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Improving Supply Chain Efficiencies in a Supply Crunch with Cross-Functional Collaboration

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Abstract

Since 2020, all industries have struggled with supply assurance. From automobile to tech, from food to textiles, from oil and gas to pharmaceuticals, there have been no exceptions. When it comes to the O&G industry, the combined efforts of operations, project management, inventory planning, sourcing, and R&D play a critical role in assuring reliable material supply—at fair prices—from around the world to minimize potential disruption to the end customer. By regularly (1) tracking inventory levels and consumption, (2) monitoring and understanding production-to-delivery lead times, (3) integrating forecasting tools from operations with vendors, and (4) staying updated on the challenges on the horizon, companies can leverage these cross-functional efforts to improve awareness of the current situation, develop smart solutions for unprecedented challenges, and drive efficiencies in global procurement strategies. Real-time communication between core teams (i.e., sales, operations, project management, R&D, sourcing, and supply chain) is also essential to the success of business continuity, regardless of what the world is going through (e.g., COVID, post-COVID, war). At Newpark Fluids Systems, through improved collaboration across functions, customers' expectations have been met, wells have been drilled, and challenges have been overcome. Although the "supply chain crunch" has not yet ended, major progress has been made in improving global processes that continue to drive results as the industry moves forward.

Introduction

In the E&P segment of O&G, supply chain is often called upon to "save the day". Although projects have formal schedules and timelines, a project's inherent pace and risk add significant uncertainty to its planning and execution. On top of the fundamental technical challenges associated with drilling, completion, workover, and/or stimulation projects, coordinating among numerous disciplines and deliverables adds additional complexity to project scopes.

Although they are often ignored in the planning stages, supply chain decisions directly affect the pace of projects, and execution issues related to those decisions (e.g., efficiency losses, downtime, and cycle times) can have massive financial implications.

From a supply chain perspective, 2020 was a turning point for the discipline: corporations faced significant losses due to disruptions at all levels. The responsibilities and expectations of supply chain departments, consequently, shifted drastically post-pandemic. Now, it is not only about delivering materials to keep up with projects. Increasingly, supply chain teams are called upon to abide by working capital metrics that are determined by corporate goals and investment communities.

The Perfect Storm

The inherent challenges of the O&G industry presented a demanding environment for supply chain prior to 2020. But, due to the COVID-19 outbreak in late 2019/early 2020 and its subsequent knock-on effects, many industrial segments—not only O&G—went through an unprecedented supply crunch, which might be one of the worst of all time. This crunch was caused by several factors, including but not limited to:

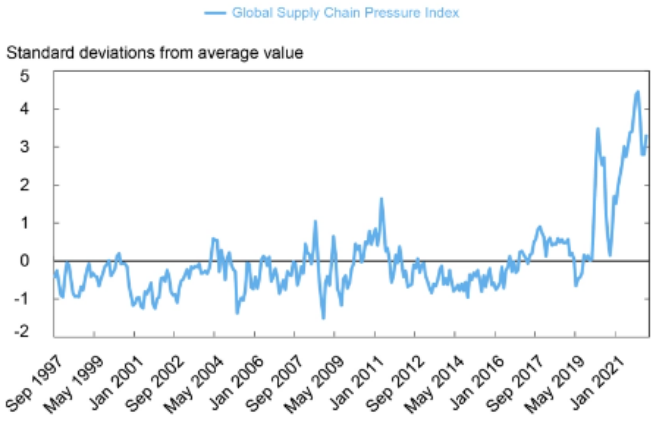
1. *Pandemic-related disruptions:* The COVID-19 pandemic caused widespread disruption to global supply chains, affecting production, transportation, and the distribution of goods.
2. *Shipping bottlenecks:* The pandemic also led to a surge in demand for goods, which put a strain on shipping networks and caused bottlenecks at ports.
3. *Material shortages:* The pandemic also caused a shortage of a wide array of resources, from raw materials (e.g., lumber, steel, and aluminum for construction/manufacturing) to semiconductors (i.e., critical components used in a wide range of products, including electronics and automobiles).
4. *Labor shortages:* The pandemic also caused labor shortages in several industries as workers fell ill, stayed home to care for sick family members, or struggled with "long COVID" (Iacurci 2022).

Breakdown of Impacts & Impacts on Working Capital Metrics

The aforementioned events had a significant impact on the expectations and requirements of the supply chain discipline; consequently, working capital metrics became a key measure of success for delivering projects. These, too, were impacted by the pandemic.

The pandemic caused widespread disruptions to global supply chains, affecting production, transportation, and the distribution of goods, which has had a negative impact on the ability of companies to meet their working capital metrics. The chart below, published by Liberty Street Economics, shows the

global supply chain pressure index at especially high levels beginning in 2019. This demonstrates how these disruptions strained supply chains.



