WHAT NEXT FOR THE CHEMICAL INDUSTRY?

Honeywell

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WHAT IS HAPPENING IN THE CHEMICALS INDUSTRY TODAY?

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Chemical companies today are experiencing unexpected economic scenarios. This has required them to adapt to rapidly changing supply & demand and adjust workplace structures to ensure the health & safety of their workers.

The chemical industry has been facing challenges well before the crisis presented by the Covid-19 pandemic. Last year, chemical companies in both Europe and North America had reduced activity with the trade tensions and perceptions of a global economic slowdown. In 2020, Covid-19 forced many of the chemical producer's customers in industries such as the automotive, buildings, construction, and consumer goods sectors to shut down operations.

While demand for certain customer segments has dropped, the demand for some segments such as those that produce plastics used in packaging & PPE has seen a rapid increase. This has made it difficult for chemical manufacturers to profitably produce and adapt to the shift in the global consumer behaviour.

The $4 trillion chemical industry converts raw materials into more than 70,000 different products with different applications ranging from packaging to pharmaceuticals to automotive applications. According to the American Chemistry Council (AAC), 96 percent of all manufactured goods contain products from the chemical industry. With such a broad and deep exposure to the global economy, the effects of Covid-19 are likely to cause sustained changes to the structure of the industry. Recovery for the chemicals industry relies heavily on the recovery of the industries of its core customers. Although the path to full recovery is uncertain, chemicals companies can still find significant opportunities for growth.

WHAT ARE THE TOP CHALLENGES FOR CHEMICALS INDUSTRIES?

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Ensuring health and safety of the workforce remains a challenge. Rapidly changing consumer behaviour, disrupted supply chains and unpredictable demand creates additional challenges.

Chemical companies are facing a tough environment of unprecedented unpredictability which affects all parts of their operations beginning with their people and customers. This has manifested itself through several challenges which had to be addressed in a relatively short period of time.

DRASTIC REDUCTION IN INVESTMENTS AND PROFITABILITY

The immediate challenge for chemical companies is eliminating losses and maximizing profitability in an unprecedented economic scenario. Current conditions have forced chemical companies to cut costs and make tough decisions about capital expenditure reductions. This year, the top 20 chemical companies alone had cut in excess of $35B capex at an average reduction of -27%. Margins for several chemical products had even dropped to negative for a while before rebounding. These conditions make it very difficult for chemical producers to prioritize where to invest, where to grow and how to transform.

NEW DYNAMIC DEMAND PATTERN

Demand patterns have been changing rapidly as a result of the pandemic-induced consumer behaviour. The pandemic has triggered a fundamental change in what people choose to buy and how they use. For example, demand for sustainable products grew while demand for products such as traditional automobiles dropped. There is also greater health consciousness among consumers resulting in consumer behaviour changes for personal care, packaging, and other products. This makes it hard for chemical producers to choose what to produce, where to produce and for whom to consume.

UNPRECEDENTED SUPPLY CHAIN DISRUPTIONS

The chemical industry's supply chain has generally had a high exposure to China which has been impacted by the pandemic. In addition to creating potential challenges in obtaining raw materials, the disruption of global supply chains also risks their ability to deliver finished products to customers. Chemicals are generally consumed by customers much further down the value chain after being produced as a different end-product such as an automobile or a packaged product. Some estimate this duration to be about 3 months on average before the end-product reaches the customer. This makes it very hard to plan the supply chain with the delayed effect between supply planning and end-consumer demand.

NEW NEEDS TO PROTECT AND KEEP PEOPLE SAFE

There are up to 20 million people employed in the global chemical industries as per estimates from the International Labour Organization (ILO). A significant share of these people cannot perform their work remotely due to the need to be close to production operations. Although safety performance is improving, companies must still bear responsibility for ensuring that the production operations are safe and that operations do not present a hazard to people and the environment. The pandemic has also created a new need to put adequate preventative measures in place to protect people and keep business continuity.

CHANGING SOCIAL EXPECTATIONS FOR SUSTAINABILITY

Sustainability, as a broad topic, is becoming a top priority on the executive agenda for many chemical companies. On one side, there is an increased demand for more sustainable chemical products as a result of changing consumer behaviour. On the other side, there is a strong demand for chemical production to decarbonize and become safer for people and the environment. Both these challenges have important implications on what products are produced and how they are produced.

