REPSOL

Global Energy and Chemical Company Uses Control Tower Solution to Manage Its Integrated Business Value Chain

aspentech | Case Study

TOP SUPPLY CHAIN PROJECTS 2022

"With the Aspen Supply Chain system, we provide full economic- and customer service-driven trade-offs to planners and schedulers for the entire Repsol chemical business. This enables us to execute feasible, optimal, profitable plans to maximize our margin efficiently and effectively. The project was a great success with great financial returns. It paid for itself in a few months."

-Alfonso Galan, Planning and Optimization Senior Consultant, Repsol

Repsol "Control Tower" Named a 2022 Top Supply Chain Project Award Winner

CHALLENGE

Repsol needed to make the best business decisions, given the VUCA (volatile, uncertain, complex and ambiguous) macroeconomic environment.

SOLUTION

To understand its entire chemicals business as one system, Repsol used Aspen PIMS-AO™ (Advanced Optimization) with the following aspenONE® Supply Chain Management (SCM) solutions:

- Aspen Supply Chain Planner™ (SCP)
- Aspen Plant Scheduler-Extended Automation™ (PS-EA)
- Aspen Collaborative Demand Manager™ (CDM)
- Aspen Schedule Explorer™ (ASE)

VALUE CREATED

With a comprehensive, total view of its chemicals business, Repsol was able to:

- Improve its profit margin with improved business decisions for crackers, polymers scheduling and distribution
- Deliver return on investment over 10x with a payback period of less than six months
- Increase its customer service factor by 2-4%

Introduction

Repsol S.A. is a global energy and petrochemical company based in Madrid, Spain. It is engaged in worldwide upstream and downstream activities to bring efficient, sustainable and affordable energy to millions of people. Repsol's chemicals business produces about 4750 kilotons/year of high value products, including ethylene, propylene, butadiene, benzene, PE, PP, LDPE+EVA, polyols, PO/SM and propyl glycols.

The company operates three integrated petrochemical complexes which are managed as a single hub to strategically supply the southern European and Mediterranean markets. These complexes have feedstock flexibility with indigenous and import feedstocks and can crack up to 35% light feedstock (LPGs). With its sophisticated, integrated business, Repsol was seeking a production and value chain optimization solution to maximize margins and solve a number of other business challenges.

Envisioning an End-to-End Supply Chain Control Tower

To manage its downstream chemicals business, Repsol envisioned a solution that would provide full economic and customer service trade-offs for planning across the entire chemicals value chain. Although Repsol had used Aspen PIMS™ for many years, it required a best-in-class, end-to-end solution that would consolidate disparate data, such as production rates, plant constraints, customer demand, prices and costs, inventories, production schedules and more. Repsol named this projected vision "Control Tower" after the air traffic control tower at an airport—directing operations across the airspace to maximize safety and efficiency.

The project included production optimization and value chain optimization in order to maximize business margin in economic terms, while considering customer service KPIs. Repsol wanted to empower its teams to improve decision-making and minimize response time across the end-to-end value chain. To enable this, Repsol designed a system to create optimal plans and then implement those plans with production and logistics schedules, all integrated within its current IT landscape in SAP/APO. This project, initially undertaken as an innovation initiative aligned with corporate digitalization programs as part of the journey to the smart enterprise, was a resounding success.

The Control Tower solution was conceived by balancing two halves of the chemicals business: the margin-driven or commodity side and the demand-driven or specialty side. Maximizing value from the integrated business requires planning processes and technology which supports both the margin- and demand-driven sides of the business and balances the objectives of each, as shown in Figure 1 below. Balancing these trade-offs shows Repsol's expertise and maturity in optimizing its business.