Sources: Bureau of Labor Statistics; Harper Petersen Holding GmbH; Baltic Exchange; IHS Markit; Institute for Supply Management; Haver Analytics; Bloomberg L.P.; authors' calculations.

Note: Index is scaled by its standard deviation.

Figure 1 – Global Supply Chain Pressure Index 1997 – 2021 (Benigno et al. 2022)

The ability to manage inventory and deliver supply on time was significantly impacted by (1) significant fluctuations in demand for certain products and (2) decreased visibility as disruptions in transportation and communication made it difficult for companies to get accurate information about their value chains. One example of such disruptions is outlined in Figure 2 below. Some months after the pandemic began, visibility sharply declined and remained at historically low levels throughout 2021 and in the first half of 2022. The reliability of ocean freight (or lack thereof) is highly correlated with the highest sustained freight prices experienced during this period of time.

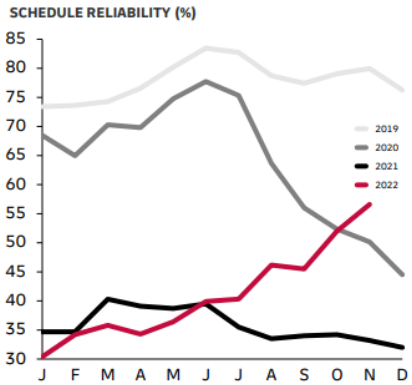


Figure 2 – DHL Ocean Schedule Reliability Index ("Ocean Freight Market Update" 2023)

In addition to negative impacts on working capital metrics and inventory management/transportation, the pandemic also led to increased costs for companies, including higher transportation costs, labor costs, and raw material costs. Per Figure 3, data plotted from the Producer Price Index (PPI) for Chemicals and Allied products demonstrates that even during previous recessionary cycles, the index was fairly stable, but in early 2021, the pattern was broken by an unprecedented increase attributed to the pandemic.

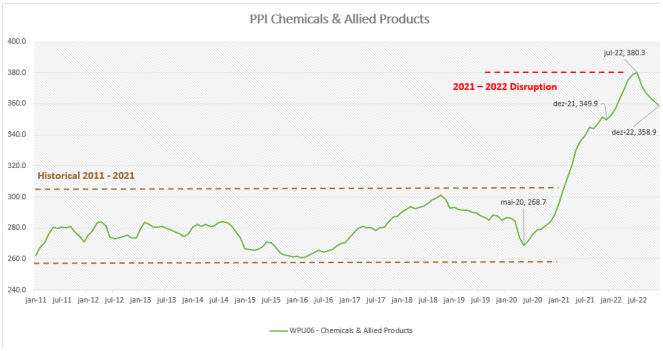


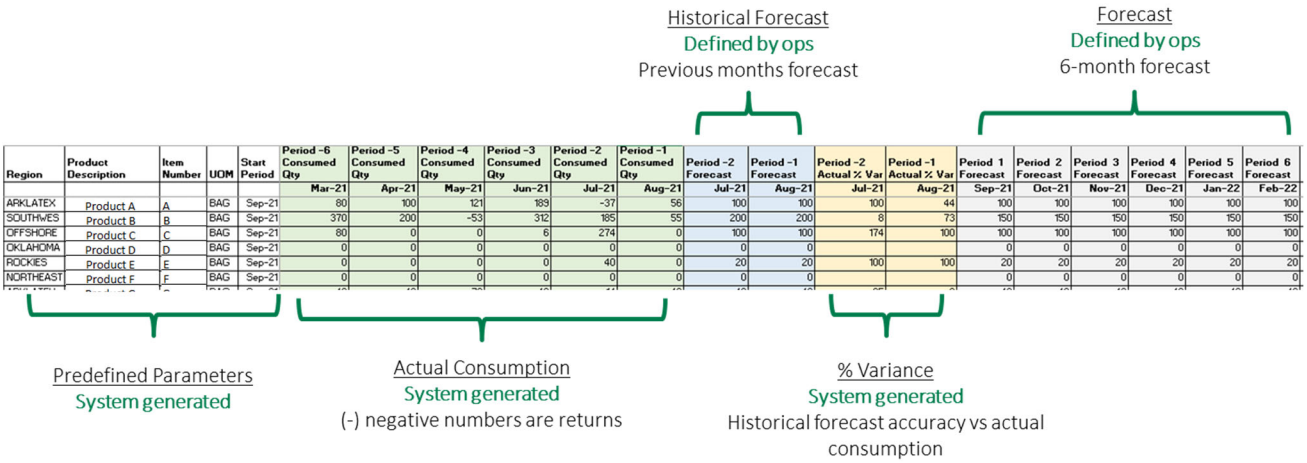
Figure 3 – Producer Price Index by Commodity: Chemicals and Allied Products ("Producer Price Index by Commodity: Chemicals and Allied Products" 2023)

Together, the impacts described in this section have resulted in significant cash flow reduction for companies operating in the retail and service space. This reduction still has not been recovered, and it significantly impacts companies' abilities to deliver goods and services. To overcome these challenges and help organization goals, Newpark—as a leading provider of sustainable technologies and services across the energy industry. —implemented certain changes to the mindset of the company and the practices of its different functional units.

