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White Paper

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Dynamic Pricing for Retail Fuels

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Introduction

Business pressures and pricing process complexities necessitate a pricing decision support system. Having the right type of calculation engine with the flexibility of multiple techniques and supporting processes are fundamental to its success. The pricing system depends on the intelligence of the calculation engine to solve various complex scenarios by using price sensitivity information. Knowledge of price sensitivity enables retailers to alter prices dynamically across sites to maximize revenue. This article describes complexities in the pricing process and different approaches for daily pricing of retail fuels.

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Business environment

Retail fuel stations receive gasoline and diesel from oil marketing companies (OMC). From the storage terminals owned by the OMCs, fuel grades are transported to retail fuel stations, usually through tank-trucks. OMCs receive the fuel from oil refining companies. Retailers sell the fuel in the open market.

Retail fuel stations can be categorized as Company Owned Company Operated (COCO), Company Owned Dealer Operated (CODO) and Dealer Owned Dealer Operated (DODO). To retain and attract new customers, retail fuel stations also sell non-fuel items and provide value added services to customers. Lately, hypermarkets have entered the marketplace.

Price impacts dynamically!

Of all the parameters that can affect a retail station business, price is the most potent and dynamic. Business performance of retail stations is affected by several parameters to varying degree viz. price, brand image, demographics, location, quality of fuel, quality of services, convenience, overall experience, etc. Retailers must consider various strategic programs and capital investments to manage these parameters. Sale price is a very potent parameter that can affect station performance dynamically. Effect of changes in sale price can be felt immediately. For an organization with large networks of retail stations, knowledge of price sensitivity of each station becomes useful information to manipulate retail station specific pricing policies. It is necessary to continuously measure and analyze the effect of these policies. Analysis of stationspecific performance also leads to network-wide business improvement. It is necessary to have an effective pricing system supported by adequate processes to improve station performance as well as the overall business.

Need for Pricing Decision Support System

The numerous constraints that must be satisfied for multiple grades across a large network of sites make it humanly impossible to identify and recommend a new price frequently. In volatile markets such as Canada and Australia, fuel prices change twice a day. In highly competitive US markets, prices changes occur daily. A typical pricing process workflow is provided in Figure 1.

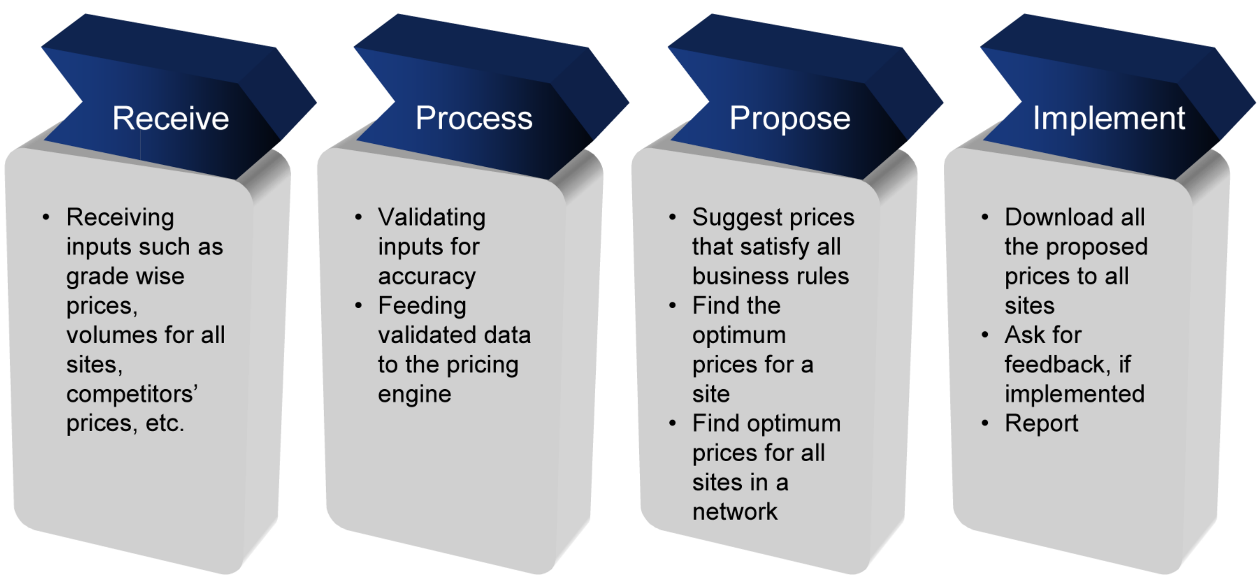

Figure 1: Typical Pricing Workflow
(Source: Infosys analysis)

Voluminous data on prices and volumes of all grades across all sites as well as prices of competitors is received by various means. The data is validated with intelligent checks before identifying the right price for each grade at each site. The proposed price must also satisfy a set of business rules. After the optimum prices are identified, they need to be downloaded to all sites for actual implementation.

Recommending a new price daily based on competitor moves or own desire to lead the change is a very challenging task. The process is highly complex and analytical in nature. Micro-markets surrounding a station must be considered. The performance of each fuel grade is affected by its price as well as the price of similar grades offered by competitors in the neighborhood. Also, the cannibalization effect due to other own grades being sold at the station needs to be studied.

