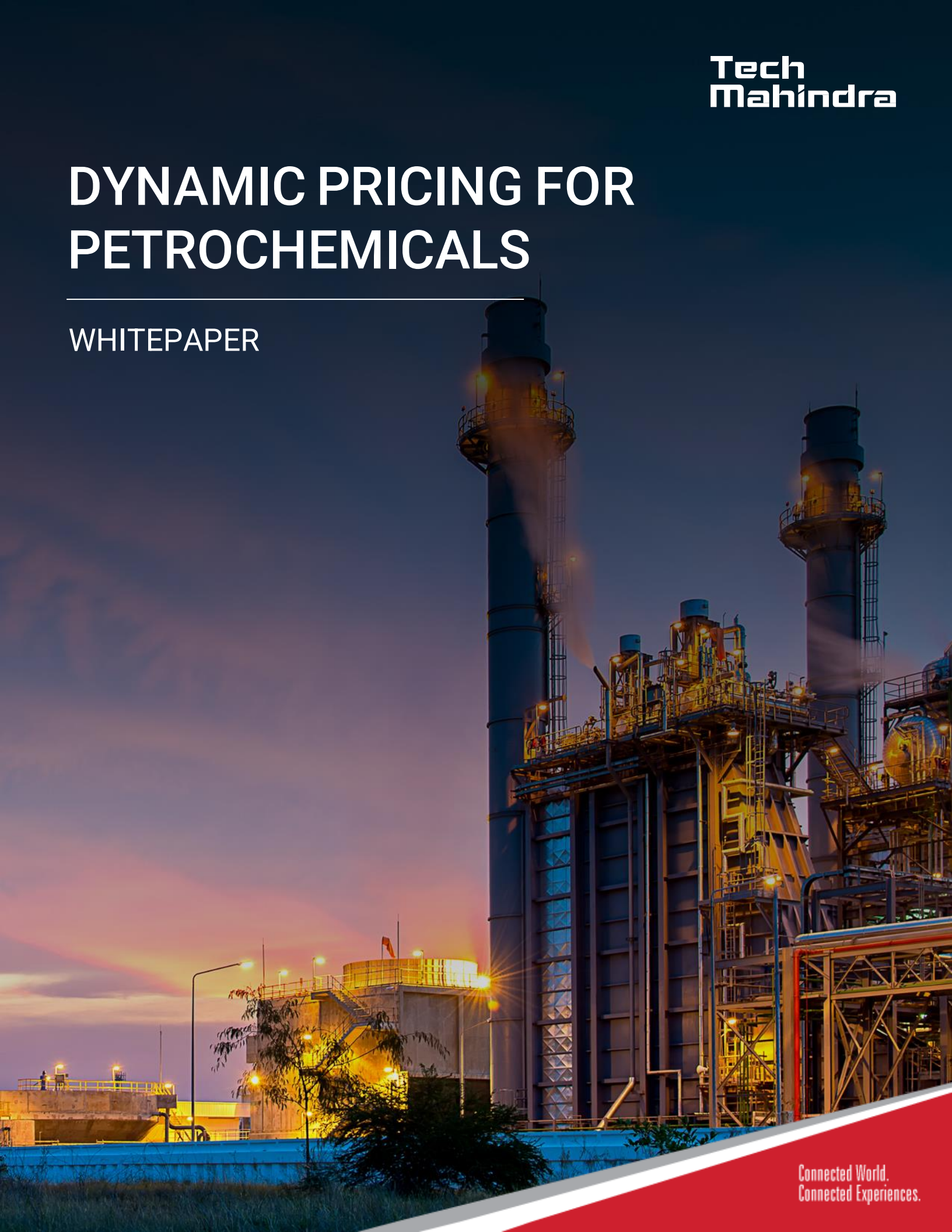
Tech Mahindra

DYNAMIC PRICING FOR PETROCHEMICALS

WHITEPAPER



Connected World.
Connected Experiences.

Abstract

Declining demand and increasing oil supply have resulted in high volatility and reduced profitability for the refining industry. The rise of renewable energy sources along with sustainability measures has increased the margin pressure. This has been the scenario for more than half a decade now. In earlier years, to protect their profits, refiners extended themselves across the value chain by setting up petrochemical plants and manufacturing special chemicals. This trend can be seen by observing the configuration of all the new plants that have come up in the past decade. Existing refineries have upgraded their configuration to integrate with petrochemical production plants. Despite all these measures, margins have remained thin and unpredictable. To deliver the desired results, refiners must use all of the levers available to improve petrochemical plants profitability. Product pricing is one of the most influential levers and is the biggest determinant of profit.

