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On the Road to Digital

Chemicals businesses must not delay on digitalisation if they want to transform their operations, says Paige Marie Morse

THE chemicals sector is continuing to perform strongly across all regions and we expect that trend to continue for the foreseeable future. Consultancy Roland Berger's study *Chemical Winners 2018 – Focus on Profits* (https://bit.ly/36ndHjp) examines the financial performance of 170 chemical companies in the US and Europe and provides an industry overview. It found that 2018 was another strong year for the sector.

According to the study, the total sales of the 170 chemical companies surveyed rose by 9% in 2018 compared with 2017 – and the profitability of the chemical industry as a whole was also strong last year. Although the EBIT margin of 12% was lower than the 13% in 2017, the overall EBIT dollar improved as the chemical industry saw industry-wide sales growth of 4%.

In our experience at AspenTech, speciality chemicals have been performing particularly well in recent times. Bulk chemicals markets are doing well too, especially in Asia where demand is strong and there is a clear drive towards self-sufficiency, and in the US, where there is a feedstock advantage. Indeed, access to cheap feedstocks continues to provide North American chemicals manufacturers with a significant cost advantage. We have already seen a huge wave of new capacity and we expect a second wave to emerge in the 2021-2024 timeframe.

Even Europe, which has struggled to compete on cost in recent years, has seen major announcements of new activity, heralding a recovery here also. Two trends impacting European operators are: first, operators in Europe importing cheap feedstock from operators in the US and second, the ongoing push from European operators to move downstream to get more involved in the specialty chemicals sector. The advantage here is that this is a complex technically-demanding business that suits the performance capabilities in Europe. Operators know that if they perform well in this space, there will be more margin and more profitability on offer – and that continues to encourage broad participation.

SCOPING THE CHALLENGE

Of course, despite the optimistic picture overall, the chemicals sector is still facing significant challenges. There are trade tensions between the US and China and, to a lesser degree, between the US and the EU. Chemical operators will need to carefully monitor these tensions because any uncertainty in trade flows is likely to act as a brake on decision-making.

The other major challenge relates to the speed of digital transformation across these market sectors. While processing industries are finally catching up to service industries in their digitalisation efforts, chemicals continues to trail when compared to others in its class. In comparison with many other heavy industries, chemicals operators are lagging behind in implementing digital solutions. Certainly, refining has moved faster than chemicals, with the majority of operators using advanced process control (APC) solutions and many moving towards artificial intelligence (AI) tools.

WHILE PROCESSING INDUSTRIES ARE FINALLY CATCHING UP TO SERVICE INDUSTRIES IN THEIR DIGITALISATION EFFORTS, CHEMICALS CONTINUES TO TRAIL WHEN COMPARED TO OTHERS IN ITS CLASS

In contrast, while a growing number of chemicals companies are exploring the benefits and running trials, far fewer have launched live commercial implementations. They are therefore potentially missing out on the benefits of deploying APC solutions that enable units to run at faster rates and deliver consistent on-spec products. Many are yet to trial analytics tools that could help them apply lessons from previous operations to improve future outcomes.

Operators will need to take action soon to address this and kickstart their digital efforts. Otherwise, they will miss out on the opportunities that moving to digital could bring – from the chance to drive up productivity and profit through enhanced throughput and yield, to better coordinated supply chains, to the opportunity to better plan maintenance and reduce the occurrence of unplanned outages.

It is all about the pursuit of operational excellence. APC still plays a key role in helping companies to maintain optimal operating conditions, while using prescriptive analytics to pinpoint when a piece of equipment will fail allows operators to plan ahead, develop contingency plans and avoid unnecessary costs. Given these potential benefits, why aren't more chemical operators capitalising on the benefits of digitalisation? What's holding most operators back is the thorny issue of operational complexity. Operators often struggle to know where to begin. Many operations, particularly in specialties, have become increasingly complex as customers demand higher levels of performance and quality and a greater range of options from producers. And operators realise they need to diversify product lines to meet these increasingly sophisticated needs.

DRIVERS OF DIGITALISATION

There are a range of drivers of digitalisation at play across the chemicals sector. Aligning with customer demands is especially crucial in the speciality chemicals area. Models of manufacturing assets can be used to automate identification and evaluation of production scenarios across a variety of timeframes. These models represent the full complexity and options possible, including production rates, constraints, setup times, sequencing and site logistics. Specialty companies cite an 8-12% increase in on-time order fulfillment when these tools are applied.

Meeting customer needs includes ensuring that assets operate well and produce the targeted products. Leading companies use multivariate tools to analyse interrelated operational data to identify and eliminate sources of process variability. Businesses apply this analysis to batch and continuous processes to make sure more production meets specification.
Innovation can enable businesses to meet customer demands while driving competitive position. Specialty chemicals manufacturers are continuously looking to innovate and enhance product performance at lower cost. Digital technologies can boost productivity and reduce errors by easing the transition from laboratory to plant production processes. And simulation solutions shorten development cycles for new products by screening process options before lab and pilot work begins.

