Manufacturing Business Technology
IT FOR MANUFACTURING EXECUTIVES

Creating A Parts-oriented Order Processing Supply Chain - Part 1

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July 2, 2013

The world is changing rapidly and in the middle, if not even the driver of this process, is the automotive industry. Globalization and individualization megatrends set the pace, supported and ultimately made possible by innovations in information technology.

Only ten years ago the vast majority of suppliers were located in the vicinity of the OEMs to better provide the parts or assemblies necessary for production. Most Tier 1 suppliers were typically located with a just-in-sequence or just-in-time assembly plant near or at the customer site. For example, a local supply region in Europe made it possible to get parts within 24 to 72 hours of production.

Since the order processes were modeled using optional capacities, there was little to worry about. Whether the parts were in inventory or not, the shipping lead-time was on only 72 hours with a production order lead-time of around three to four weeks. It was enough for an assembly plant to know that 300 sunroofs could be delivered per day. The model or configuration choice was a secondary consideration because sunroofs came from a nearby supplier or from a sub-assembly within the final assembly plant. The supplier could deliver the desired sunroofs by assembling them shortly before they were installed and to the exact configuration for the specific sequenced vehicle.

Changed circumstances require a new methodology

In today's automotive supply chain the situation has changed: when a customer configures and orders his vehicle at the dealer (or on the Internet), a growing proportion of parts come from distant regions, and the delivery may take several days or even weeks. The variety of parts has increased dramatically. A customer can now choose from a number of features which affect other part configurations leading to a high number of different options. For example, with high-end vehicles, the number of possible electronic control units has grown to more than 60.

Based on the selected features, such as engine, transmission, seats, onboard electronics, sound system, etc., the component requirements are usually calculated or generated from rule-based bills of materials. For each part, there can be one or more rules that are used to determine which part is required for a specific order. If a customer in the United States orders a vehicle from the BMW 5 Series with a

navigation system, the chosen engine implies certain aggregates. From the rules, one can derive a particular navigation device for the local market.

The variance is based on regional differences. The Mercedes C-Class has several hundred rear axles, depending on engine size, right or left-hand steering, etc. The supply requirement must be chosen in the most economical way for the assembly plants whether they are located in Germany, South Africa or the United States. Given the great diversity, it is now almost impossible to keep all the variants in sufficient numbers at the assembly warehouse. Instead, OEMs request the needed variants in an order-oriented fashion from the supplier which may be several thousands of miles away resulting in long delivery times.

Global production networks have been created to accommodate the growing global supply chain. For some level one components, shipments to the OEM start from six to eight weeks prior to final assembly. In nearly all cases, six to eight weeks out prior to assembly the supplier plant is sending parts based on a combination of firm orders, forecast orders and component forecasts.

With parts in-transit based on a mix of forecast and real orders, the OEM must consider the mix of parts and their projected arrival time. Since OEMs no longer keep large part inventories, transparency and awareness of which parts are in the shipping pipeline is critical. Visibility cannot be limited to non-specific features such as “navigation system” and must include the specific components required based on the vehicle orders and rule-based bill of material.

Organizationally, there are two separate areas that must come together: the sales-oriented scheduling of orders and material scheduling which consists of supplier orders, material shipping requirements, part control, and transportation. With a global supply chain, it is necessary to merge the information between the order slotting or scheduling systems and the material scheduling systems. In order to get reliable and efficient planning parameters, an explosion and implosion of the bill of material for all orders is required down to the relevant level of detail.

The immediate benefits of the visibility gained from the merging of this information are savings on freight and expedite costs. Without the precise coordination of information in both areas part shortages are not discovered until very late in the supply pipeline. Traditionally, supply coverage is checked shortly before the assembly process to determine if all parts will be delivered on time. If parts are missing, it becomes a challenge for suppliers to provide the correct parts on time resulting in costly expedites. It is usually the responsibility of the supplier to create a flexible supply and organize their part flows accordingly.

However, with the growth of global sourcing, it is becoming more of the responsibility of the OEMs to optimize supply chains for flexible delivery in a timely manner. This is extremely challenging due to the push in flexibility with the large variety of parts while keeping little inventory buffers in the warehouse. Although many parts are supplied locally, a significant percentage comes from overseas. With high visibility, decisions can be made from both an order planning and material supply perspective to avoid shortages and suppliers can cost-effectively provide parts from great distances.

If the supply chain is not transparent and stable, supply shortages will ultimately cause production bottlenecks. Quick adjustments are possible but require expensive air-freight to fly in the missing parts. Because the need for such critical part air expedites are inevitable, OEMs are planning for these "special cases" by booking air freight capacity sometimes as much as months in advance. Ideally, with visibility during order slotting, one could check whether or not the necessary parts will be available before making commitments. Most of the systems used today, do not accommodate the use of part requirements in the planning process. In fact, it usually takes an overnight job to convert order scenarios into part requirements and for most, it is a manual process to backward translate part bottlenecks to the affected orders.