WHAT CAN THEY DO ABOUT IT?

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The current conditions provide chemical companies with a unique opportunity to transform business processes and improve operations by building the ability to respond faster.

Digital technologies provide specific capabilities that allow this transformation to better respond to changes in the industry. These capabilities range from designing better products and processes to optimizing production operations across the enterprise.

GAIN NEXT LEVEL OPERATIONAL EXCELLENCE WITH END-TO-END OPTIMIZATION

Achieving top-quartile cost performance and higher will enable chemical companies to become more resilient through economic cycles and deliver predictable margins. While operational excellence is not new, it is still a high priority for most chemical companies to improve their cost performance. Operational excellence relies on using data to make the most informed decisions that improve end-to-end production operations. It also involves managing the competency & productivity of the workforce. Till date, the chemical industry has been selectively optimizing few processes. Expanding to a holistic way at an enterprise level by combining production operations with new ways of working allows chemicals companies to improve their operational excellence and unlock the next level of profitability.

Specifically, one trend that is increasingly being adopted in the chemicals industry is that many companies are evaluating the switch from batch to continuous processing. Many specialty chemicals and pharmaceutical manufacturing companies use batch processes which give them an advantage for control over reaction conditions. This same approach makes it more time-consuming and expensive compared with continuous processes. Chemical companies can use process design and simulation capabilities to rapidly build these new continuous processes to switch from batch processes. Advanced process control also provides necessary process control and optimization capabilities to producers as they shift to continuous processes. This help unlock new profitability avenues.

TAKE ADVANTAGE OF PRODUCT DEMAND CHANGES AND FEEDSTOCK FLEXIBILITY

Usually, demand variations are the direct result of changes in the consumer industry. Chemical companies must keep track of this demand to determine what to produce, for whom to produce and how to produce it profitably. Adapting production to changes in consumer markets such as construction, automotive, packaging and agriculture will allow producing the highest margin products. Having an enterprise operations management capability with flexible processes allows chemical manufacturers to respond fast. End-to-end planning and execution can lead to these margin improvements.

One opportunity for chemical companies is lowering raw-material costs using crude oil price opportunities. In many cases, an upstream chemical company such as in petrochemicals provide the raw material for a downstream chemical company such as in specialty chemicals. The ability to quickly take advantage of changing oil prices from different spot markets helps improve profitability. A recent McKinsey analysis pointed that a 50 percent drop in crude-oil prices has the potential to generate gains of 2-4% increase in earnings for companies where raw material spend is 10-20% of their revenues. Chemical companies who operate with enterprise level planning and optimization models can quickly take advantages of these opportunities.

ESTABLISH FULL ENTERPRISE-LEVEL SUPPLY CHAIN VISIBILITY

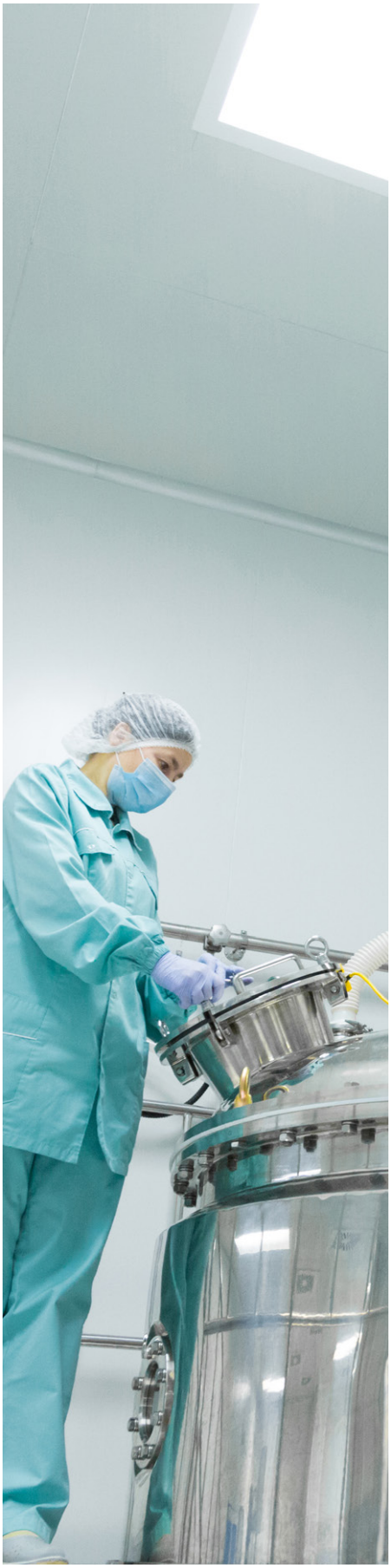
The chemical industry relies on smooth supply chains. The supply chain must address operational challenges caused by raw material availability, raw material quality, scheduling and other plant constraints. Demand-driven supply chains with full visibility allows chemical companies to respond faster to changing market conditions.

