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UNICAT's catalysts boost efficiency

UNICAT Catalyst Technologies aim to advance Saudi Arabia's petrochemical and hydrogen sectors, supporting Vision 2030 through improved efficiency, cost savings, and reduced emissions – Page 10



AI to drive digital future of chemicals

AVEVA's AI and data solutions boost efficiency, resilience, and sustainability in chemicals, as Gulf firms adopt cloud and digital twin tech for smarter operations – Page 18



Swagelok leads in project management

The company offers global construction services, project management support, and international resources to support construction projects involving industrial fluid systems – Page 23

OIL & GAS FACES ALARMING CYBERSECURITY CRISIS

By **ABDULAZIZ KHATTAK**

● **69pc of top oil and gas firms scored D or F in cybersecurity**

A RECENT cybersecurity report reveals that 69 per cent of the world's top oil and gas companies are critically vulnerable to cyberattacks, scoring a dismal D or F in cybersecurity assessments.

However, most concerning is that 94 per cent of these companies have suffered, at least, one data breach, with over 50 per cent experiencing incidents in the past 30 days and 27.1 per cent in the last week alone.

According to the Cybernews Business Digital Index analysis, this alarming statistic, drawn from an evaluation of 391 of the 400 largest firms by market cap, underscores a sector-wide failure to secure critical infrastructure, leaving it perilously exposed to breaches, ransomware, and operational disruptions that could ripple through global supply chains.

The Cybernews research, utilising publicly available data from custom scans, IoT search engines, and domain/IP reputation databases, paints a grim picture.

A staggering 35 per cent of these companies received an F rating, the lowest possible score, while 34 per cent earned a D, highlighting systemic weaknesses.

Only 10 per cent achieved an A grade, indicating robust digital defences. The sector's average security score of 72 out of 100 places it firmly in the high-risk category.

Vincentas Baubonis, Head of Security Research at Cybernews, warns: "These ratings point to widespread vulnerabilities that could lead to operational shutdowns, plummeting stock values, and eroded investor trust."



Common vulnerabilities plague the oil and gas industry

A significant proportion of companies exhibit unresolved software patching issues, which means they have not applied important security updates.

Some 32 per cent companies are vulnerable to general patching gaps and 20 per cent are exposed to critical unpatched flaws that could allow attackers to exploit known weaknesses and gain access to their systems.

Issues with SSL/TLS configuration were identified in 91 per cent of organisations, indicating widespread failures in properly encrypting data transmissions — a flaw that can expose sensitive information to interception or tampering.

The data also reveals that corporate credentials have been stolen from over 80 per cent of companies, increasing the risk of unauthorised access.

Common vulnerabilities plague the industry, with 91 per cent of firms showing SSL/TLS configuration flaws, exposing sensitive data to interception.

System hosting issues affect 74 per cent, revealing insecure server or cloud setups, while email security is another weak point, with 48 per cent lacking protections against phishing and spoofing, and 38 per cent of domains vulnerable to email spoofing.

Unresolved software patching issues impact 32 per cent, with 20 per cent exposed to critical flaws that attackers could exploit.

Baubonis says: "A single breach can halt drilling, refining, or logistics, costing millions and disrupting global markets."

Geographically, Asia fares worst, with an average score of 65 compared to 74 in Europe and North America.

Asian firms show higher vulnerabilities, with 59 per cent of domains susceptible to email spoofing and 68 per cent reusing breached passwords, compared to 35 per cent and 31 per cent in North America, respectively.

High-risk vulnerabilities affect 30 per cent of Asian companies, against 23 per cent in Europe and 18 per cent in North America.

Qatar to expand LNG trade, targets profits

QATAR is aggressively expanding its liquefied natural gas (LNG) trading and production to seize profits previously lost to global traders, as QatarEnergy aims to dominate the global energy market.

A Bloomberg report quoting Saad Al-Kaabi, Qatar's Energy Minister and QatarEnergy's CEO, at the Qatar Economic Forum said the company's trading unit, established a few years ago, currently handles 10 million tonnes of LNG annually, with over half from non-Qatari sources.

By 2030, the goal is to trade 30-40 million tonnes of non-Qatari LNG, capitalising on market volatility and rising global demand.

Al-Kaabi noted that international traders were reselling Qatar's cargoes for profit, prompting the creation of a trading arm to retain those earnings.

"What we saw is that there was money left on the table," Al-Kaabi said. Traders from around the world "would buy our cargoes and make money off it. And we have the capability and can actually establish a trading organisation and we did."

Qatar, the world's second-largest LNG producer, is also increasing its output from 77 million to 160 million tonnes, with contributions from the North Field East project by mid-2026 and a US venture.

