One Network Enterprises™

Constraint-Based Supply Planning & Execution for the Automotive Sector

Supply and demand will continue to be out of balance well into 2023 for the automotive sector. Issues for automotive OEM's include part shortages, price increases and long lead times with semiconductors averaging 6 to 9 months, integrated circuits at 9 to 12 months and microcontrollers often at 12+ months.

Frequent though undesirable solutions by automakers have been to either sell vehicles with certain features backlogged for future installation, or to simply scale back volumes. With some predictions forecasting that shortages could run past 2023 and into 2024, additional solution options are required.

Short term wins can be generated by improving the demand/supply match based on current part shortages and existing backlog. One Network Enterprises' (ONE) Smart Control Tower enables upstream supplier visibility and control across multiple tiers in the supply chain network. This representation includes the distributed bill of material and thus provides a completely constrained view of potential output scenarios based on assembly part dependencies and current/projected inventories upstream through to raw materials.

From an operational perspective you will receive an alert that a planned inbound shipment to one of your suppliers is short, delayed, or worse. The control tower will immediately propagate the impact of that event downstream in the network, alerting the planners and schedulers as to the planned order impact. Solution options are available to allocate short supply in a number of different ways.

First could be a simple "fair share" allocation. However, given the need to maximize profit and mix in the face of lowered volumes, a more intelligent solution is required to assemble the highest profit vehicle mix. In addition to intelligently allocating to achieve targeted business metrics, companies must also be sure that constrained parts will not be allocated to vehicles, assemblies, or subassemblies where other constrained parts will prevent final assembly and sale.

This capability will also save on cost given parts will not be expedited in situations where other parts are unavailable and thus will cause an assembly delay. To enable this, **One Network's NEO Platform provides projected inventory and capacity dashboards displaying inventory positions across the trading partner ecosystem as well as available capacities, both current and projected.**

Looking at the big picture, automotive procurement must look to become more resilient through improved commodity and category management combined with better forecasting and capacity contracting. Automotive has traditionally deployed hub and spoke planning systems, with visibility limited to tier 1 supply compounded by high forecast error, especially as they expand into EV's.

When actual demand exceeds planned demand, such as the faster rebound seen post pandemic, there is no ability in the short term to recover, because the upstream tier 2 and 3 suppliers have already reallocated capacity to other customers.

Combined planning and execution on a single platform, that can run continuously and incrementally, is required to solve for constrained supply in today's chaotic world.

Control Tower enabled scenario planning across multiple time horizons backed up by a multi-tier supplier collaboration capability provides the ability to course-correct in the face of this uncertainty, thus avoiding backlogs and revenue shortfalls.

The automotive industry has suffered more than other sectors due to forecast error, lack of resiliency, part availability and reallocation of capacity. US light vehicle sales are forecasted to run at 13.4 million units moving forward. The cumulative effect of supply shocks, capacity limitations, and lead times on auto manufacturers, is continuing to constrain sales by limiting the availability of inventory to customers. Production issues relating to ongoing shortages, especially for electronics, will continue to limit sales well into 2023.

There seems to be some easing recently with recessionary fears and worldwide inflation slowing demand for consumer electronics, with memory and other prices dropping lower. However, microcontrollers and analog components remain constrained moving into 2023.

For the automotive sector, top of mind is the optimal allocation of constrained supply. While most companies have an eye toward a longer term and more strategic solution, today's problem is scheduling assembly to produce the optimal volume and mix of product based on available supply.

One Network's NEO Platform provides scarce supply allocation based on targeted business objectives. This capability isn't limited to a single tier of supply where allocation errors are caused by other dependencies. The platform includes the full distributed bill of material across all tiers of supply to optimize mix and volume based on constrained supply, material, and logistics.

In order to better optimize available supply, One Network's Intelligent Supply Planning respects constraints by moving orders to earlier time buckets, offloading to alternate resource/work definition/supply sources, modifying transportation modes, or adjusting labor plans.

If these measures are insufficient, then the constrained supply plan will next look to constrain demand. This way trading partners are not expecting to receive goods which are not coming thus reducing overall network chaos and variability.

The demand is shaped in terms of volume and mix based on targeted business objectives, customer service levels, and vehicle option take rate requirements for final assembly. Today planners and schedulers are stuck trying to resolve across multiple application silos and trading partner echelons, which doesn't work well.

OEM's and suppliers are seeing increasing inventories of non-constrained materials and components, due to critical part constraints. For example, let's say supplier production capacity is 2000 units of item A per week with 2 weeks safety stock or 4000 units prior to the supply constraint emerging. Item A runs into a supply constraint and will run at 1000 units per week which will reduce the finished item inventory to 0 within 4 weeks.

Once the finished product inventory is consumed, the market demand will be 1000 units per week greater than the supply capability and will remain in backlog as past due demand. The new demand for 2000 units the company receives each week will result in growing the total order book which will include past due demands plus new weekly market demand.

Purchased Items B, C, and D are also part of a subassembly which includes item A. Given that market demand is still 2000 units, the inventory for those purchase items will increase rapidly because those items will only be consumed at the production rate of 1000 per week given the limitation in supply of Item A.

The ERP system will show demand and supply in balance while the total purchased item inventory will grow well beyond acceptable levels. The inventory will grow at the rate of the production shortfall of 1000 additional units per week. If the supply constraint continues for an extended time, the vendor of the constrained item will extend the purchase order lead time for the constrained item. This is due to the backlog of customer demand which will be delivered at some point in the future.

The supplier is working to satisfy both demand backlog and new market demand. The reaction in the ERP system is to extend order lead times, thus trying to solve a problem by creating a bigger problem.