Mindset Shift No. 1 – Communication Is Key

The pandemic demonstrated that changes in the way the supply chain team communicates and interacts with sales and operations were necessary. To ensure supply, deploy initiatives efficiently, and mitigate costs and disruptions, the following changes were required:

1. *Bringing customers into the conversation (external measure)*
   a. Holding strategic discussions related to inventory levels, product availability, planned logistics, and contingency scenarios are a fundamental part of project planning. These conversations ensure that requirements are fully captured, comprehended, and agreed upon by all parties, so expectations are clear.
   b. Constantly sharing information pertaining to product life cycles, value chain risks and challenges, and cost increases with customers is also vital to project planning.
   c. Brainstorming and offering alternative products as contingencies to mitigate risks of downtime are also important during planning and should be incorporated accordingly.
2. *Making sales and operations teams key players for sharing information (internal measure)*
   a. By improving visibility for longer term projects and



Region	Product Description	Item Number	UOM	Start Period	Period -6 Consumed Qty	Period -5 Consumed Qty	Period -4 Consumed Qty	Period -3 Consumed Qty	Period -2 Consumed Qty	Period -1 Consumed Qty	Period -2 Forecast	Period -1 Forecast	Period -2 Actual % Var	Period -1 Actual % Var	Period 1 Forecast	Period 2 Forecast	Period 3 Forecast	Period 4 Forecast	Period 5 Forecast	Period 6 Forecast
					Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Jul-21	Aug-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22
ARKLATEX	Product A	A	BAG	Sep-21	80	100	121	189	-37	56	100	100	100	44	100	100	100	100	100	100
SOUTHWES	Product B	B	BAG	Sep-21	370	200	-53	312	185	55	200	200	8	73	150	150	150	150	150	150
OFFSHORE	Product C	C	BAG	Sep-21	80	0	0	6	274	0	100	100	174	100	100	100	100	100	100	100
OKLAHOMA	Product D	D	BAG	Sep-21	0	0	0	0	0	0	0	0			0	0	0	0	0	0
ROCKIES	Product E	E	BAG	Sep-21	0	0	0	0	40	0	20	20	100	100	20	20	20	20	20	20
NORTHEAST	Product F	F	BAG	Sep-21	0	0	0	0	0	0	0	0			0	0	0	0	0	0

Figure 4 – Example of Forecast Output Report Generated by Newpark ERP system

sharing agreed-upon demands for forecasting/planning purposes, procurement teams can plan purchases four to six months in advance instead of spot purchasing in a crunch.

b. Constant communication about the pace of ongoing projects and expected delays are now part of formal, routine communication among sales, operations, and supply chain. Forecasts/SIOP meetings led by the supply chain group capture information related to upcoming tenders, new product developments, and inventory needs. (This information is required for ongoing jobs, performance tracking, anticipated project changes/delays, hurdles, etc.) Sharing this information is critical because every region has its own particularities and complexities, which drives the need for a tailored process for each. These discussions enable Newpark to adequately plan for changes in customer needs, volume, and product mix.

Mindset Shift No. 2 – From Reactive to Predictive, Traditional, and Agile

To reiterate an earlier point, even in past recessions/downturns, never before have there been major disruptions in supply or transportation like there were during and after COVID. Regardless, this same historical data has been critical to supply planning and inventory management following the pandemic.

Newpark's supply chain team relied heavily on historical consumption patterns to restock materials and maintain maximum possible availability to cover potential disruptions. Although this process was efficient from a supply-assurance standpoint for operations, it required a larger quantity of inventory at all times, which led to lower inventory turnover. (Lower inventory turnover necessarily leads to higher DSI metrics, a key component of working capital efficiency.)

As working capital improvements became mandatory and companies were forced to work at higher efficiency with lower inventories, mindset changes were required across the industry, followed by updates to tools and management techniques.

At Newpark, these updates mainly consisted of combining traditional forecasting processes with agile Kanban tools. This tailored solution was put in place to overcome "just in case" inventory challenges: traditional forecasts and SIOPs predict procurement while agile Kanban tools prove predictive data and track execution performance.