To support this, QatarEnergy will grow its fleet from 70 to 198 ships.

With global energy needs surging due to population growth and artificial intelligence, Al-Kaabi is confident in strong demand, particularly in Asia, and sees no risk of a supply glut.

QatarEnergy is negotiating sales with buyers in China, India, and beyond, aiming to secure long-term and spot market deals.

This strategic expansion ensures Qatar maximises profits while meeting the world's escalating energy demands.



Aramco deploys world-first Fe/V flow battery for gas well operations

ARAMCO, a leading integrated energy and chemicals company, has achieved a world-first by successfully commissioning a megawatt (MW)-scale renewable energy storage system to power gas production activities.

It is the first deployment globally of an Iron-Vanadium (Fe/V) flow battery as a backup solar power source for gas well operations.

Located in Wa'ad Al-Shamal, in western Saudi Arabia, the 1-MW/hour flow battery system is based on Aramco's patented technology and was developed in collaboration with Rongke Power (RKP), a global leader in flow batteries.

It can support up to five wells over its projected 25-year lifespan, offers a robust alternative to existing solar energy solutions, and can handle variable

power demands efficiently and cost-effectively.

It is specifically engineered to withstand the hot climate of Saudi Arabia and achieve optimal performance under extreme weather conditions, setting it apart from other vanadium flow batteries on the market.

According to Ali Al-Meshari, Aramco Senior Vice-President of Technology Oversight and Coordination: "The pioneering flow battery system spearheaded by Aramco's researchers represents a breakthrough for the oil and gas industry. Aramco already powers a large number of remote gas wells with solar panels connected to lead-acid battery systems, but our ground-breaking flow battery technology offers a flexible solution for diverse renewable energy storage requirements, making it an attractive option for

a variety of industrial applications. This is just one example of how Aramco is developing and deploying advanced technologies with the aim of enhancing energy efficiency and reducing emissions across its operations."

Flow batteries store energy in liquid electrolytes separately from battery cells, and electrolytes pumped into the cell convert chemical energy into electricity.

In addition to providing energy independence, flow batteries can be repeatedly discharged and recharged with minimal capacity loss.

They also reduce fire risks compared to other types of batteries, while their modular design makes them easier and less costly to maintain.

The new (Fe/V) flow battery commissioned by

Aramco aligns with the company's focus on renewables investment and energy efficiency, as part of its ambition to achieve net-zero Scope 1 and Scope 2 greenhouse gas emissions across its wholly-owned operated assets by 2050.

It offers enhanced electrolyte utilisation and reduced vanadium consumption compared to others available, and has a broad operating temperature range of -8 deg C to 60 deg C without the need for thermal management systems. It paves the way for further integration of the technology at isolated and unmanned oil and gas sites, providing an efficient power solution that can adapt to fluctuating demands without incurring additional expenses.

Read the Fe/V explainer in OGN's July edition

SABIC STAYS RESILIENT DESPITE MARKET SHIFTS

By optimising its business portfolio, driving cost efficiencies, and maintaining a steadfast commitment to innovation and safety, SABIC has positioned itself to navigate ongoing market challenges and pursue sustained growth in the years to come

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Abdulrahman Al-Fageeh announcing the Q1 2025 financial results

By **ABDULAZIZ KHATTAK**

SABIC, a leading chemicals company and 70 per cent owned by Saudi Aramco, has recently gone through a period of change, facing both planned strategic adjustments and ongoing market challenges.

Looking back at 2024 and the first few months of 2025, the company has actively worked to improve its business portfolio, streamline operations, and push for steady growth.

This has been necessary due to shifting market conditions, like an oversupply in the petrochemical sector and wider economic uncertainties.

Despite these hurdles, SABIC has stuck to its commitment to developing new ideas, focusing on sustainability, and building long-term value, keeping its strong position in the global chemical industry.

FINANCIAL PERFORMANCE & STRATEGIC DIRECTION

SABIC's financial trajectory over the past year reflects a concerted effort to adapt to and overcome a challenging market environment.

For the full year 2024, SABIC reported a net profit of SR1.5 billion (\$400 million), a significant turnaround from a net loss of SR2.8 billion recorded in 2023.

This return to profitability underscores the effectiveness of the company's carefully planned strategies and robust operational framework.

Revenue for 2024 reached SR140.0 billion (\$37.3 billion), with an EBITDA of SR19.5 billion (\$5.2 billion).

The company's resilience was further demonstrated by a stable EBITDA margin, despite the broader petrochemical industry facing persistent headwinds.