Lack of integration among business divisions such as sales and marketing, R&D and production adds further to the complexity. Lack of full supply chain visibility often renders optimization efforts sub-optimal. With increased scrutiny on recalls and returns, traceability of product from procurement to manufacturing to finished goods is an additional requirement. Chemical companies with full supply chain visibility and track & trace capabilities across organizational boundaries are best positioned to optimize their supply chain.

ESTABLISH ENTERPRISE-WIDE PROCESS AND OCCUPATIONAL SAFETY

Creating global safety and operational risk management allows companies to remain socially responsible, remain compliant and achieve the best productivity. The industry is particularly vulnerable during crisis such as the pandemic that the bulk of its production workforce is in on-site jobs that cannot be done remotely. Implementing any type of physical distancing is also difficult in workplaces that are often worker dense. Implementing remote monitoring, maintenance and operations wherever possible will help minimize disruptions to operations.

Chemical companies who provide for a connected worker with digital operations management, field operations management and remote assistance helps keep these deskless workers safe. Building operational risk management practices administered at the enterprise level, ensures compliance to strict organizational and regulatory practices. Together, it provides increased safety, reduced risk and enables compliance.



IMPROVE SUSTAINABILITY IN BOTH THE PRODUCT AND OPERATIONS

The first aspect is building sustainable chemical products. A concept that is often discussed in this context is that of the circular economy. Circularity involves managing the chemical product's full lifecycle from the production to consumption and back as raw material for production. There are 3 steps in designing a chemical product fit for the circular economy.

First, design products to be suitable for the circular economy by being recyclable. Next, ensure these products are highly recoverable for recycling. Finally, recycle and reuse the chemical product by turning them into new value-added products. One of the most common examples is that of recycled plastics. Often, recycled material is less valuable than the original material. The process which is used for recycling (e.g.) to recover raw materials from plastics are difficult and inefficient. Process design and simulation increases the speed of implementation of these processes and ensuring that they are as efficient as possible.

The other aspect is having sustainable operations. Chemical producers must focus on both energy & emissions reduction as well as waste reduction in manufacturing processes. Ensuring on-spec production is particularly challenging for complex chemical business. Any related losses of energy and raw material can have a significant financial and environmental impact. The right manufacturing operations management systems with detailed understanding of both batch and continuous processes enable the next level of sustainability in operations.

HOW CAN DIGITAL TECHNOLOGIES MAKE THIS HAPPEN? WHAT SPECIFIC TECHNOLOGIES TO WATCH?

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Enterprise Performance Management technologies have the potential to deliver on the promises of digital technologies. With new business models, the costs to adopt these technologies at scale have also come down.

ENTERPRISE PERFORMANCE MANAGEMENT

Enterprise performance management systems improve the performance of operations, assets and people through better visibility, predictability and intelligent autonomy. It generates specific insights across business units, sites and regions by having end-to-end visibility of operations across the enterprise. Next generation enterprise performance management systems use this visibility to execute against intelligently determined performance improvement actions to help ensure that every day is the best possible day of production.

PROCESS SIMULATION AND END-TO-END OPTIMIZATION

Process simulation and optimization helps adapt production process to meet variable market needs. It aligns operational and financial performance goals and enables rapid decision making based on forecast variance, order changes, and market conditions.

Advanced process control technology stabilizes operations within a new target range as demand varies, integrating capabilities of assets to find optimal operating conditions. For many units, this optimization can be done dynamically to ensure operational efficiency. It also optimizes production plans, reduces variations, and lowers spend on base inputs.