1. *Forecasts/SIOP:* These tools are traditional and predictive. At Newpark, the supply chain group leads discussions related to upcoming tenders, new product developments, and inventory needs for ongoing jobs every month. Again, each region has its own particularities and complexities, and because of this, each region requires its own tailored process. These tailored processes enable us to adequately plan for changes in customer needs, volume, and product mix. Rough capacity planning is done on a monthly basis, and detailed planning is done on a rolling six-month outlook. (See Figure 4.)
2. *Kanban:* Newpark utilizes a tailored Kanban system, based on Lean manufacturing principles, for each of our warehouses that is fully connected to our ERP system. It functions with a complementary "pull-type" replenishment system used to track planned forecast against actual quantities. Levels are set based on quantity of rigs, forecasted consumption, and lead time. Each bin on the Kanban represents a pre-established quantity for a specific product. Empty bins are denoted by a red cell, which acts as the trigger for replenishment. This is a clear and objective visual aid indicating that the item requires immediate attention based on the lead time. (See Figure 5.) Thereafter, replenishment sources are identified based on overall consumption to best utilize logistics costs. Combined, forecasts/SIOPs and Kanbans provide insightful information that allows supply chain and operations teams to properly plan inventory replenishment and receive real-time data for managing inventory.

Mindset Shift No. 3 – Comprehending the Full Life Cycle

Comprehending the full life cycles of both projects and products is important for risk mitigation purposes, which is key to successful deliveries. By performing such assessments, it is

Organization Name	Item Description	Lead Time (In Days)	Number of Bins	Bin Qty	Bin1	Bin2	Bin3	Bin4	Onhand Inventory Qty	Open Supply
NDF Longview TX - 1055	Product A	7	3	550	550	550	1414		2514	1050
NDF Longview TX - 1055	Product B	7	3	1800	1800	1750	0		3550	1800
NDF Longview TX - 1055	Product C	7	2	4	4	14			18	32
NDF Longview TX - 1055	Product D	7	4	200	200	200	200	700	1300	3640
NDF Longview TX - 1055	Product E	7	4	160	160	160	160	1252	1732	0
NDF Longview TX - 1055	Product F	7	4	120	120	120	120	684	1044	0
NDF Longview TX - 1055	Product G	7	0	0	40				40	0
NDF Longview TX - 1055	Product H	70	3	80	80	80	1808		1968	0
NDF Longview TX - 1055	Product I	70	3	80	80	80	28		188	800
NDF Longview TX - 1055	Product J	7	3	240	240	240	953		1433	0
NDF Longview TX - 1055	Product K	7	3	900	900	900	1647		3447	0
NDF Longview TX - 1055	Product L	7	3	840	840	840	377		2057	525
NDF Longview TX - 1055	Product M	7	0	0	221				221	0
NDF Longview TX - 1055	Product N	7	3	504	504	504	1140		2148	0

Figure 5 – Example of Key Information Contained on the Newpark Kanban Report

possible to identify potential risks and proactively implement strategies to mitigate them.

From the project standpoint, these assessments are key to proposing alternative solutions early on in project planning stages. These assessments also open the door for discussions regarding risks associated with supply disruption, as well as fair pricing review mechanisms, which ultimately drive fairest cost models and the implementation thereof.

From an internal standpoint, these assessments allow us to discuss and develop strategies to mitigate risks. Such strategies may include source diversification/rationalization (i.e., supplier, country of origin, etc.), mindset changes for make-or-buy decisions, portfolio prioritization/rationalization, product re-engineering (for fit-for-purpose applications), manufacturing efficiencies, or inventory backup solutions among others.

From a value-chain standpoint, these assessments allow us to further evaluate and better comprehend the full value chains of our vendors, so that we can better support them in mitigating their own risk. This is particularly important when dealing with vendors that are not large organizations and are therefore at the mercy of the market due to limited resources.

Conclusions

By comprehending global supply chain changes and embracing the fact that these new challenges are the reality of the future, Newpark was able to implement meaningful modifications, processes, and tools throughout the organization, which resulted in successful operations through a disruptive cycle.

These changes were necessary from a continuous improvement standpoint (which the company embraces), but in a much larger sense, they were vital to the business's "survival" in a volatile, uncertain, complex, and ambiguous time for the world. Simultaneously, these changes created stronger foundations on which the organization could build its success.

By implementing the mindset shifts, processes, and tools discussed in this paper, Newpark Fluids Systems was able to continue delivering and supporting its projects by consistently proposing the most beneficial solutions to its customers. Indeed, because of these changes, DSI levels post-pandemic are roughly 30% lower, exposure levels on our product portfolios are reduced by 25%, and the same portfolio has been smartly rationalized by 30%, allowing supply chain to focus on important products while continuing to provide a comprehensive array of solutions to our customers.

Nomenclature

DSI = Days sales inventory
E&P = Exploration and production
O&G = Oil and gas
R&D = Research and development
SIOP = Sales, inventory, and operations planning

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