,290		9,276,210
26	6148		3,725,010	1,992,320		5,717,330
27	6149		2,757,520	2,338,740		5,096,260
28	6150		6,145,470	5,408,030		11,553,500
29	6154		5,483,080	4,877,730		10,360,810
30	6156	4,386,670	5,212,080	2,091,810		11,690,560
31	6157	6,110,400	3,395,660	5,407,430		14,913,490
32	6160	5,942,680	3,946,340	5,371,600	3,699,090	18,959,710
33	6161	5,942,680	3,946,340	5,371,600	3,699,090	18,959,710
34	6162	10,533,740	13,700,030	32,436,620	20,480,490	77,150,880
35	6163	10,524,440	11,856,910	26,794,830	17,336,010	66,512,190
36	6164	11,482,310	13,668,050	31,608,450	20,014,480	76,773,290
37	6165	11,155,250	13,030,930	30,316,070	19,207,220	73,709,470
38	6166	10,447,430	11,149,970	24,532,190	16,060,220	62,189,810
39	6167	10,464,660	11,701,580	26,273,320	17,048,110	65,487,670
40	6168	14,913,490	6,073,420	12,323,890	8,172,020	41,482,820
Grand Total		**155,374,690**	**231,988,910**	**337,011,530**	**233,974,890**	**958,350,020**

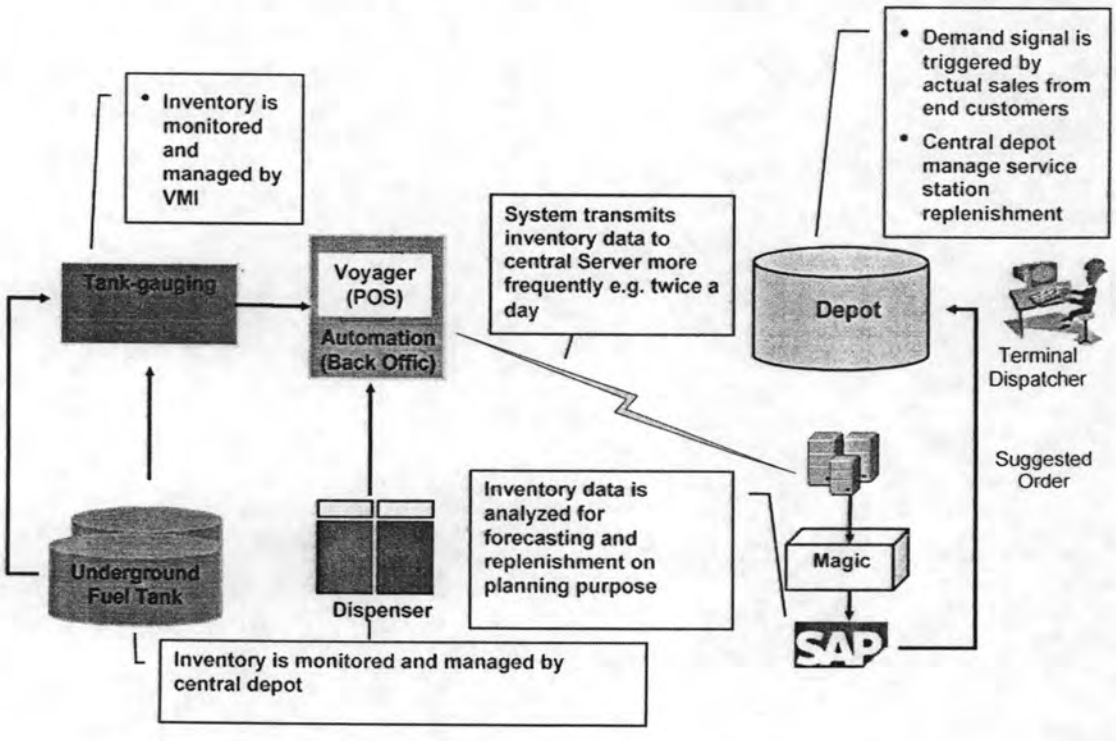
Figure 4.2 shows the existing annual inventory of each plant.

4.2 Proposed Gasoline Distribution and Inventory Management Policy

The proposed gasoline distribution from central depot to gasoline stations has the work flow and distribution policy as below.

- To apply vendor managed inventory concept for gasoline distribution.
- Gasoline order quantities operate by central depot.
- Inventory are monitored and managed by central depot.
- Central depot operates the sales forecast which based on statistic method.
- Point of sales data and inventory level are update and transmit to central depot in everyday.
- Point-of-sale system contributes for forecasting and replenishment planning purpose, sales & marketing analysis and transportation management.
- Transportation management based on end customer consumption.
- Inventory management policy that be considered included Continuous review with maximum forecast error, Minimum –Maximum approach, Minimum –Maximum with maximum forecast error approach.
- Safety stock models perform in 2 scenarios included Max forecast error method and Customer Service level with standard deviation method.

Figure 4.3 To-be gasoline distribution systems



4.3 Forecasting and Inventory system tools

SPSS program used to generate the multiple regression analysis of historical sales data to identify the coefficient value of long holiday and price fluctuates from oil crisis. Microsoft excel used to operate the exponential smoothing forecasting model and inventory policy method included

4.3.1 Continuous review with maximum forecast error.

This approach continues review the inventory level at least once a day. Safety stocks vary by maximum shortage quantities of forecast error in previous month.

4.3.2 Minimum – Maximum Inventory approach

This approach adopts to generate the reorder level when the inventory level is lower than the specific minimum inventory which included the daily average sales and safety stock. Safety stocks vary by standard deviation of each month sales volume with specific service level at 95%. The maximum order quantities are limited by stock target level which generates from average sales over time interval and lead time and safety stock.

4.3.3 Minimum – Maximum Inventory with maximum forecast error approach

This approach adopts to generate the reorder level when the inventory level is lower than the specific minimum inventory which included the daily average sales and safety stock. Safety stocks vary by maximum shortage quantities of forecast error in previous month.