

CASE ANALYSIS



AGARWAL AUTOMOBILES: FUEL STATION FORECASTING AND INVENTORY MANAGEMENT



OUTLINE

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- Current Structure
- Challenges
- SWOT Analysis
- Forecasting
- Inventory Planning
- Recommendations

CASE SUMMARY

- Agarwal Automobiles is an authorized fuel station for Bharat Petroleum Corporation Limited (BPCL) located in the Sagar district of Madhya Pradesh.
- Agarwal Automobile was founded by Mr. Alok Agarwal and he signed a dealership contract with BPCL in 1981.
- Agarwal Automobile own the premises where fuel station is located, BPCL installed fuel dispensing machines.
- Agarwal automobiles sold three main products at the fuel station: Diesel, Petrol and High speed petrol (HSP). Renovations
- Agarwal Automobile has been performing well for last 35 years and it has been recognized by the BPCL several times for its excellence in performance.
- In March 2015, the fuel station was renovated and was transformed into a next-generation pump station.
- Agarwal Automobiles did not use any formal analytical techniques to govern ordering and inventory management policies.
- Most of the operating decisions of the business were based on simple operating principles combined with managerial intuition.
- Agarwal Automobile held an average inventory of Rs. 2.1 million in past 6 months
- Average daily sales of the fuel station is 0.52 million in past 6 months
- Renovations were made in the fuel station which increased the inventory capacity and physical space of the business which in turn increased the number of customers that could be served at one time, boosting sales.
- Because of high competition, Agarwal automobile is keeping high inventory level to ensure high customer service levels.

CURRENT STRUCTURE

- **Organizational Structure** – Small organization, primarily, centralized decision model where owner is taking the decisions and others are following it. Any other people are not having any say in decision making.
- **Suppliers** – BPCL, the market leader in Indian petroleum sector
- **Competitors** – Many other fuel station nearby. MP has total 3269 fuel stations in 2015-2016
- **Customers** – No specific category. Mostly repeat customers.

CHALLENGES

- Mr. Alok Agarwal looking for a better way to tackle the demand properly in order to serve the customers effectively and to maximize the profits at the same time.
- Mr. Agarwal's main concerns is about the optimum inventory level that should be kept in order to fulfil the demand of the customers. Also what, when, and how much to order are the main issues when it comes to determining the purchase policy of the firm.
- Aditya Agarwal, son of Mr. Alok Agarwal, a IIM-Indore graduate with specialization in Supply chain management took the responsibility to analyze the current status and suggest suitable solution to maintain a optimum inventory without affecting the customer demand.

SWOT ANALYSIS

Strength

- Solid historical performance, Fuel station was recognized by BPCL many times in past.
- Huge Experience - 35 years of experience in same business.
- New facility - Fuel station was renovated and new machines are installed, have larger inventory carrying capacity and can serve large number of customer at a time
- Willingness to change – Alok is eager to thrive for excellence by minimizing the inventory cost and operational excellence.

Opportunities

- Increase in customer demand - Fueling industry was witnessing rising consumer demand now.
- Higher consumption – In FY 2015–16, overall consumption of petrol and diesel grew by 7.5% and 14.5%, respectively.
- Low Operating cost - Operating costs to run a fuel station is not as high compared to other businesses.

Weakness

- Agarwal Automobiles did not use any formal analytical techniques to govern ordering and inventory management policies.
- Most of the operating decisions of the business were based on simple operating principles combined with managerial intuition.
- The company held an average inventory of 2.1 million worth ₹ of fuel products to maintain average daily sales of ₹0.52 million.

Threats

- High competition from other fuel stations.
- BPCL pressure to increase sales
- Keep high inventory level to maintain a high customer service level
- Switching cost of customer is low as it is commodity based business

FORECASTING

- Four types of methods have been incorporated to determine the forecasted values of HSP, Petrol and Diesel
- Moving Average – Done for 3 months
- Weighted Average - Done for 3 months and taking weights as 0.7, 0.2 and 0.1
- Exponential Smoothing - α - value is taken as 0.3 and $Z = 2.33$ (99% customer service level)
- Time Series Decomposition
- Here the MAD value using weighted moving average is minimum for HSP, Petrol and Diesel. Hence this we can say is best method to forecast.
- Also, if we plot forecasted and actual values using weighted moving average, the forecasted value is almost equal to actual sales value. We can use this to predict future quantity to be ordered.

MAD Values	HSP	Petrol	Diesel
Moving Average	2295.18	7499.32	38509.64
Weighted Average	1961.08	5576.87	23172.68
Exponential Smoothing	2290.52	5625.69	32619.37
Time-Series	2207.08	11405.68	32775.23

INVENTORY PLANNING

- Economic Order Quantity (EOQ) = $\text{SQRT}(2 \cdot D \cdot S / H)$
- Demand (D) per day in June 2016 which was calculated from forecasting
 - $D(\text{HSP}) = 260 \text{ L}$, $D(\text{Petrol}) = 3591 \text{ L}$, $D(\text{Diesel}) = 4756 \text{ L}$
- Demand (D) per month in June which was calculated from forecasting
 - $D(\text{HSP}) = 7800 \text{ L}$, $D(\text{Petrol}) = 107730 \text{ L}$, $D(\text{Diesel}) = 142680 \text{ L}$
- Ordering cost / day (S) = Rs.150
- Inventory Holding Cost (H) = 10% of Fuel Cost
- Fuel Cost = Rs 73 (HSP), Rs. 70 (Petrol) and Rs. 60 (Diesel)
- Since the Ordering cost is given as one and not individually

$$\text{EOQ} = \text{SQRT}(2 \cdot (D(\text{HSP}) + D(\text{Petrol}) + D(\text{Diesel})) \cdot S / (H(\text{HSP}) + H(\text{Petrol}) + H(\text{Diesel})))$$

$$= 1953.37$$

- Number of orders(O) = Demand/EOQ
- Frequency of order to placed (n) = $(D(\text{HSP}) + D(\text{Petrol}) + D(\text{Diesel})) / 12000$ (fix combined quantity which has to order) = 22 times
- Reorder Point = Daily Usage * Lead Time

Fuel Type	HSP	Petrol	Diesel
Demand (Units per day)	260	3591	4756
Demand (Units per Month)	7784	107740	142671
Ordering cost / day (S)	150 (Since breakup is not given, we would consider this same for all)		
Fuel Cost	73	70	60
Inventory Holding Cost (H)	7.3	7	6
Economic Order Quantity (EOQ)	566	2149	2671
Number of orders(O)	14	50	53
Reorder Point	260	3591	4756

RECOMMENDATIONS

- One of the options would be to stop selling HSP, as margins are high but the sale is too low and also on decline. Utilize the storage tanker for either diesel or petrol. This will further improve the inventory model.
- Other options for Agarwal Automobile could be to look into setting up CNG/LPG in the fueling station. This way Agarwal Automobile will ensure diversification and also will ensure new customers coming.
- Another possible option which Agarwal Automobile is to look into decreasing the tank capacity of HSP to half and utilize the other half for diesel or petrol.
- Apart from looking into the Inventory and Forecasting model, Agarwal Automobile can start loyalty cards or lucky draw competitions for repeat customers. This will increase customer satisfaction levels and also will ensure customer loyalty.
- Ensure regular and periodic review of the data to keep updating the inventory and forecast numbers and adjust the parameters accordingly.

THANK YOU