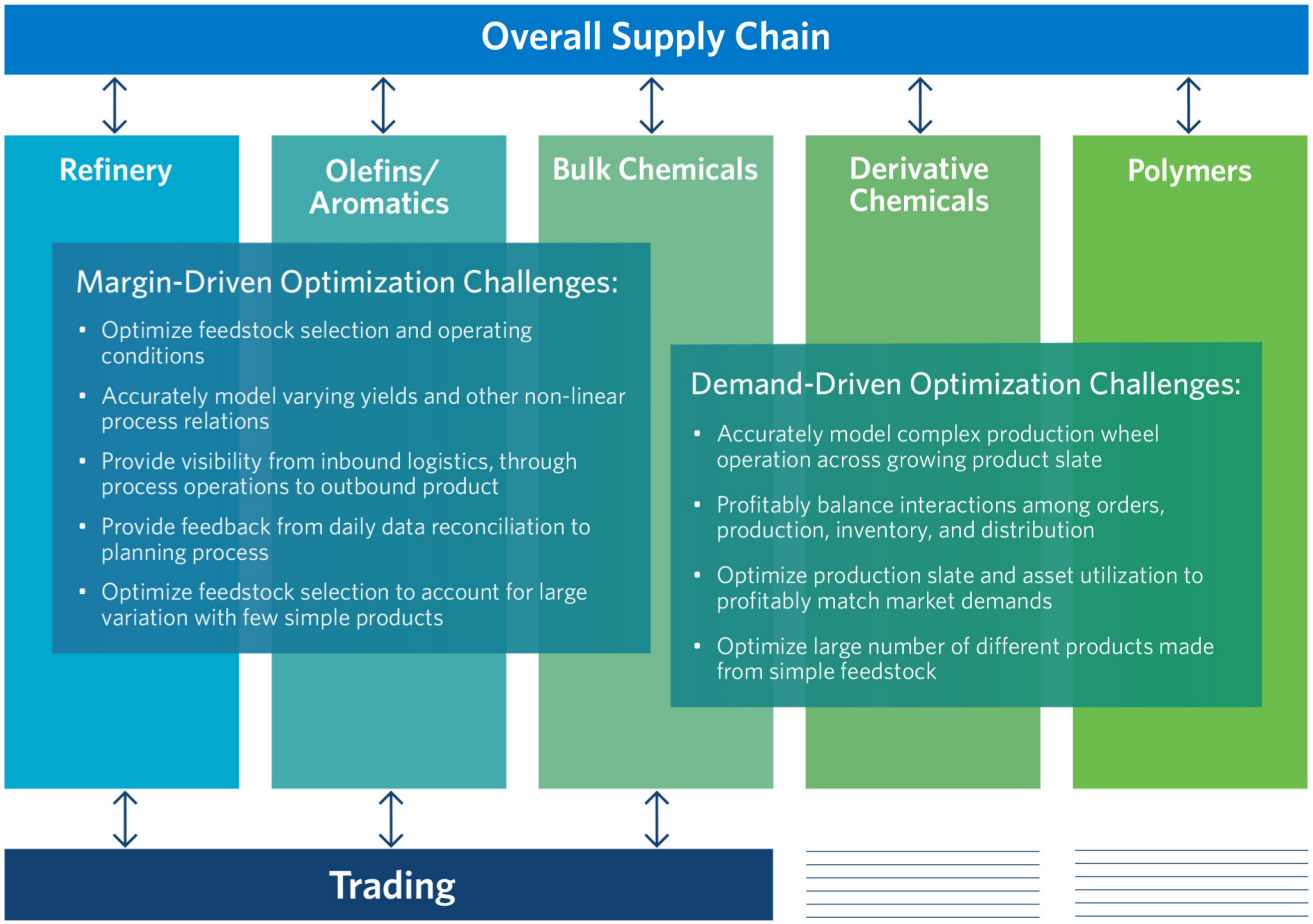

Figure 1. Margin-driven vs demand-driven optimization and challenges in the supply chain.

Selecting the Right Partner

After evaluating three vendors, Repsol selected the Production Optimization and Value Chain Optimization solutions, for the following reasons:

- The software package **covered all functional business requirements** with its modules and could be integrated with the existing Repsol Chemicals IT infrastructure.
- It **combined proven, leading "margin push" and "demand pull" optimization** technologies in innovative ways to provide Repsol competitive advantage in the market.
- Because Repsol Chemicals is already using the Aspen PIMS Family from AspenTech for monomer availability and optimization, it could easily extend the model to include the chemicals business.
- AspenTech is a leading industrial software company with hundreds of installations in energy and chemicals, backed by advanced R&D, industry support and a future road map.
- aspenONE® Supply Chain Management is best-in-class for polymer plant scheduling that takes into consideration polymer grade wheel sequence and transition time optimization.

