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Agile supply chain planning

Providing a common workspace improves data integration

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Historically, refinery planning begins with setting constraints and targets, and optimizing an objective function in a linear programming (LP) model. The resulting optimized plan is made for short- and long-term timeframes (e.g., 30, 60, or 90 days). However, as we look beyond the refinery and include more of the supply chain, additional information is needed for building a better optimized plan. More perspectives are needed so each functional area can quickly interpret imbalances and participate in the optimization. At the same time, a good plan depends on the timing (i.e., how quickly does the plan come together before market changes decrease its value?). Building the best plan is not only an iterative process, but also time consuming. If you are like most companies, plan creation is becoming more sophisticated with more data requirements. Likewise, to create a good plan requires more time while the deadlines to publish are more aggressive each year.

What is agile supply chain planning? Agility is the ability to move quickly, methodically and with ease to meet today's supply chain challenges. Specifically it includes:

- Responding to new business knowledge quickly (faster data integration and analysis tools)
- Multiple perspectives based on the user's role (working with the plan according to the functional area experts such as a refinery planner, an area logistics planner—terminal or distribution area, trader and sales manager
 - Seeing and validating the data quickly (user-friendly visual tools)
 - Performing visual analysis, “what-ifs” and case comparisons
 - Taking the results and synthesizing a new improved starting baseline for the LP optimization

- Decreasing the planning cycle (from monthly to weekly publishing)
- Providing a common workspace for accomplishing the above tasks for multiple users. This will be referred to as the “planning workspace.”

■ **The ability to assemble and coordinate different types of data is a major component of enabling agility.**

Multiple perspectives are needed.

Plan optimization must be moved from individual efforts to a joint collaborative process. Functional areas such as refinery and logistics planning, supply, sales planning and trading functions impact each other when the plan changes. Functions

must not only manage planning in their own area, but also optimize according to changes made upstream or downstream. Providing functional perspectives that interact with each other makes rapid collaborative planning possible. A planning workspace provides multiple perspectives while sharing the same supply chain information (Fig. 1). Changes made in one area are automatically seen in the other areas according to the impact.

Timely data feeds for many functional planners. This is the most common constraint to speeding up a data-intensive planning process. Supply chain planning requires a robust quantity of data from multiple systems. They must be assembled and organized quickly for the functional planners. These data include:

- Refinery scheduling static data (e.g., tankage/cavern capacities, pipeline/berth pumping capacity, pipeline linefills and process unit production capacity constraints)

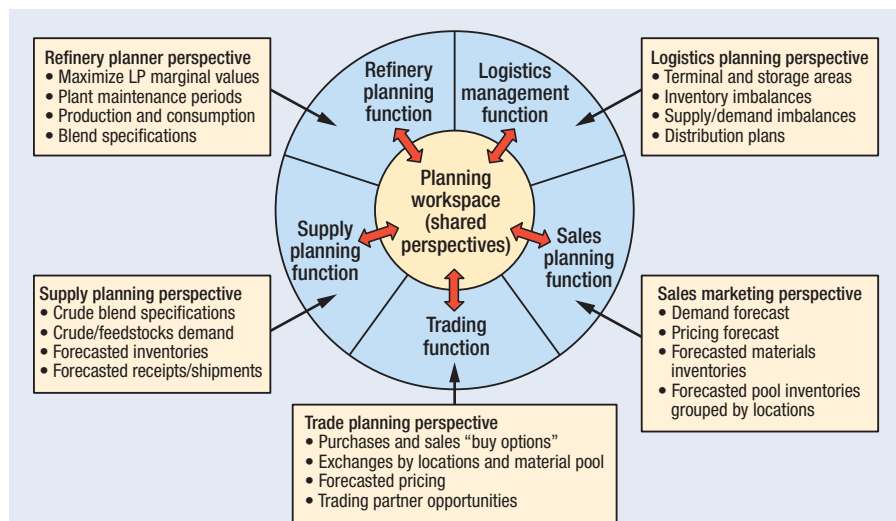


FIG. 1 Supply chain planning perspectives wheel.