In the speciality sector, in particular, manual procedures, hand-written reports and paper-based systems are still common for critical activities like recipe execution and raw material management. These isolated tools limit visibility into data and frequently delay responses to potential quality issues and regulatory requirements. Through digitalisation, organisations can achieve visibility of key data that, in turn, allows them to gain the necessary insight to deliver improvements in consistency and quality.

When assessing the value chain for specialty chemicals producers, technology solutions enable monitoring, execution and control of the manufacturing process. In addition, planning and scheduling tools help boost responsiveness and related profitability. Rapidly-changing market and customer demands force frequent changes in production schedules. Adjustments as high as 25-45% each month are not uncommon.

Improved scheduling tools add value to business decision-making as variations occur, by incorporating constraints – like storage limitations and variable lead times – while minimising excess inventory and off-spec production. Digital solutions also enable better collaboration among colleagues, to ensure that changes are less disruptive to operations. Better scheduling capability can also boost asset utilisation. At the same time, schedulers can see the impact of their decisions and make adjustments to avoid problems along the supply chain before they happen.

Moreover, production optimisation, which links manufacturing systems to scheduling, helps to align business and operations processes to ensure that the plant runs to full

constraint limits and the business can capture maximum margins. Many chemical companies now have complex international supply chains that must integrate regional demands with variable economics and constraints. Digital technologies let planners run multiple scenarios to select the best option, comparing key financial metrics and operational key performance indicators (KPIs) across several production units.

Another key enabler to align business with operations is visualisation tools that display critical performance metrics aggregated from multiple systems to a single data access layer. This technology eases the reporting process and facilitates sharing across the organisation, creating more integrated workflows and coordinating decision-making across business functions. Enterprise dashboards are easily created from process and business sources, retaining the confidential details locally while benefiting from a low maintenance, scalable SaaS hybrid cloud approach. This performance is best represented by the concept of a digital thread that weaves throughout the enterprise to enable a step-change in productivity and, correspondingly, profitability.

PUTTING A PROCEDURE IN PLACE

Chemicals production, whether bulk or speciality, involves thousands of different processes that are used to make tens of thousands of products on a wide range of asset types, and often across multiple geographic regions. In this environment, it is wrong to imply that quick and simple solutions are readily available.

Digitalisation efforts can take considerable amounts of time but the experiences our customers report overwhelmingly prove the value of the effort. Increasingly today, digitalisation is not just an option for chemical operators, it is a strategic imperative.

So what works in practice? How can chemical operators move beyond a theoretical appreciation of the benefits of digitalisation and instead begin implementing business solutions on the ground to drive enhanced profitability and competitive edge? Here we outline some key steps: from enterprise-wide planning to the development of internal specialists to ensure digital transformation efforts are a complete success.

- **Prepare your organisation**: Many companies struggle to find the resources to execute digital projects, and efforts often get held up by competing priorities. BASF sees the importance of fast action for Industrie 4.0 projects, and has created a separate organisation, isolated from IT, to push the implementation. At INVISTA, the concept of "citizen data scientists" is used to encourage employees to get involved in analytics projects that identify preventative and prescriptive actions to resolve production issues.
- **Develop internal specialists:** ExxonMobil uses a team of internal experts to implement APC technologies at its olefins/polymer complexes across the world. The experts travel to each site to implement and troubleshoot and, using the latest adaptive process control capabilities, have been able to reduce implementation periods from six months or more to just six weeks. Braskem has identified internal change agents that use entrepreneurial thinking to encourage adoption of new digital tools throughout its businesses.
- **Incorporate digitalisation in your sustainability plan:** Digital solutions have always targeted improved efficiency and reduced use of resources, which are common goals in sustainability programmes. Businesses are moving from purely financial metrics to alternatives like carbon dioxide emissions and total resource efficiency to target employee actions and engagement at the broader impacts of operations. YNCC has implemented a systematic approach to energy and process optimisation as part of its company-wide goal to cut energy consumption and greenhouse gas emissions by 10.3% by 2020.

BENEFITTING FROM DIGITAL ACCELERATION

For four decades, the process industries focussed on improving operational performance through digitalisation. Digital technologies allow chemicals businesses to take this beyond operations and expand to address key market drivers like accelerating innovation, optimising the value chain and aligning with customer demands, effectively giving them a route map to future success.

I DO NOT SEE A FUTURE WHERE COMPANIES NO LONGER DEPEND ON THE CONTROL AND OPTIMISATION CAPABILITIES THAT HAVE BEEN DELIVERED BY DIGITAL SOLUTIONS ON ASSETS AROUND THE WORLD

At a recent industry event in Mexico, an audience member asked me: "Is digital a fad – something that will go away and no longer have meaning for my business?" I responded with a resounding "definitely not". I do not see a future where companies no longer depend on the control and optimisation capabilities that have been delivered by digital solutions on assets around the world.

The market landscape is likely to remain complex and difficult to navigate - but that must not stand in the way of chemicals operators. If they want to reap the many rewards on offer, they cannot afford to delay. The tools, services and solutions that operators need to manage their complex operations and achieve new levels of reliability and profitability are available to them now.

If they want to avoid being left behind by their rivals and missing out on the chance to drive profits, they must cut through this complexity and start their journey today. The efforts demand focus but the payoffs make it well worth the endeavour. ■

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