While recommending new prices, constraints posed by several rules must also be taken into account. Rules can be of different types:

- Cost based rules
- Government enforced floor price/ ceiling price rules
- Rules to distinguish own grades
- Rules to follow a leader or distinguish from a competitor grade
- Rules to develop a "Price Image"

In large networks with thousands of retail stations, it is humanly impossible to recommend prices for all grades at each station on a daily basis, honoring all the various rules based constraints. In the absence of pricing decision support systems, retailers take gut-feel based decisions. Due to the complexity and magnitude of the problem, this results in delayed responses and inability to capture market opportunities. Wrong decisions can wipe off bottom lines while good decisions have the potential to earn margins. In today's highly competitive market, the need for a proper pricing decision support system is felt more than ever before.

Different Approaches to Pricing

Dynamic pricing for fuel grades poses different challenges in site-level and network-level pricing considering the network of individual sites is fed from the same depot. The approaches to address pricing and related issues at the site and network levels include Rules-based pricing and Optimization-based pricing.

Rules-based pricing

From the practical view point, quick and satisfactory pricing for various grades of fuels available across the network is desirable. A variety of types of rules exist based on the business environment such as price differential between own grades as well as with competition grades, upper and lower limits, etc. Based on a set of rules, the pricing system confirms if the suggested prices fulfill all constraints. It helps in automating the pricing process where prices are managed only by exception. Besides, it leads to establishing a consistent price image.

Optimization-based pricing

The key objective function of optimization is revenue maximization. This can be achieved both at the site and network levels. Optimization-based pricing exploits the nonlinear relationship between price and volume and simultaneously solves multiple cases to arrive at an optimum price-volume combination that provides the maximum revenue.

Price-volume elasticity is an important input for the optimization process. In case of pricesensitive sites, a small decrease in price can cause a large increase in volumes. At less sensitive sites, prices can be increased slightly without sacrificing volumes. An intelligent combination of price changes at various sites in a network can lead to better revenue and profitability.

The two approaches are compared in Table 1.

Approach	Features	Benefits
Rules-based Pricing	• Business rules govern price recommendation • Pricing implementation process is automated • Price management by exception	• Agility; quicker response to market • Event-driven pricing is possible • Compliance to pricing rules • Consistent price image
Optimization-based Pricing	• Price modeling (what-if scenarios) • Performance forecasting - Site optimization • Network optimization	• Increase in site margins • Improved network business by classifying sites based on sensitivity • Improved pricing rules • Better what-if analyses capabilities • Optimum response to market

Table 1: Comparing different pricing approaches

The optimization-based pricing approach can be further detailed as Optimization at Site-level and Optimization at Network-level.

Optimization at Site-level

While recommending grade price at a site, several constraints that define a specific band within which the price can move must be considered. The recommended price must maintain a predetermined differential with a competing grade price in the local market. Another restriction on the price band comes from own previous day prices of the same grade. These restrictions curb drastic changes in daily prices. The possibility of cannibalization of demand between fuel grades necessitates constraints related to maintaining a gap between them. Price restrictions from regulatory authorities also need to be considered for suggesting the optimal price.

While deciding the band in which prices will vary during optimization, retailers also need to consider the restriction imposed on the volume provided by the depot (supply location) to a particular site. A price that provides maximum profitability but requires a volume greater than the allocation to the site cannot be considered.

Price elasticity for a grade at specific sites is another factor to be considered. It determines the volume that can be sold at a price. The problem becomes difficult because of two primary reasons. First, the nonlinear relationship between price and volume makes it difficult to calculate revenue during the optimization process as the coefficients to the prices do not remain static. Second, the interdependence of the prices of various grades rules out the possibility of determining prices in a sequential fashion, especially if the number of grades and the possible price points in the band are large.

Optimization at Network-level

One of the concerns at the network-level is the distribution of the right quantities of various grades of fuels among the different sites depending on past demand patterns. The decision also depends on the transportation cost of fuel from the depot to various sites in the network. The primary allocation of volumes to various sites in the network may not be optimal as the price volume combination for each site may suggest volumes for that particular site, which may be different from the allocated volume.

One option is to optimize site-level prices and volumes after considering the volume restrictions imposed by the supplier depot. The difficulty in this approach is that the optimization of each site independently, when accumulated over network, more often than not, provides sub-optimal result. This happens because the possibility of re-allocation of volumes is not considered during the optimization process.

Another option is to optimize the situation at each site independently without considering the volume restriction imposed by the supplying depot, and recommend the required volumes to the supplying depot. The depot can reallocate supplies to match volumes, possibly by altering the total volume available from the supplying refinery. If the difference in the allocated volume and optimal volume at a site is less, then this approach can be adopted. The reason being that compensation among sites may not force the depot to alter the demand on refinery to a large extent.

The third and more meticulous option is the optimal volumes suggested by independent site optimization without considering volume restrictions. Volumes at each site can be increased or decreased in multiple ways by taking extra supplies from one or more sites or by offloading extra supplies to more than one receiving site. Each such activity set has its own cost implications. The optimization model chooses the most cost optimal way of redistributing volumes to make the overall distribution closest to the allocated volume distribution.

It is recommended that a primary assessment of the business situation and existing processes be undertaken to decide on the approach.

Conclusion

Business pressures to continually perform better and pricing process complexities necessitate a pricing decision support system. In order to recommend prices for all grades across a large network, a huge amount of data is processed. Having the right type of calculation engine with the flexibility of multiple techniques and supporting processes is fundamental to the success of a pricing decision support system. Pricing systems depend heavily on the intelligence of a calculation engine to solve various complex scenarios by using price sensitivity information. Knowledge of price sensitivity enables retailers to manipulate prices dynamically across sites in a manner that maximizes revenue. Each site belongs to a mini-market and presents different challenges to pricing. Similarly, pricing for large networks have different issues. Different approaches are possible to overcome these challenges. Organizations embracing dynamic pricing need to analyze specific issues facing their businesses and adopt one or multiple approaches.

About the Authors

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