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Stability through transparency

The motivation to change the current parts ordering situation usually comes during a crisis, causing business teams to review their current processes and analyze new solutions. Or the motivation may come from the need to modernize information technology systems and convert outdated resources, such as mainframes, to new technologies. The motivation also comes from the company mergers or reduction of business units leading to the need for common system platforms.

The objective of aligning order slotting and material scheduling is to create stability in order processing which leads to reduction in freight and material handling costs.

flexis AG developed a software solution module that link to the OEM's existing ordering systems to create a connection between orders and parts. During the process of booking orders, the solution module not only check if parts are available for a given feature combination, but also checks the supply pipeline including current advanced shipping notices (ASNs) between different supply chain nodes. This enables the order slotting module to control the slotting of orders based on whether or not sufficient supply is available or in-transit for an on-time delivery, or a supplier call has been made which would provide coverage for the order. The slotting module also considers the most cost-effective assembly production facility to allocate the order based on sufficient part inventory and production capacity. The merged data from order slotting and material scheduling provide information on the respective demands as well as on the existing part inventories and supply capacities. This data is visualized at different levels so that various divisions, departments, or business owners can have access to the same information at any given time. This facilitates the coordination of decisions for order and part supply re-planning, as well as avoiding unnecessary duplication of work in Sales, Logistics, Purchasing and Production.

In the case of managing the supply chain, simulations allow for analysis to be done to help verify 'what if' situations. For example, a simulation may be used to determine what happens if a container is lost somewhere in the supply chain. Through the simulation, one can determine which days of production and what orders are affected by the delayed shipment as well as when additional supply parts are required.

In terms of supply disruptions from natural disasters, fires, port strikes, or other unforeseen interruptions, the system allows for rapid analysis of the total impact on all orders, across multiple facilities and regions. This allows for re-planning based on market priorities, balancing of production facilities and regional requirements. During the simulation analysis, you can look at order changes, supply changes, capacity changes or transportation mode changes. This allows transportation streams to be scheduled earlier and in the most cost-effective way to get back to a stable supply condition.

Verification using the flexis solution module not only includes information about what is in-transit within the supply chain, but also whether the maximum delivery capacity has already been exceeded. A supplier can only deliver parts based on a defined capacity or contractual agreement. If the defined capacity or production quantity has been exceeded or is being used at a faster rate than projected, an OEM can use the information to coordinate more available capacity at an earlier stage.

This leads to many beneficial effects for OEMs and suppliers:

- Customer promise dates are checked against capacity leading to improved delivery performance
- Reduction of short-term troubleshooting measures by the early identification of demand and capacity changes
- Holistic optimization of the supply chain as opposed to local optimization only
- Integrated transparency across processes (e.g. alignment sales plan / production program)
- Securing long-and medium-term supply call-offs
- Verification of actual parts inventory pulled earlier by several weeks

Lower costs and better on-time delivery

The early parts coverage check allows a considerable amount of time to be gained between the detection of capacity shortage and the production of the order. With more stable long-term plans, short-term production changes can be avoided leading to a significant reduction in both transportation costs and material management costs. Using optimized order slotting that considers both orders and material conditions, OEMs and their suppliers can also reduce fluctuations in the supply chain. This avoids the associated bull-whip effect and permanently reduces the amount of work in process. This applies particularly to long-lead-time components. WIP inventory can be reduced by ten to 30 percent through the reduction of large safety stocks, warehouse inventory and handling costs.

With Sales and Production more closely integrated from a systematic organization point of view, personnel can be used more efficiently. Elaborate due date checks, manual coverage calculations, and inefficient processes to determine allocations for part shortages can be a thing of the past. Simply by avoiding duplication of effort, personnel expenses are reduced by up to 50 percent. In times of skill shortages, this is an important consideration.

By the capacity checked slotting of orders and permanent transparency across the entire planning horizon, the on-time delivery can be significantly improved. At reference installations, flexis customers report an immediate increase in delivery performance.

The linking of information from Sales and Production at the part level earlier in the order slotting planning process is a relatively new concept. Only a few automotive manufacturers are working with this innovative approach to bring more visibility to their supply chain. In a time where global supply chains have become the standard and in which big OEMs are frequently acquiring new businesses, this approach undoubtedly meets the current needs of the automotive industry. Many OEMs rely on common global sourcing and have decided that perhaps a single supplier will deliver modules to all of their plant locations globally. In order to achieve the desired synergies, innovative systematic solutions must be used which eliminate the separation of demand and capacity, and thus keep stability in the global supply chain.

About the author:
Oliver Reisch. Oliver is the COO of flexis AG and member of the company's board responsible for Professional Services. Oliver has been with flexis AG since 1998 and focuses mainly on topics related to Advanced Planning and Scheduling. He holds a master's degree in aerospace technology and worked previously as a project manager at Fraunhofer-Gesellschaft for five years. For additional information go to www.flexis.com.