A substantial portion of this financial improvement can be attributed to the ongoing synergies realised through its association with Saudi Aramco, which accumulated to SR9.66 billion (\$2.57 billion) since June 2020, with SR3.04 billion (\$0.81 billion) specifically captured in 2024 alone.

These synergies have been instrumental in driving cost efficiencies and strengthening SABIC's competitive position.

The strategic divestment of non-core assets also played a crucial role in optimising SABIC's portfolio and enhancing capital allocation.

This included the sale of Hadeed, SABIC's metal business, its Functional Forms business (specialising in plastic films and sheets), and its stake in Aluminium Bahrain (Alba).

These divestments were part of a broader transformation programme launched in 2024, aimed at improving capital efficiency and fostering long-term value creation.

Looking ahead, SABIC has allocated between \$3.5 billion and \$4 billion for capital expenditure in 2025, signalling continued investment in strategic growth projects, including the Fujian Petrochemical Complex in China and the Methyl Tertiary Butyl Ether (MTBE) project in Saudi Arabia.

OPERATIONAL EXCELLENCE & INNOVATION

Beyond financial metrics, SABIC's operational performance and commitment to innovation remained key pillars of its success throughout the past year.

The company recorded its best-ever Total Recordable Injury and Illness Rate (TRIIR) of 0.09 in 2024, an 18 per cent improvement over the previous year, highlighting its unwavering dedication to Environment, Health, Safety, and Security (EHSS) excellence.

This focus on safety and operational integrity extended into Q1 2025, where the company saw a 17 per cent improvement in its safety, health, and environment rate (SHER) compared to the same period last year.

Innovation continued to be a cornerstone of SABIC's strategy, with 135 new products introduced in 2024, signifying a robust commitment to meeting evolving customer needs across diverse industrial sectors.

The company's innovative prowess was further acknowledged through numerous global awards, including five Edison Awards

in 2024 and six in 2025, alongside two R&D 100 awards and the EcoVadis Award.

These accolades underscore SABIC's ability to develop cutting-edge solutions that drive progress and address complex global challenges.

The company also maintained its position as the second most valuable brand in the chemical industry for the fifth consecutive year, with an estimated brand value of \$4.9 billion.

However, the start of 2025 presented a mixed financial picture. In Q1 2025, SABIC reported a net loss of SR1.2 billion (\$0.32 billion), although this represented a 36 per cent improvement from the SR1.9 billion loss in Q4 2024.

Abdulrahman Al-Fageeh, SABIC CEO, attributed the loss to the one-time costs related to business restructuring, which, he stressed, "will reflect positively on the company's long-term financial results and contribute to controlling its expenses".

Despite the net loss, revenue in Q1 2025 remained stable at SR34.59 billion (\$9.23 billion) quarter-over-quarter and showed a 6 per cent increase year-over-year.

Production volumes in chemicals and polymers saw a slight increase, contributing to stable sales performance, despite marginal overall decreases in agri-nutrients and polymers sales volumes.

The EBITDA for Q1 2025 stood at SR2.5 billion (\$0.67 billion), impacted by these restructuring costs, but an adjusted EBITDA (excluding special items) of SR3.7 billion reflected a 7 per cent increase from Q4 2024, with an EBITDA margin of 11 per cent.

Overall, SABIC's performance over the past year demonstrates a determined focus on strategic adaptation and operational excellence.

By optimising its business portfolio, driving cost efficiencies through integration with Saudi Aramco, and maintaining a steadfast commitment to innovation and safety, SABIC has positioned itself to navigate ongoing market challenges and pursue sustained growth in the years to come.