Refiners in the developed world have taken control of their profitability by adopting dynamic pricing (fully or partially automated adjustment of prices based on demand, supply, competition, and so on) for mobility fuels. Developing economies are also progressing in the same direction. As next step, the integrated refiners should consider adopting dynamic pricing for petrochemicals and other special products.

Key takeaways

Dynamic Pricing: Maximizing Margins from Petrochemicals

Implementing Dynamic Pricing

TechM NXT.NOW™ Capabilities

Role of Technology

- Data Exploration and Analysis
- Clustering
- Demand Curve
- Optimization

The Way Forward

Dynamic Pricing: Maximizing Margins from Petrochemicals

The chemicals and petrochemicals industry produces a wide range of products. On one end of the spectrum are the highly commoditized products which are feedstock for plastic manufacturing plants and on the other end are special chemicals which have a very specific end use . Currently, petrochemical companies are pricing the entire spectrum using the conventional pricing mechanism which is fixing a price for a given product for a given time period (a month). The conventional pricing mechanism results in value leakage as it adopts formula driven pricing based on international prices, freight, packaging costs, and marketing costs. This mechanism does not consider the nature of the product, the customer's willingness to pay, the customer's price sensitivity and elasticity, competitors' ability to supply, and also does not optimize the volume sold.

Dynamic pricing, on the other hand, leverages the new-age digital technologies of data analytics and takes a data-driven approach to pricing. It analyzes historical data of all transactions with the customer which gives insights into customers' willingness to pay, their price sensitivity, and proposes a price that maximizes the gains for the petrochemical companies. It also takes into account all the external variables affecting prices such as demand and supply curves, seasonality, competitor's prices, outages, capacity additions, etc. Accounting for all the above variables and leveraging advanced analytic capabilities, companies can increase the pricing performance to a higher level of accuracy resulting in increased profits and higher market share.

For special chemicals, dynamic pricing will enable refiners to identify and capitalize on the value created by their product by the chemical or plastic manufacturer. For petrochemicals such as polypropylene and polyethylene which constitute the basic building blocks of plastics and are very volatile because of the underlying oil price, frequent price adjustments are imperative. Dynamic pricing enables the maximization of margins for such products.

Implementing Dynamic Price:

To reap the benefits of dynamic pricing, companies will need to make changes in technology, processes, and people. In this paper, we are going to delve only into the technology aspect.

Role of Technology:

Refiners would need to first put in place the necessary infrastructure, such as a data platform with advanced analytics capabilities to implement dynamic pricing. This would include hardware as well as software capable of ingesting data from various internal and external sources and then extracting and transforming the data to churn out meaningful insights. The platform would have to have the following capabilities:

Data Acquisition/Integration

AI/ML Capabilities

Data Management (ETL, Data Quality, and Data Governance)

Data Visualization

Without the infrastructure with the right capabilities, dynamic pricing will not be feasible and will not be able to deliver the desired benefits.

After the technology, infrastructure has been set up and all the relevant data has been migrated to it, the team of data scientists will have to go through the following processes to deliver the end result:

Data Exploration & Analysis:

On this data platform, the data team will need to consolidate all historical data for each customer and transaction. They will also have to source external data such as market prices, competitors' price, supply curve, and trade promotional discounts also on this platform.

All the aggregated data would have to be cleansed and validated. Next steps will be analyzing and exploring the data to identify trends and patterns.

Clustering:

The ideal process would be to analyze each customer's transactions data but given the large number of customers the data scientist would identify a group of customers based on purchase pattern or volume.

This grouping of customers based on common attributes is called clustering. Clustering will bundle the customers with similar behaviors in response to a pricing decision together to enable further action and analysis.

For clustering, a data scientist will prepare the data to run clustering algorithms by consolidating it at the customer-product level and identifying a suitable time period to calculate variables such as:

Volume: total volume lifted during the period

Price sensitivity: a correlation between volume and price

Profitability: unit profit earned from the customer

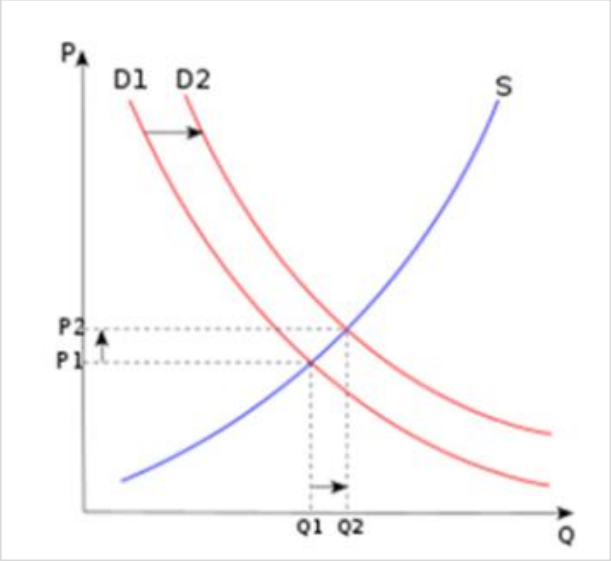
Region: freight costs across different regions.

Loading window: Number of days between two loadings

Please note that above variables are for illustration purposes only. As a next step, the data scientist will run a hierarchical clustering algorithm on this dataset and select a suitable n-cluster solution.

Demand Curve:

Ideally, in this step, data scientist should construct a demand curve for each customer in order to estimate the right price for the quantity that the customer is willing to buy. It is built as an outcome of the analysis of customer's historical purchase behavior, current demand, market dynamics, and other relevant variables. But that is not possible, therefore the demand curve will be estimated for each cluster.



By estimating demand curves, the petrochemical companies can achieve "personalized pricing": charging both categories of customers appropriately: a) customers with a higher willingness to pay and b) price-sensitive customers, enabling the company to maximize volume as well as the profit.

Note: The above two dimensional graph is used to illustrate the demand curve only. The actual demand curve will be multi-dimensional and will include attributes like competitor's price, their ability to supply, forward curve of prices etc.

Optimization:

The end goal of the above steps is to predict the appropriate price for each customer. Once the demand curves for each customer cluster have been established, an optimization model is run which finds the most appropriate combination of 'price and volume' for all customer clusters. In other words, optimization will enable petrochemical companies to rank their customers on the basis of the revenues generated.

The optimization step looks beyond maximizing the objective function, which in this case is the overall profit margin. Companies also need to set constraints such as volume targets, strategic significance of a given customer, floor/ceiling premiums, inventory constraints, etc., as inputs to the optimizer. The constraints define the boundary conditions within which the optimization algorithm searches for a single optimized price for each customer.

The TechM NXT.NOW™ of Dynamic Pricing

- TechM's data and analytics experience spans 20+ years and has 9800+ associates across all geographies and industries.
- TechM has total of 160+ customers across verticals in data and analytics space with 120 active engagements and around 15 industry awards and acknowledgments.
- With 40+ internal solutions, 6 industry-certified proven solutions, and 10 centers of excellence across multiple discipline, TechM is an established player in the data and analytics space.
- TechM offers implementation of EDW, big data platform, data architecture, and data modeling. Our in-house IP's and platform cover E2E gamut of services and solutions like PRISM, UDMF, decisions, infowise, etc.
- We also provide end-to-end data migration services like selection, preparation, extraction, transformation, and permanent movement of data that is of the right quality to the right target at the right time.
- Further, TechM helps with managing and visualizing that data. Our master data management provides one view of data elements across the organization.

The way forward

To counter the increasing pressure on margins, integrated refining complexes should adopt dynamic pricing for petrochemicals. This will enable them to overcome the price volatility of feed stock and boost their margins by passing the increased costs to customers and commanding premiums for highly differentiated products. Advanced analytics abilities, readily available in current times, will help to identify customers' willingness to pay and to estimate a value-based price for the thousands of small and medium-size product customer combinations. This will plug the value leakage and maximize return on capital employed (ROCE). Though we have covered only the technology aspect of this shift, the implementation of dynamic pricing will yield desired results only if the existing processes are tailored to suit the new ways of working. Also, the people would have to be trained across hierarchies if we want to see the adoption of the new pricing mechanism.

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Nidhi is a chemical engineer with 10+ years of global experience in downstream oil and gas industry. She started her career with corporate optimization at Indian Oil Corporation. She has hands-on experience in enterprise level supply planning and supply chain management systems. She has also worked with the ESSAR-Stanlow refinery planning team and was responsible for maintaining the planning model and carrying out the retrospective analysis. She did her MBA from the Indian School of Business. Before joining Tech Mahindra, Nidhi worked with Accenture Consulting Energy Downstream practice. She was responsible for execution and implementation of digital transformation projects in APAC and the Middle East. Her other core expertise lies in developing business processes for various integrated oil majors across the globe.

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