- Refinery scheduling dynamic data (e.g., scheduling forecasted run rates, forecasted production/consumption/inventories and operating setpoints)
- Maintenance systems for forecasted asset/equipment downtimes
- Nominations from the enterprise resource planning system or other shipment/receipt source systems
- Trading opportunities
- Exchange management
- Current and forecasted material prices
- Distribution constraints/costs
- Export of synthesized supply chain plan data for starting a new or revised LP plan including constraints, demands and prices to the LP planning tool
- Import from the LP planning tool the initial, revised or final LP planning solution tool. This contains the refinery production plan, trading plan and the supply plan for the terminals.

The ability to assemble and coordinate different types of data is a major component of enabling agility. Fig. 2 shows the enterprise data being assembled by an integration depot for supporting the multiple perspectives needed.

A common portal into the planning information. A common portal is needed to work in. This enables personnel to validate, analyze and perform what-ifs, and view the information in one place (even though it originated from many sources). This is a mission-critical feature for a supply chain optimization tool. It must be user friendly, fast and feature rich. The user's productivity with the tool will ultimately determine whether the tool is successful or not.

Planners, traders, distribution area supervisors, etc., need to work and see their information in many different groupings. For example, the traditional materials and material pools (i.e., crudes and crude pools) as well as geographic groups such as supply areas containing refineries, terminals, pipelines, etc. Time scales are also needed to group results by monthly, weekly and daily averages, or by a custom duration (e.g., 13 periods of 28 days each for financial business model comparison purposes). The planning workspace information sources also have their components such as inventory forecast, price forecast, demand forecast, trading plan, exchange plan and forecasted stock transfers, etc.

Be more productive has been the management direction for some time, so the portal must have robust features allow-

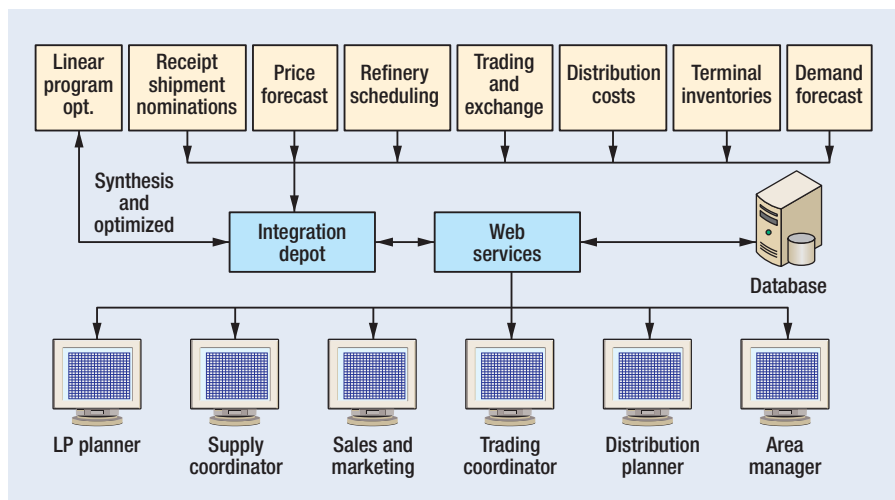


FIG. 2 Supply chain plan multiple data feeds.

ing rapid changes, analysis, reporting and building scenarios. For planning, making changes in the external source systems and reimporting data to the workspace to perform analysis can be

too time consuming and doesn't always make sense. A planning workspace allows users to change data immediately without reimporting while also providing the ability to save plans (or scenarios) of their work. Plan comparison allows multiple what-ifs to be analyzed side by side.

Planning is an iterative process, so let's not recreate the wheel. Historically the starting point is the LP planning system. The case or cases should not only be easily imported, but the planner's improvements from the planning workspace should be synthesized into a new baseline case for the LP to start with when necessary. Planning workspace allows the user to export the synthesized data directly back into the LP so it can be reoptimized. This may include revised constraints, targets, prices, refinery production targets, transfer costs or other changes for the refinery.