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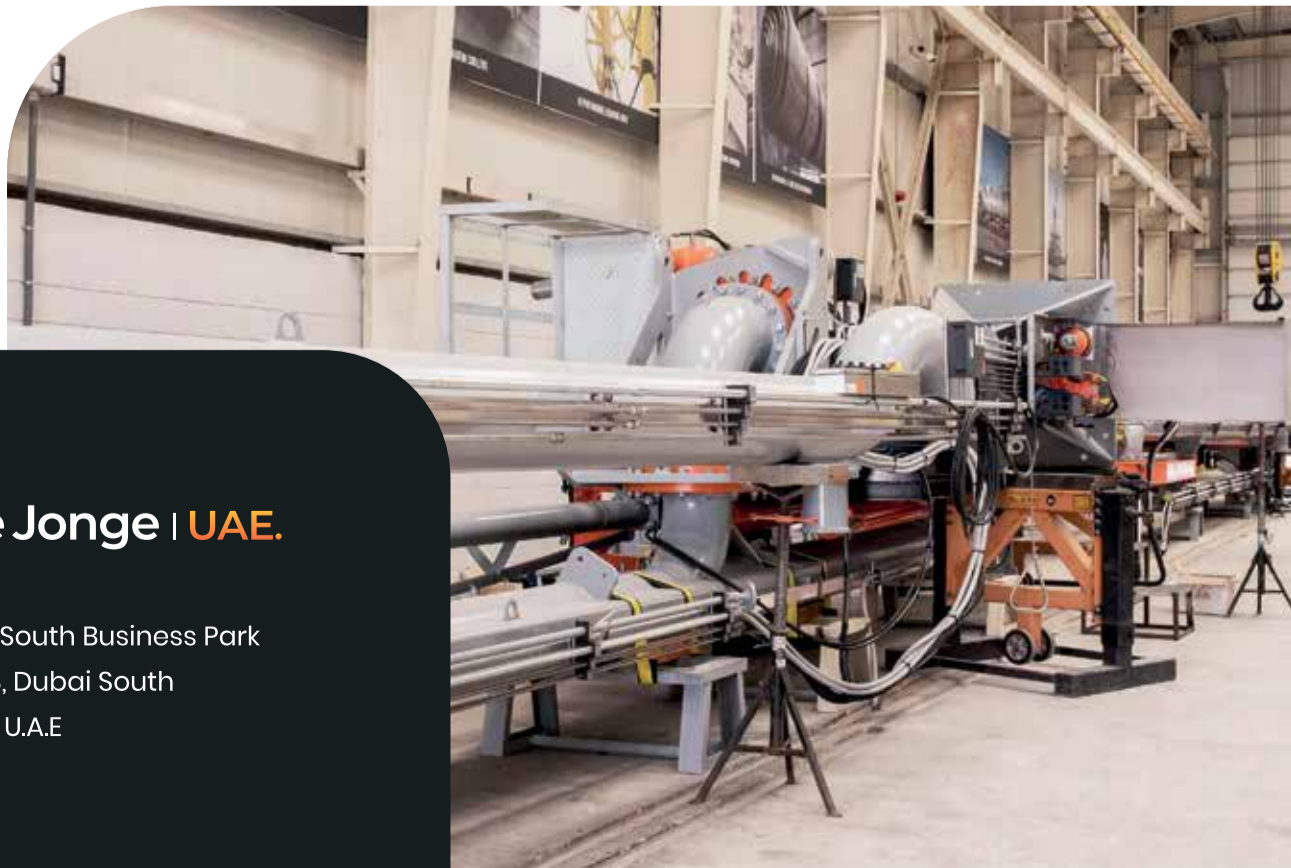
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- ✓ Upgrades from Hydraulic to Electric



SABIC's eco-materials shift Formula E into full throttle

Revolutionising electric motorsport, SABIC's advanced materials drive Formula E's quest for performance and sustainability, accelerating innovation from track to road

THE electrifying world of Formula E, where speed meets environmental consciousness, has found a pivotal partner in SABIC, a global leader in diversified chemicals.

Their collaboration extends beyond mere sponsorship, embedding SABIC as a principal and innovation partner, instrumental in propelling the championship's advancements in electric vehicle (EV) technology.

This synergistic alliance highlights how cutting-edge material science is not only enhancing the performance of electric race cars but also charting a course for a more sustainable future in the broader automotive industry.

From lightweighting and improved aerodynamics to fostering a circular economy, SABIC's innovative solutions are at the very heart of Formula E's ongoing evolution.

SABIC's commitment to Formula E is deeply rooted in its BLUEHERO™ initiative, a strategic endeavour aimed at supporting the global shift towards electric power and carbon neutrality.

The racetrack serves as an accelerated testbed for these innovations, allowing for rapid development and refinement before they find their way into everyday electric vehicles.

A prime example of this race-to-road technology transfer is SABIC's significant involvement in the GENBETA programme.

This live development platform, created with Formula E and the FIA, pushes the boundaries of EV technology, demonstrating the potential of advanced materials.

The GENBETA car, based on the GEN3, shows



SABIC's innovative chemistry drives competitive advantage in Formula E

cases the transformative impact of SABIC's highly engineered thermoplastics.

Applications include 3D-printed front wing endplates, injection-moulded wheel fins, and a wind deflector.

These components, crafted from materials within SABIC's TRUCIRCLE™ portfolio, a collection of circular polymers, are crucial for optimising airflow and reducing aerodynamic drag, contributing to enhanced acceleration

and overall efficiency.

The GENBETA car, notably, set a Guinness World Record for the fastest indoor speed, a testament to the integrated performance gains achieved through these material innovations.

The wheel fins, for instance, not only reduce drag but also aid in cooling the brakes, improving stopping power—a critical advantage in the demanding environment of street racing.

