Energy goes green

Achieving sustainable operations in capital-intensive industries

Digital technologies can help reduce environmental impact

Digital technologies will take centre stage on the path to net-zero. However, attaining a balance between sustainability and business objectives is a considerable challenge, Antonio Pietri, President and CEO, Aspen Technology, tells OGN.

In recent months, firstly at COP26 in Glasgow and then at Adipec in Abu Dhabi, capital intensive industries reiterated calls to increase efforts to improve sustainability and reach carbon-zero targets.

In the run up to 2030, with the culmination of the EU's climate target plan, this upcoming deadline is just one of many drivers coming together to act as a catalyst for change and increasing the urgent need for technology that enables sustainability and environmentally-efficient operations.

An additional thrust is a soaring demand for energy as we emerge from the impacts of the pandemic, also underscoring the need for more sustainable solutions.

And, while over the years investors have differentiated their portfolios by offering ESG-conscious funds, these funds now represent a growing proportion of the investment funds in the marketplace—accounting for $51B USD of new money from investors in 2020. That ability to access finance is pressuring companies further to embrace ESG to implement and meet sustainability targets.

An increasing number of oil and gas companies are seen adopting net zero carbon emission targets. Chemical companies are establishing thermal emission targets and are additionally making commitments around plastic waste, an initiative rapidly becoming a priority for governments and regulators.

Simultaneously, employees and customers expect organisations across these industries to run clean and efficient businesses.

The latest generation of workers and customers are demanding greater accountability around sustainability.

Organisations know that if they want to protect their brand reputation and attract and engage workers, they must build cleaner, safer and greener businesses.

"Forward-looking companies are developing innovative technologies and business models," says Pietri.

The result of all these combined factors is that companies in capital-intensive industries are facing a dual challenge—meeting the growing demand for resources and higher standards of living from a growing population while also addressing sustainability goals. And to succeed they will require new levels of operational excellence.

ARC Advisory Group's recent report "The Sustainability Future for Energy and Chemicals," revealed that 90 percent of global energy and chemical companies have sustainability initiatives in place.

And while definitive action may still be needed, at least, by some of these businesses, but for all of them sustainability either is, or can be, a driver of digital transformation.

DIGITAL SOLUTIONS KEY ENABLER FOR SUSTAINABILITY GOALS

Whereas in the past, investment in digital was often justified based on its potential to deliver enhanced profitability, today, this kind of funding is just as commonly signed off based on its ability to deliver a reduction in CO_2 emissions. It hits the bottom line, just from a different angle.

Digitalisation is a crucial enabler for companies to meet both business and sustainability objectives. In the ARC survey, 75 percent of respondents said they believed digital transformation was either extremely important or very important for achieving sustainability goals.

The International Energy Agency (IEA) found that digital solutions can help boost energy efficiency as much as 30 percent for industrial operations.

In Europe, the Technology Platform for Sustainable Chemistry has highlighted digitalisation as a key tool to meet sustainability objectives in the chemicals sector.

The new generation of digital solutions deployed across the capital-intensive industries provides the visibility, analysis and insight required to address the challenges inherent in the achievement of sustainability targets.

Success begins by harnessing the vast volumes of data available from operations—leveraging new technologies, like artificial intelligence (AI)—to control operations and empower operators to make the decisions that will help attain their core objectives of customer satisfaction, sustainability and profit.

To achieve energy efficiency, operators must focus on cutting the environmental footprint from resources consumed by their own business activities.

That might encompass everything from reducing the use of non-renewable resources, like water for feedstocks or energy generation, through to cutting down their carbon footprint, or lessening environmental emissions generated by business operations.

Many digital solutions have concentrated on efficiency gains for production processes, and technology projects frequently target reductions in energy use, yield improvement and lower emissions. Critically too, many solutions make it possible to track progress on sustainability goals.

For example, the latest process simulation technology monitors and optimises CO_2 and other pollutant emissions; while the same tools, combined with other technologies like enterprise visualisation tools and planning solutions, provides the basis for emissions reporting for chemical plants, refineries and other energy assets.

PUTTING TECHNOLOGY IN PLACE

Integrated technological solutions can form the core of strategic sustainability initiatives.

Sophisticated models and workflows enable companies to do everything from cutting water and energy usage to reducing or avoiding emissions.

Indeed, the use of AI will be instrumental in driving energy efficiency and achieving sustainable operations across the capital-intensive industries.

Embedding AI in process models, for instance, helps companies develop more efficient production options that utilise less energy and resources.

REDUCING ENVIRONMENTAL IMPACT

Digital solutions can also provide guidance on environmental impact throughout project planning and operating processes, and even give insight into maintenance activities to help avoid equipment breakdowns—and the emissions and dangerous conditions that come with them.

Digital technologies can also be used to reduce environmental impact when processes do not run as planned, by providing insight and avoidance measures.

AI gives companies advance warning of potential breakdowns, so they can avoid dangerous conditions, and minimise maintenance costs. For complex processes, multivariate analytics can identify those process variables that are critical to reduce off-spec production and lower waste.

DRIVING EFFICIENCY AND INNOVATION

The desire to make significant strides toward sustainability targets is also driving many companies to fundamentally change their energy sources and shift product portfolios.

This transition is taking time and requires substantial investment in new technologies. However, the potential payoff is significant.

Digital technologies are enabling companies to more quickly develop solutions to solve the challenges of the circular economy, where materials are re-used after initial application so fewer resources are used overall.

The solutions focus primarily on emissions associated with energy use, such as CO_2 and NOx, in addition to a move toward the use of alternative energy sources.

MARCH TOWARDS DECARBONISATION

We are seeing a growing focus across the industry towards "decarbonisation," or the reduction of the carbon footprint of a process or energy source.

These efforts target a reduction in carbon emissions associated with a process, for instance, using a lower-carbon fuel like natural gas instead of coal, or substituting wind or solar energy or renewable biomass for a fossil fuel.

Digital solutions aid these efforts by modelling and comparing alternative processes for various metrics, such as cost, emissions of CO_2 and other greenhouse gases for the energy delivery.

McKinsey's research on Europe's net-zero pathway suggests that this type of mature climate technologies could deliver as much as 60 percent of the emissions abatement needed to stabilise the climate by 2050.

There are many strategic and technological challenges to be overcome before this becomes a reality.

Many forward-looking companies have already begun this process, investing to build new capabilities, and developing innovative technologies and business models to achieve new targets.

Achieving the fragile balance of sustainability goals equally considering people, planet and profit is a considerable challenge, but one that must be addressed to be competitive in the capital-intensive markets of tomorrow.

Digital technologies will take centre stage during this transition, enabling the capabilities that will separate the winners from the losers.

About Aspen Technology
Aspen Technology (AspenTech) is a leading software supplier for optimizing asset performance. Our products thrive in complex, industrial environments where it is critical to optimize the asset design, operation and maintenance lifecycle. AspenTech uniquely combines decades of process modeling expertise with machine learning. Our purpose-built software platform automates knowledge work and builds sustainable competitive advantage by delivering high returns over the entire asset lifecycle. As a result, companies in capital-intensive industries can maximize uptime and push the limits of performance, running their assets safer, greener, longer and faster.

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