Project Overview

The Repsol Control Tower solution combines aspenONE Supply Chain Management with Aspen PIMS-AO, its current margin optimization system. Demand-driven optimization is performed using global demand forecasting with Aspen Collaborative Demand Manager, global supply planning with Aspen Supply Chain Planner, plant level production scheduling with Aspen Plant Scheduler™ and enhanced collaboration, communication and "supply chain social networking" with Aspen Schedule Explorer. Margin-driven optimization of Repsol's refining and chemicals assets is completed with Aspen PIMS. All these capabilities, deployed in a Microsoft Azure private cloud, are integrated with SAP through Aspen Supply Chain Connect™ (ASCC) and Microsoft PowerBI sharing supply chain data using powerful dashboards (see Figure 3).

The scope of Repsol's Control Tower is expansive, covering bulk chemicals, derivatives and polymers business units, and includes business processes such as sales and operations planning (integrated business planning), production economics, production planning, production scheduling, product/grade wheel sequencing, demand management, supply/demand balancing, supply network planning, inventory optimization and distribution optimization. AspenTech's solutions are specifically tailored to perform these business processes with best-in-class accuracy and speed, and a friendly, easy-to-use interface.

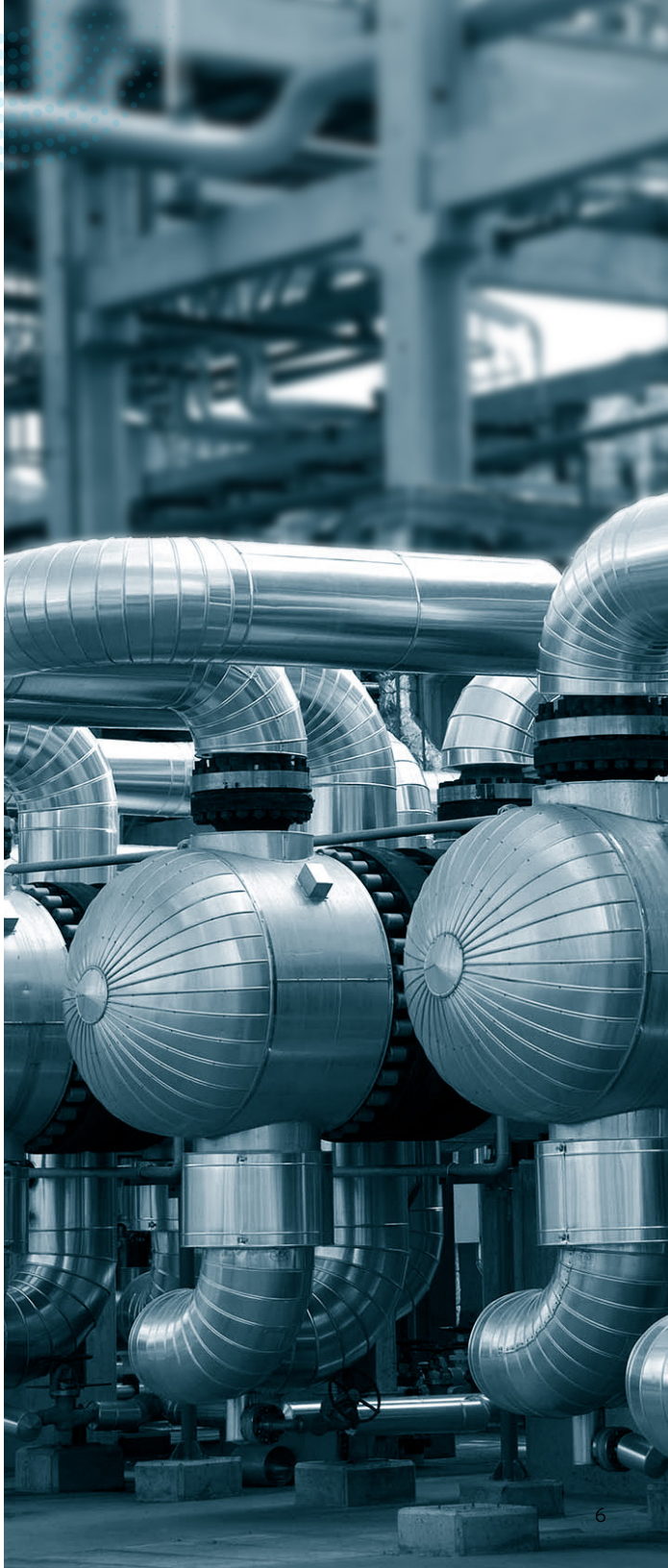

Figure 2 below illustrates the 12 steps of this process:

1. Reference data and transaction data extracted from SAP
2. Aspen Collaborative Demand Manager (CDM) generates forecast
3. Unconstrained forecast from CDM to Aspen Supply Chain Planner (SCP)
4. SCP optimizes polymers and intermediates customer service levels and margins without monomer constraints
5. SCP sends netbacks to Aspen PIMS-AO
6. PIMS-AO optimizes crackers/monomers
7. PIMS-AO sends monomer availability to SCP
8. SCP re-optimizes polymers and intermediates, margins and customer service levels with monomer constraints from PIMS-AO
9. SCP sends constrained plan to CDM
10. CDM sends constrained demand plan to Aspen Plant Scheduler (PS)
11. PS runs schedule with feedback from Aspen Schedule Explorer (ASE)
12. Planned orders are exported to SAP

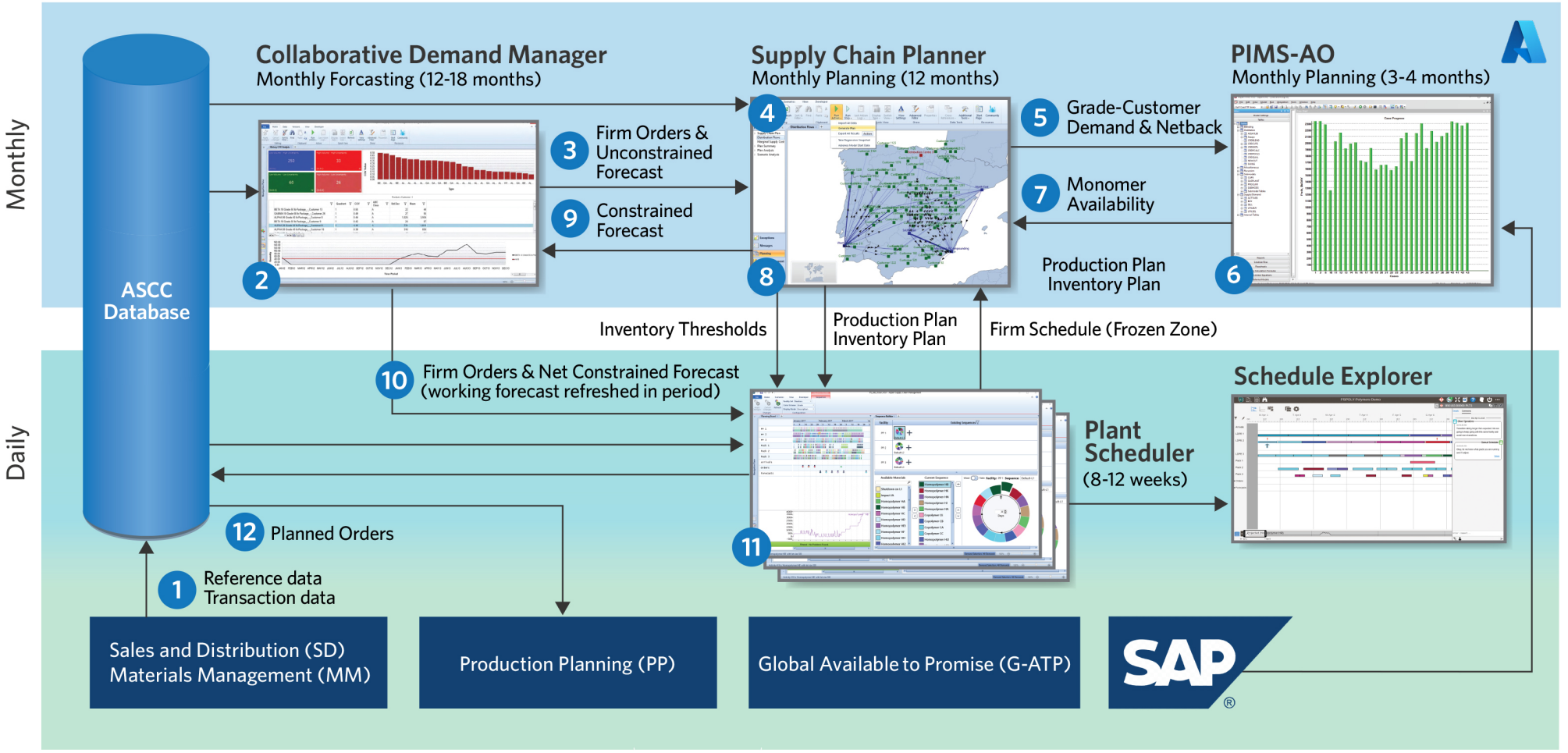

Figure 2. Business process diagram with step-by-step processes, data and decision flows. SCP, PS, CDM and ASE are running in Azure private cloud.

There were three critical success factors for the Control Tower solution:

1. Completion of Repsol's business process and organizational transformation as part of the project (not just IT changes).

2. Establishment of a clear governance model for information and processes across the complete end-to-end optimization. To begin with the end in mind, the solution engaged key users at central planning and plant scheduling levels from the beginning of the project. At the start of the project, data owners were identified. These owners were responsible for providing quality supply chain reference data, knowing that quality data would enable quality optimization results.

3. Maintained focus on the practical benefits of the project to enable effective decisions throughout the project lifecycle.

As part of the critical success factors, Repsol identified several metrics or key performance indicators (KPIs) that would be helpful to track, including demand forecast quality, margin attainment and supply chain economics.