Beyond aerodynamic enhancements, SABIC's

materials are vital for other aspects of the Formula E cars, including the GEN3 and the latest GEN3 Evo.

These vehicles embody the principle of uncompromising sustainability; the bodywork incorporates linen and recycled carbon fibre from retired GEN2 cars, while a significant percentage of the tyres are made from natural rubber and recycled fibres.

SABIC's contributions extend to developing lightweight, highly efficient, and inherently flame-retardant materials that are crucial for EV battery systems.

The use of these advanced plastics, in contrast to conventional materials, offers multiple benefits: Reduced weight, streamlined manufacturability, recyclability, enhanced thermal management, and improved occupant safety.

This comprehensive approach aligns perfectly with Formula E's ambition to be the world's first net-zero carbon sport since its inception.

By providing solutions that contribute to the car's structural integrity, aerodynamic efficiency, and overall sustainability footprint, SABIC is not merely supplying materials but actively shaping the future of electric mobility.

Its ongoing work with commercial EV makers and partners ensures that the insights and breakthroughs gleaned from the demanding Formula E environment directly inform the development of more efficient, higher-performing, and safer electric vehicles for the road.

The collaboration between SABIC and Formula E truly exemplifies how innovative chemistry can drive both competitive advantage and a greener future.

Pioneering the industrial decarbonisation journey

THE global imperative to combat climate change has placed industrial decarbonisation at the forefront of corporate strategies worldwide.

In this pivotal landscape, SABIC, a global leader in diversified chemicals, has set a resolute course towards achieving carbon neutrality across all its operations by 2050.

This ambitious commitment, announced in 2021, underscores the company's proactive stance in addressing environmental challenges and driving sustainable practices within the chemical sector.

It is a journey propelled by significant investments in groundbreaking technologies, a relentless pursuit of operational efficiencies, and strategic partnerships aimed at redefining the industry's environmental footprint.

SABIC's roadmap to net-zero is not merely an aspiration but a tangible plan, reflecting a deep understanding of the complex interplay between industrial growth and ecological responsibility.

DRIVING DECARBONISATION THROUGH INNOVATION AND EFFICIENCY

SABIC's journey towards carbon neutrality is underpinned by a multi-faceted approach, focusing on innovation in production processes and the deployment of advanced technologies.

A cornerstone of this strategy is the shift towards cleaner energy sources and more efficient manufacturing assets.

The company is actively exploring and investing in technologies that reduce direct greenhouse gas (GHG) emissions from its operations.



SABIC's Home of Innovation Center in Riyadh

A notable example is the pioneering work on an electrically heated steam-cracking furnace, a critical component in olefin production.

This innovative technology aims to significantly reduce the carbon intensity of a historically energy-intensive process by replacing fossil fuels with electricity, ideally from renewable sources.

Furthermore, SABIC is enhancing its existing assets with energy efficiency improvements and optimising operational parameters to minimise energy consumption and associated emissions.

The company's commitment extends to exploring carbon capture, utilisation, and storage (CCUS) solutions, recognising their vital role in abating emissions from hard-to-decarbonise industrial processes.

Through strategic partnerships, such as those with Aramco, SABIC is progressing projects that aim to capture CO₂ from industrial sources and convert it into valuable products or safely store it, demonstrating a circular approach to carbon management.

Beyond operational transformations, SABIC's TRUCIRCLE™ portfolio plays a crucial role in

its decarbonisation efforts by promoting circularity and responsible consumption.

This comprehensive portfolio encompasses certified circular products derived from advanced recycling of mixed plastic waste, certified renewable polymers from bio-based feedstock, and solutions designed for recyclability.

By offering products with a lower carbon footprint and encouraging the reuse and recycling of materials, TRUCIRCLE™ contributes indirectly to reduced emissions across the value chain.


For instance, the use of certified circular polymers derived from pyrolysis oil, a product of chemical recycling, helps to displace virgin fossil-based materials, thereby lowering the embedded carbon.

Similarly, the development of lightweight materials and solutions that improve energy efficiency in end applications, such as in the automotive or construction sectors, further supports the broader decarbonisation agenda.

SABIC's focus on sustainable product design and stewardship aims to create a ripple effect, encouraging more environmentally conscious practices throughout the entire lifecycle of its products.

This holistic approach, combining direct emission reductions with value chain engagement, positions SABIC as a proactive leader in the transition towards a low-carbon economy.

The progress made in 2024, including the start-up of advanced recycling facilities and the development of new low-carbon solutions, signifies tangible steps on this ambitious pathway.