Supply chain planning is a collaborative process, i.e., it's not just for planners anymore. The tool should be multiuser enabled with change management to coordinate the planning efforts of many. Planners, traders and area supervisors can check-out and check-in a plan (or scenario) for detailed work that enables a collaborative process. Plans should be locked or shared with others. Reports (e.g.,

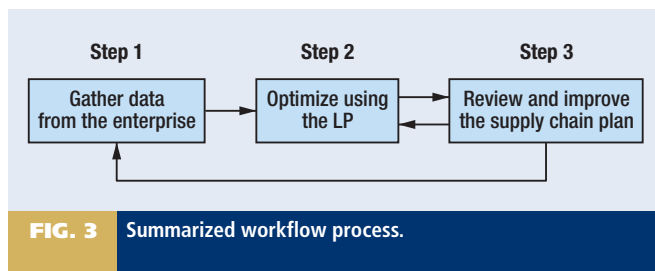


FIG. 3 Summarized workflow process.

supply demand balance, etc.) should be bookmarked to make easy reference for others to access. Role-based access should be available for a view only, planner and administrator user types.

What is the workflow process? The workflow process starts with gathering data and continues with an iterative improvement cycle to optimize the supply chain plan until it is published. A summarized workflow process is shown in Fig. 3.

The first step uses automation to assemble data from many enterprise systems and creates cases for optimization. Step two is the optimization via LP tools. The LP receives information such as blend specifications, demands, constraints (for distribution and raw materials), costs, exchanges, operating parameters, prices, unit capacities, etc., from either step one or step three via an automated process call "synthesis." Automating this step is a key component needed for speeding up the review and improvement processes. After optimization by the LP tool, the results consisting of the refinery consumption and production plan, the refinery blend specifications, the trading plan and the supply plan for the terminals are passed to the review and improvement process. Step three is the multiuser and a

multiperspective area with robust tools for information analysis. Pain points are highlighted to identify problems quickly for the users (e.g., a pain point would be an inventory supply and demand imbalance for a particular material pool for a specific location). Once the pain points are removed and the plan is approved by the functional users, it can be published or the plan can be synthesized into a new LP case for reoptimization. Once optimization is completed, it can automatically be fed back into the workspace for the functional users to review and continue supply chain planning in their area. Depending on supply chain planning needs, steps two and three can occur over and over in an iterative process.

How long does the overall cycle take? Assembling the supply chain data for the workspace and synthesis for the LP is automated. In addition, taking the LP optimized results back into the workspace is also automated. Use the automation mentioned and the planning workspace tools for the functional users, the entire planning process can be significantly reduced. Fig. 4 shows the detailed workflow with the concurrent processes happening in a planning workspace. Technology allows the automation of several steps to speed up the process. The target is to decrease the overall time duration from 30 days to one week, while still allowing multiple iterations of plan improvements before the final plan is published.

What does a typical planning workspace screen look like? Fig. 5 shows a typical functional perspective for the Cedar Park location and its material pools (pools can be used to aggregate similar grades). Graphs and inventory calculations not only show the current values but can change automatically when values are changed by the user. Therefore, it supports rapid what-ifs and results are shown quickly. User changes are simulated within the planning workspace to show impact with other locations or against supply and demand constraints (e.g., receipts, shipments and inventory constraints).

Benefits from a better plan. The supply chain planning workspace can help businesses plan better, to perform better, across the wide spectrum of procurement, manufacturing and distribution activities. A planning workspace allows this process to be performed in a timely iterative fashion with an LP tool for optimization. This makes more time available for spot oppor-