Repsol was also able to study and challenge existing constraints such as a reduction in minimum run length at its polymers units. "Our most complicated business is polypropylene. It can use more than one grade wheel," said Alfonso Galan, Planning and Optimization Senior Consultant for Repsol. "The scheduler for that business is especially talented, often analyzing which grade wheel would be best in any given situation. During shutdowns, the scheduler uses the Plant Scheduler model to select which grade and wheel to start up. The tool automatically restarts the plant with predefined logic, saving her lots of time. We also especially love the optimization of the length of the campaign based on the customer demand and inventory."

Control Tower Results and Benefits

Overall, the business benefits to Repsol from the Control Tower project were significant, including a 2-4% improvement in the company's customer service level across the entire supply chain. Customer service level measures the quantity of orders filled on time by a company; an increase generally means greater customer retention and satisfaction. Both Aspen Plant Scheduler and Aspen Supply Chain Planner played a key role in customer service improvement. Aspen Plant Scheduler enabled a reduction of runouts by considering on-time delivery for sequencing polymer production while Aspen Supply Chain Planner enabled demand sizing for capacity feasibility.

A Repsol sales and marketing team member described the Control Tower project by saying, "Having the data integrated in one place makes it very easy for me to make the best, most profitable decisions for our business. For example, I can easily decide between one polymer client and another by understanding the pricing and supply/demand impacts of each choice."

Another huge benefit for Repsol was increased profit, enabled by three different initiatives implemented as part of the overall project. First, the amount of prime product was increased by reducing transition time on the polymers units by approximately 3-4% due to scheduling optimization. Second, better decision-making at the crackers resulted from increased visibility into the polymers business demands and constraints. For example, the flexible crackers could switch from LPG to naphtha feedstock, or vice versa, depending on economics and inventory at the downstream polymers units. This translated to a production cost reduction of between 0.7% and 1.3%. Third, full visibility of clients improved marginal sales margin by approximately 4%.