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Circular vision: Transforming plastics for sustainable future

SABIC spearheads the circular economy by revolutionising plastic recycling and pioneering advanced solutions to close the loop on valuable resources

THE transition from a linear “take-make-dispose” model to a circular economy is a defining challenge of our era, particularly within the plastics industry.

As a global leader in diversified chemicals, SABIC is at the forefront of this transformation, demonstrating a strong commitment to circularity through its innovative TRUCIRCLE™ portfolio and groundbreaking advanced recycling initiatives.

Recognising the urgency of resource optimisation and waste reduction, SABIC's approach goes beyond mere compliance, embedding circular principles into its core business strategy.

This commitment is not only about meeting environmental targets but also about creating new value streams, fostering sustainable consumption, and ensuring that vital resources remain within the economy for as long as possible.

Through strategic partnerships, technological advancements, and a forward-thinking product offering, SABIC is actively reshaping the future of plastics, proving that industrial growth and environmental stewardship can, and must, go hand in hand.

INNOVATING WASTE-TO-VALUE STREAMS

A cornerstone of SABIC's circular economy strategy lies in its pioneering efforts in advanced recycling, particularly chemical recycling.

This technology offers a crucial solution for plastics that are difficult to recycle mechanically, transforming mixed plastic waste into pyrolysis oil, a feedstock for new virgin-quality polymers.

A significant milestone in this endeavour is the successful start-up of the demonstration hydrotreater unit at its Geleen



SABIC's manufacturing site in Geleen, the Netherlands

site in the Netherlands, a facility capable of upgrading pyrolysis oil to enable its direct use in SABIC's crackers for the production of circular polymers.

This breakthrough signifies a crucial step in scaling up chemical recycling, enabling the creation of certified circular polymers with identical performance to virgin materials, thus facilitating their integration into high-performance applications like food packaging.

The TRUCIRCLE™ portfolio encompasses these certified circular products, along with certified renewable polymers from bio-based feedstock, and solutions designed for recyclability, including lightweight materials and mono-material structures.

These offerings provide brand owners and manufacturers with tangible ways to reduce their environmental footprint and meet their sustainability targets.

SABIC's commitment to closing the loop extends to collaborative projects that demonstrate the practical application of its circular solutions.

A notable example is the pilot project with Jessa Hospital in Belgium, which utilises SABIC's certified circular polymers for the production of reusable medical packaging.

This initiative showcases how advanced recycling can deliver high-quality, safe, and sustainable solutions even for demanding applications within the healthcare sector, reducing waste and promoting resource efficiency in critical environments.

Furthermore, SABIC's collaborations with various value chain partners, from waste management companies to brand owners, are crucial in establishing a robust circular ecosystem.

These partnerships are essential for securing feedstock, developing new applications for circular polymers, and educating consumers about the importance of plastic recycling.

By fostering such collaborations and continuously investing in research and development, SABIC is not only advancing its own circular goals but also contributing significantly to the broader industry's transition towards a more sustainable and resource-efficient future.

Investing in the growth and well-being of people

IN today's dynamic global economy, a company's greatest asset is its people. Recognising this fundamental truth, SABIC, places immense emphasis on cultivating a thriving workplace where employees feel valued, supported, and empowered to reach their full potential.

This commitment extends beyond mere professional development, encompassing a holistic approach to employee well-being that addresses physical, mental, and emotional health.

By investing significantly in talent management, leadership development, and fostering an inclusive culture, SABIC aims to attract, retain, and inspire a diverse workforce capable of driving innovation, operational excellence, and sustainable growth.

This comprehensive strategy reflects a deep understanding that a healthy, engaged, and continuously developing workforce is the bedrock of long-term organisational success and resilience.

FOSTERING CULTURE OF GROWTH & WELL-BEING

SABIC's approach to employee development is multifaceted, designed to nurture talent at every stage of their career journey.

The company offers a wide array of learning and development programmes, ranging from technical skill enhancement to leadership training.

Initiatives such as "Boot Camp 2024" for emerging leaders are critical in preparing the next generation of executives, equipping them with the strategic vision and practical skills necessary to navigate complex business environments.