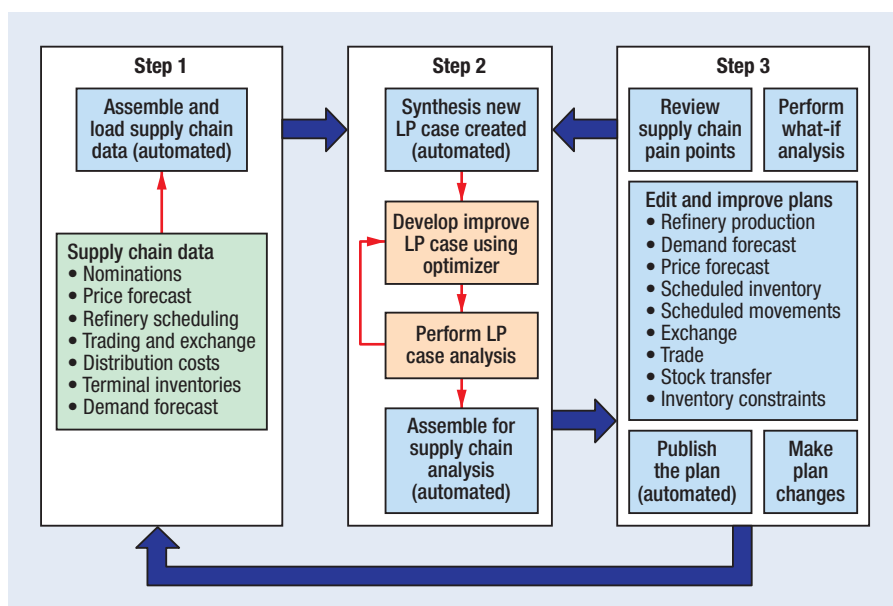


FIG. 4 Detailed workflow process.

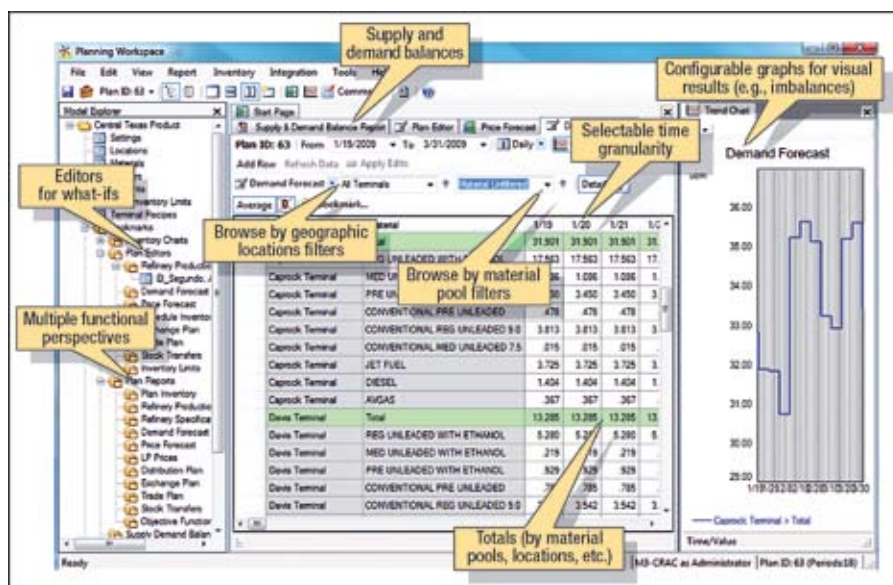


FIG. 5 Typical planning workspace screen.

tunities analysis (via procurement or trading) to increase potential profits.

Manufacturing (i.e., refining) costs are reduced by aligning the refinery production forecast with demand and trading opportunities and reducing overall feedstock costs. A planning workspace can integrate with the refinery scheduling systems so that the production forecast as well as constraints, inventory and operating parameters (i.e., process unit run rates) can be easily shared. This helps refinery management sync up with procurement and distribution planning objectives.

The make-buy-sell decision process

is made easier by aggregating the right information and enabling what-ifs to be modeled. Purchases, sales and production options can be better planned and aligned with the supply chain economics. Distribution costs associated with the various manufacturing, procurement or sales scenarios can be more closely evaluated. Specific changes throughout the supply chain can be included in the scenarios and their impact seen in the planning workspace. Alternatively, the plan can be reoptimized using the LP optimizer and fed back into the planning workspace for additional review. **HP**



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