The critical requirement to keep inventories of non-constrained items under control is making a change from using an unconstrained demand signal to one that is based on known supply constraints upstream across multiple tiers of supply using a distributed bill of material. By limiting the demand signal to the rate of supply of constrained items we will ensure there will not be excess inventory of non-constrained materials.

This dynamic workflow has not been possible in the traditional S&OP to "Rough Cut" Capacity Planning process given the granularity has been limited to weekly without multi-tier dependencies at the item level.

Daily generation of gross-to-net requirements based on a constrained supply capacity view can ensure that dependent requirements for unconstrained materials are in line with the achievable rate of production. The platform propagates the constraints upstream and downstream across all trading partners at all tiers in the network.

To keep inventory under control, it is critical to identify and resolve problems related to materials or production capacities that are constraining flow through the supply chain. Controlling the events that restrict output puts us in a position to gain control of inventory levels while also stabilizing production. When upstream trading partners are constraining supply, it is essential to secure achievable supply commitments from those vendors.

For automotive, defining the rate of material supply the vendor can achieve under constrained conditions will facilitate building a supply constrained demand plan to drive replenishment of non-constrained materials. The rate of supply of the constrained item should be the determinant

of the rate of production for the affected parent items downstream as well as the child items upstream.

Understanding the rate of supply of any constrained items requires close collaboration with suppliers, a distributed bill of material across all tiers of supply, and a commitment to the rate of supply the trading partners can achieve for those materials. Optimally, the rate of supply should be articulated in daily commitments to ensure continuous inbound flow of materials.

Supply availability will be subject to other considerations such as batch production, minimum order quantities, and logistics schedules. While these variables will be modeled in the analytics, the need for daily supply/demand matching remains critical so that the supply/demand match is constantly updated based on network-wide supply constraints.

Knowing there is a mix or volume supply/demand mismatch earlier in the process provides many more choices as to how to solve problems or optimize output when you have your multi-tier supplier ecosystem modeled in the network.

Planners fulfill demand by leveraging the network and evaluating all possible alternatives, such as using different sources, substitute components, or intelligent allocation.

Multi-party collaboration is a core capability in the One Network decision-making process and all data related to decisions, both structured and unstructured, is attached to the transactions. Accurate logistics and order lead times have been more difficult to pin down and must be treated as hard constraints when running the plan. Machine learning algorithms have been deployed across ONE's Digital Supply Chain Network™ to better determine accurate lead times across trading partners tiers.

A real time single version of the truth running on a common data model across the network with robust demand, supply, and logistics services enables trading partners many more degrees of freedom to solve for demand and supply variability.

In a typical ERP hub and spoke configuration flags are set that allow planning to run without respecting lead times when demand shifts inside of lead time. Understanding and resolving for constrained supply further upstream in the supply network is beyond the configuration capabilities of an ERP type solution. A separate logistics visibility tool does nothing to solve for this problem, providing what amounts to some pretty graphics and non-actionable data.

Scenario planning to resolve for supply issues includes hard constraints such as max quantity or days of supply, along with soft constraints such as demand splits and sourcing or allocation percentages. Constraints will forward and back propagate across the network to completely resolve problems.

Less sophisticated heuristics-based planning capabilities available in ERP runs the risk of propagating actions which create more problems than they are solving, due to the lack of understanding of the network dependencies.

One Network 's Constrained Supply capabilities include the typical configurations found in both advanced planning and ERP, but also go much further in terms of driving value. The network is capable of redistributing progressively downstream any upstream material constraints. The constraint considerations include lead time, lot sizes, and multi-level sourcing of items, simultaneous component usage, plant capacity, and the actual time to produce and ship.

Such critical capabilities required to optimally solve for constrained supply are not available by combining advanced planning with ERP along with any logistics visibility tools.

The network enables site-based constrained supply planning which is scaled across each network tier across all trading partners. This capability enables constrained supply planning for every site which then extends across all parallel site dependencies.

For an assembly that requires parts A, B, C, and D, all dependencies based on the availability of these parts at their production sites is known and included in the decision. And any inbound supply constraints to the production site that make these individual parts is also known and considered, enabled by the multi-tier representation in the network.

ONE's NEO Platform enables the ability to resolve for constrained supply across a "full" multi-echelon supply chain by chaining the algorithmic engines.

No patchwork configuration in the market can provide this capability which is why it has gone unsolved thus far. The ability to generate value through network capabilities is both untapped and tremendous.

Planners interact with the system through user friendly graphical workbenches and scenario modeling which provide multi-tier demand propagation, forecast collaboration, fully constrained capacity and material forecasts, multi-tier demand driven constrained supply planning, optimized product mix and allocation based on constrained supply, constrained production order forecasts, concurrent order/ logistics planning and execution, and goal-based channel allocation.

In summary, constrained supply planning is a hot topic in board rooms across the globe. Rightly so, but the key is:

Demand and supply variability requires a more intelligent supply chain network to achieve the highest customer service levels at the least landed cost while achieving overall sales, profit and market share objectives.

One Network Enterprises™

US Corporate Headquarters

4055 Valley View Ln, Suite 1000
Dallas, TX 75244

+1 866 302 1936 (toll free)
+1 972 385 8630
inquiries@onenetwork.com
www.onenetwork.com

One Network Europe

Office 3.03
1 King Street
London, EC2V 8AU

+44 (0) 203 28 66 901
europe@onenetwork.com

One Network Australia/ Asia-Pacific/Japan

+61 401 990 435
cedwards@onenetwork.com

One Network India Pvt Ltd

Westend Centre III, Survey No. 169/1,
Second Floor, South Wing, Sector 2
Aundh, Pune 411007, Maharashtra, India

+91 20 49111800
indiasales@onenetwork.com