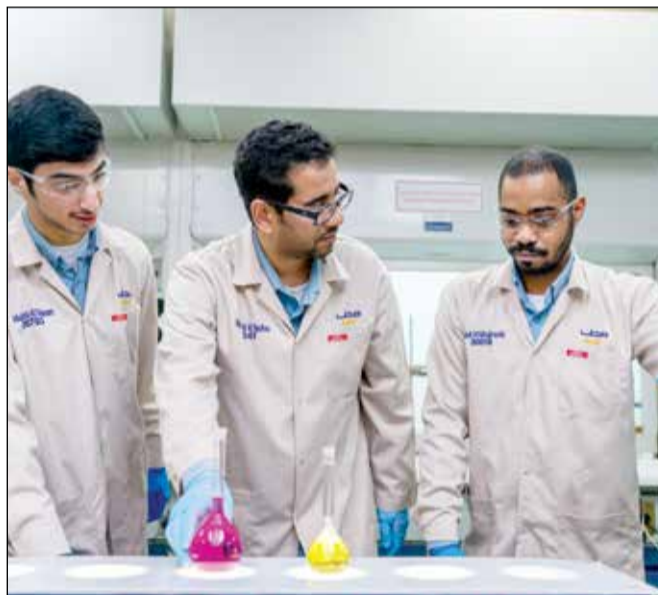
Furthermore, SABIC promotes a culture of continuous learning through digital platforms and mentorship programmes, ensuring that employees have access to resources that facilitate their professional growth and adaptability.

The concept of "Career Co-Ownership" empowers employees to take an active role in shaping their career paths, fostering a sense of ownership and accountability for their development.

This commitment to ongoing education and skill enhancement ensures that SABIC's workforce remains agile and capable of responding to evolving industry demands.

Beyond professional advancement, SABIC places a strong emphasis on the holistic well-being of its employees, understanding that a healthy workforce is a productive one.

The company has implemented comprehensive well-being programmes that address various aspects of employee health,



SABIC offers various learning and development programmes

including physical fitness, mental resilience, and financial literacy.

These initiatives are tailored to support employees through life's challenges, promoting a balanced lifestyle and reducing stress.

The high employee engagement survey response rates underscore the effectiveness of these programmes and the strong connection employees feel with the company's values and mission.

Moreover, SABIC is dedicated to fostering a diverse and inclusive workplace where every individual feels respected and has an equal opportunity to contribute.

By championing diversity, the company benefits from a broader range of perspectives and experiences, which in turn fuels innovation and strengthens its global competitiveness.

Through its integrated focus on professional development, holistic well-being, and an inclusive culture, SABIC is building a workforce that is not only highly skilled but also deeply committed and resilient, ready to drive the company's future success.

Future-proofing supply chains

FOR a global chemicals company like SABIC, maintaining robust supply chain resilience and effective risk mitigation strategies is not merely a preference but a fundamental necessity for sustained operational excellence and market competitiveness.

Recognising the inherent vulnerabilities of a highly globalised supply network, the company has focused on building redundancy and flexibility into its procurement and distribution channels.

This involves diversifying sourcing geographies for critical raw materials, establishing robust inventory management systems, and fostering strong, collaborative relationships with a global network of suppliers and logistics providers.

Such partnerships are essential for ensuring a stable and reliable flow of resources, even amidst disruptions.

Furthermore, SABIC leverages sophisticated data analytics and digital tools to enhance visibility across its supply chain, enabling real-time monitoring, predictive analytics, and rapid response to potential bottlenecks or unforeseen events.

The ongoing digital transformation initiatives, including advancements in cybersecurity, play a crucial role in safeguarding the integrity and efficiency of these complex systems.

Beyond operational resilience, SABIC employs a comprehensive risk management framework that systematically identifies and assesses a wide spectrum of potential threats, from market volatility and regulatory changes to operational disruptions and environmental hazards.

This proactive approach allows the company to develop robust mitigation plans, ensuring business continuity and protecting shareholder value.

In a world where supply chain and energy cost risks are intensified by geopolitical uncertainties, as noted in the 2024 Integrated Annual Report, SABIC's ability to navigate these complexities is paramount.



SABIC shipped the world's first blue ammonia in 2020

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FOAMGLAS® insulation systems mitigate fire risks, and can be used with above-ambient temperature applications. Their multiple-layer configurations, coatings, and other components are resistant to thermal cracking



FOAMGLAS cellular glass insulation can be prefabricated for piping applications



Prefabricated FOAMGLAS® impermeable insulation being installed

FIRES can result when combustible liquids, such as oils and heat transfer fluids, are absorbed by insulation materials (also called ‘wicking’). Even certain non-combustible insulation materials can absorb combustible liquids and, consequently, can contribute to the spreading of a fire.

Under certain conditions, these combustible liquids can auto-ignite without the presence of an open flame.

This occurs by slow oxidation and temperature buildup within the saturated insulation, and, finally, spontaneous combustion.

As a result, system engineers often specify non-absorptive, non-combustible cellular glass insulation systems as recommended systems for applications with a risk of leaking organic fluids.

Cellular glass insulation is also recommended for low-temperature applications to minimise the potential danger of condensed hydrocarbon gases or liquid oxygen and their risk of possible interaction with organic materials.