END-TO-END PLANNING, SCHEDULING AND MANUFACTURING EXECUTION

Responding to drastic supply and demand fluctuations requires fast and accurate data through digital supply chain and manufacturing execution systems. Full supply chain visibility helps maintain control of highly regulated products from inbound to customer receipt. It can identify risks and react to developing global supply events. It also helps collate information from key points in the supply chain and enables real-time decision making.

Digital manufacturing execution systems at the enterprise-level helps chemical companies make informed decisions without sacrificing safety or quality. It also helps them respond faster to supply and demand disruptions across their value chains. Given the long delay between chemical production and consumption by the end-customer, agile production planning systems can increase supply chain alignment and collaboration across multiple sites and regions while market conditions change rapidly. It then allows quick planning of alternate scenarios to improve the economic outcome for chemical companies.

REMOTE MONITORING, ASSIST AND OPERATIONS MANAGEMENT

Adapting to new ways of working unlocks a greater level of risk reduction and protects business continuity. Remote operations technologies that support the workforce with collaboration and remote access allows shifting to reduced and offsite workers to address travel, safety and expense reduction. Another aspect is implementing remote learning and assistance for workers to ensure that both competency and productivity of the workforce is maintained. Safety and health are a concern and will become an even greater consideration as society restarts and normalcy starts to return. Digital tools enable this link between man, machine and operations to shift to these new ways of working.

PROCESS DIGITAL TWINS WITH ENERGY & EMISSIONS AND RELIABILITY MANAGEMENT

Digital twins can be created for existing processes and assets to define new production boundaries while integrating safety limits and cost concerns. Different scenarios can be planned and evaluated considering various constraints such as energy consumption, emissions, performance limits, reliability and margin impacts. This can result in improved quality and yield of manufacturing operations from design to operations and increase resource consumption efficiency while reducing costs and wastage.

It also helps maintain plant equipment reliability. Reliability concerns increase as maintenance activities are delayed and non-routine operations create equipment stresses. Hybrid modelling technologies which use both artificial intelligence and first principles models enable chemical companies to maximize uptime by preventing failure with highly predictable failure models.

WHAT STEPS SHOULD CHEMICAL COMPANIES TAKE?

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> **Chemicals companies in the future will be highly digital. Realizing value from digital technologies for chemicals company requires a step-change in the current thinking and a structured plan to execute.**

Having the right technologies and partners in an open ecosystem can accelerate value realization from digital technologies. The following steps can help with faster value realization:

SET TRANSFORMATION OBJECTIVES THAT EXTEND TO CORE PRODUCTION OPERATIONS

Create transformation objectives that link the board room with the control room and operations floors. Having clear value drivers such as eliminating production losses, energy efficiency or reducing maintenance expenditure are better than setting an objective to just implement software products.

EXTEND ACROSS THE ENTERPRISE FROM HQ TO EACH PLANT AND BEYOND ORGANIZATIONAL BOUNDARIES

Scaling quickly across the organization from the headquarters to each of the chemical plants is a necessary step in value realization. Including all suppliers and contractors across organizational boundaries will also help in achieving objectives such as safety and sustainability allowing end-to-end visibility and compliance.

INCLUDE PEOPLE IN THE CORE OF BOTH PLANNING AND EXECUTION

While planning and executing the transformation, include different operating regions, all types of chemical plants & its processes, and the requirements of people across the organization. Inclusion ensures that adoption is easier and helps make changes stick. Including field workers ensures that the last mile is also included in closing the loop of any technology-enabled transformation..

CHOOSE THE RIGHT TECHNOLOGY AND SET OF PARTNERS TO HELP WITH THE JOURNEY

Having the right set of technologies and partners who bring capabilities in digital transformation can help accelerate time to value. Having the most open ecosystem which allows the chemicals company to bring best-in- class technologies and protect their own data helps in achieving scale.

ORGANIZE FOR ADOPTION AND CHANGE

Building the right business process will ensure adoption and continuous improvement. As an example, while implementing a remote operations centre it is important to rethink operator training and standard operating procedures. Having the right organization will help ensure that changes stick with the company while ensuring the wellness of all people.

For chemicals companies, Honeywell Forge for Industrial is built with these requirements in mind to achieve the next level of efficiencies in both operations and software technology. With deep domain expertise in the industry, advanced software experience and strong consulting capabilities, Honeywell can be a preferred partner for digital transformation.

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