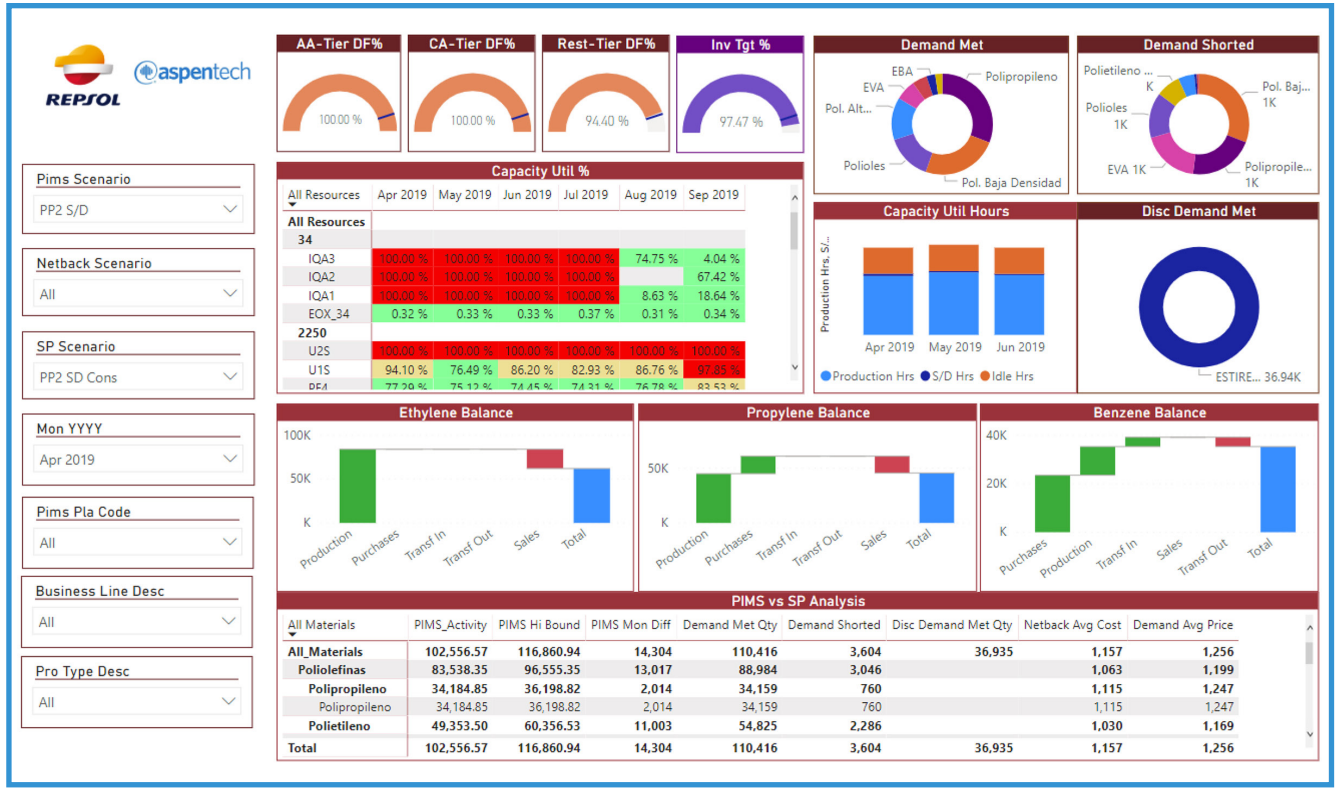

Figure 3. Repsol Control Tower dashboard including capacity utilization, customer service and demand fulfillment, monomer balances, and detailed economics such as netbacks, costs and prices.

Conclusion

A number of qualitative benefits from using aspenONE Supply Chain Management were realized in addition to the quantitative benefits already mentioned. The system's users love the optimization capability far and above the previous SAP solution. They said, "It is absolutely incredible to be able to see the possibilities of a production change with just one click." Moreover, the models enable support for strategic studies, such as the ability to analyze decisions to buy, sell or build production lines, depots and other assets. The model also provides visibility into production costs at each site, enabling Repsol to evaluate production facilities more easily.

The Control Tower solution proved to be so impactful that Supply & Demand Chain Executive magazine named it one of its Top Supply Chain Projects for 2022. These awards recognize the most transformative and successful case studies from the past year.

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About Aspen Technology

Aspen Technology, Inc. (NASDAQ: AZPN) is a global software leader helping industries at the forefront of the world's dual challenge meet the increasing demand for resources from a rapidly growing population in a profitable and sustainable manner. AspenTech solutions address complex environments where it is critical to optimize the asset design, operation and maintenance lifecycle. Through our unique combination of deep domain expertise and innovation, customers in capital-intensive industries can run their assets safer, greener, longer and faster to improve their operational excellence.

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