POSSIBLE PROBLEMS

Absorbent insulation materials can create a serious fire hazard because they can retain large quantities of combustible liquids should a system leak occur.

Compounding this potential danger is the fact that leakage and absorption may go undetected while developing into a serious threat to personnel, property, and production.

Fires caused by leakage into insulation lagging on hot surfaces have occurred with lubricating oil and hydraulic fluid in power stations and ship engine rooms, as well as with a variety of liquids in chemical and related industries.

Included in the wide range of potentially dangerous liquids and gases are heat transfer fluids, chemical intermediates, resins, solvents, vegetable oils, silicones, fatty acids, explosives, and oxidisers.

THE DANGER POSED BY AUTO-IGNITION

With heat transfer fluids, for example, hydrocarbons, slow oxidation occurs in porous insulation where system temperatures are above 260 deg C.

Insulation materials such as calcium silicate and perlite and various permeable materials offer a large reaction surface and space for the collection of vapour.

A slow exothermal oxidation reaction between the organic and limited air can begin at 260 deg C.

Then, when the insulation is exposed to open air during repairs, etc, ignition can take place because the organic is above its auto-ignition temperature.

Multiple pieces of research have shown that the auto-ignition temperature of certain heat transfer fluids was reduced drastically when absorbed by the insulation.

Oils such as lubricating, fuel, hydraulic, etc. can cause a similar auto-ignition action. The volume occupied by the penetrating oil in



Wicking of different insulation materials after absorption of combustible liquids

permeable materials enlarges by one-thousand-fold.

Oxidation begins immediately and the auto-ignition point could be reduced in such a way that the combination of oil, oxygen, and a permeable insulation material could lead to the material bursting into flames at routine operating temperatures. Studies of oil-soaked lagging fires have found ignition at temperatures as low as 80 deg C.

The auto-ignition temperatures for oils are much lower than those for heat transfer fluids. However, many specifiers are less aware of the potential danger with oils than those with transfer fluids.

Lower auto-ignition temperatures also occur with gases. For example, ethylene oxide, which normally has an ignition point of 571 deg C, was found to have a much lower ignition point after being absorbed by porous insulation materials.

LEAK SOURCES

Most major leaks result from component failure. Expansion joints, leaky valves, equipment flanges, and areas where insulation is in contact with flat surfaces are among the critical points that collect and absorb leaked chemicals.

These areas should receive extra attention when insulating your heat transfer pipework and system engineers recommend always using cellular glass insulation for these critical points.

FOAMGLAS® CELLULAR GLASS INSULATION

- **Non-combustibility:** Many manufacturers of heat transfer fluids often specify FOAMGLAS® cellular glass insulation material where organic leakage and contamination are possible.

The non-absorbent, inorganic, closed-cell nature of cell glass insulation prevents the absorption of liquid and vapour organics and eliminates the risk of auto-ignition within the insulation due to leakage.

- **Above ambient systems:** Heat transfer fluids are generally used at 175–400 deg C, which requires thermal shock-resistant insulation systems.

FOAMGLAS® insulation systems can be configured specifically for use with above-ambient temperature applications. Our systems may include multiple-layer configurations, coatings, and other components that are resistant to thermal cracking.

- **Cryogenic/cold and below ambient systems:** In low-temperature applications, gases can condense within permeable insulations and create a fire risk.

Some closed-cell materials, such as commonly specified cellular plastics can allow slow vapour diffusion when a vapour pressure differential exists between one side of the product and the other.

Within rigid, organic polyurethane and polyisocyanurate foam, combustible hydrocarbon gases can then accumulate in cells from which the blowing agent has diffused.

FOAMGLAS® cellular glass insulation finds widespread application in various cryogenic pipe applications due to its impermeability, non-absorbability, and non-organic nature.

For example, liquid oxygen can self-detonate by mechanical shock when in contact with organic and some inorganic materials.

Consequently, no organic insulation materials should be used at cryogenic temperatures below minus 183 deg C – the condensation temperature of oxygen.

FOAMGLAS® cellular glass insulation has been proven liquid oxygen-compatible as it will not interact with liquid oxygen, and minimise the dangers associated with oxidising organic materials.

- **Prefabrication and easy of inspection:** For both vessel and piping applications, FOAMGLAS® cellular glass insulation can be prefabricated, including pre-applied finishes, for efficient, time-saving installation and inspection.

For leak-prone valves and flanges, reusable covers of FOAMGLAS® insulation can be fabricated, incorporating latched, metal outer jacketing. These covers can not only save fuel without producing a fire risk but also provide easy access for inspection and maintenance.