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Decarbonization is the challenge of our time

How can the chemical industry reach net-zero by 2050 while still delivering everything the modern world needs, and wants? By partnering with a company who shares the vision that a low-carbon chemical industry is possible. **Enter Worley…**

↘ "The chemical industry is a key enabler of modern life. However, we've built much of it based on cheap and abundant hydrocarbon feedstocks and energy. And now, our industry needs to play its role in addressing climate change, while remaining a vital contributor of chemistry-based solutions for a sustainable world. To do that we need to change. And to change, we need world-class engineered solutions," starts Tony Frencham, SVP for Chemicals and Fuels at Worley.

"After spending more than 30 years working for chemical companies all around the world, it's now fascinating to be providing engineering services to those same companies and to the broader chemical industry," he says. "We view it as a privilege to support our customers as they embrace the challenges of today and of a net-zero future."

Delivering a more sustainable world

Frencham is surrounded by teams of people doing just that at Worley, the largest global provider of engineering services to the chemical industry. The company has become known and trusted after decades of successful project delivery and long-standing customer relationships. In 2020, it updated its corporate purpose to 'delivering a more sustainable world'.

"It's an exciting time to be leading sustainability at Worley. And updating our purpose was significant because it reflects the challenge of our time and the role we want to play in it," explains Clare Anderson, Group Sustainability Lead. "At Worley we take environmental, social, governance (ESG) very seriously. For example, we're committed to reducing our greenhouse gas emissions, with a net-zero ambition on Scopes 1 and 2 by 2030, and Scope 3 by 2050."

However, the company isn't just focusing inward when it comes to its ESG commitments. "We take a broad ESG view of the service we provide to our customers, too," explains Anderson. "Advisian, our consulting business, is well known for its technical expertise to the chemical industry, as well as providing environmental, societal, and asset sustainability advisory services."

Providing decarbonization solutions

Frencham and his team's focus is on helping their customers as they start to address decarbonization. "Whatever decarbonization challenge our customers face, we're here to help," says Frencham. "We love a challenge. And we don't believe you should have to separate your chemical engineer from your sustainability engineer – we're one and the same.

"We've been working with our customers to develop solutions across three main areas of focus – feedstocks, processes, and end-of-life," he adds.

Engineering for the future

"Feedstocks in the first instance means addressing those chemicals currently producing large carbon emissions during production. For example, traditional routes to hydrogen are now starting to be managed with carbon capture or by changing to electrolysis. We're also actively working with customers to convert to bio-based feedstocks where that makes sense," he adds.

Process changes are initially focusing on electrifying energy usage such as steam generation, and then supplying that electricity from sustainable sources.

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"We need to appreciate that a new chemical plant being engineered now will still be operating in a 2050 net-zero world. So we need to design in the ability to upgrade as low-carbon technology becomes available and economic."
Tony Frencham,
Senior Vice President, Chemicals and Fuels

upgrade as low-carbon technology becomes available and economic," says Frencham.

"While end-of-life considerations are about social license and the importance of resource stewardship" he continues. "Plastics are a great example where we're working with customers to convert this previously considered waste into energy, or feedstock, or fuel. Our best-in-class ability to scale first-of-a-kind technologies puts Worley at the forefront of these activities."

Sustainability is more than just an environmental viewpoint

The service Worley offers its customers in the chemical sector, and indeed all its sectors, goes beyond the requirement to decarbonize.

"We help our customers consider the sustainable management of water and land, and oversee the vital interactions with local communities, indigenous owners, and governments," explains Anderson. "We believe that sustainability goes beyond simply an environmental viewpoint."

Worley recently launched Sustainable Solutions. This incorporates sustainable thinking into project design and delivery and means its people can apply the latest sustainability methodology to project management, supply chain, engineering, and construction.

"Sustainable Solutions allows us to support our customers in reducing the environmental footprint of their plant and its future operations," says Frencham. "This means we help them get one step closer to their net-zero commitments."

> "We work with our customers to make sure that sustainability goes beyond simply an environmental viewpoint."
> Clare Anderson,
> Group Sustainability Lead



The path to net zero is clear

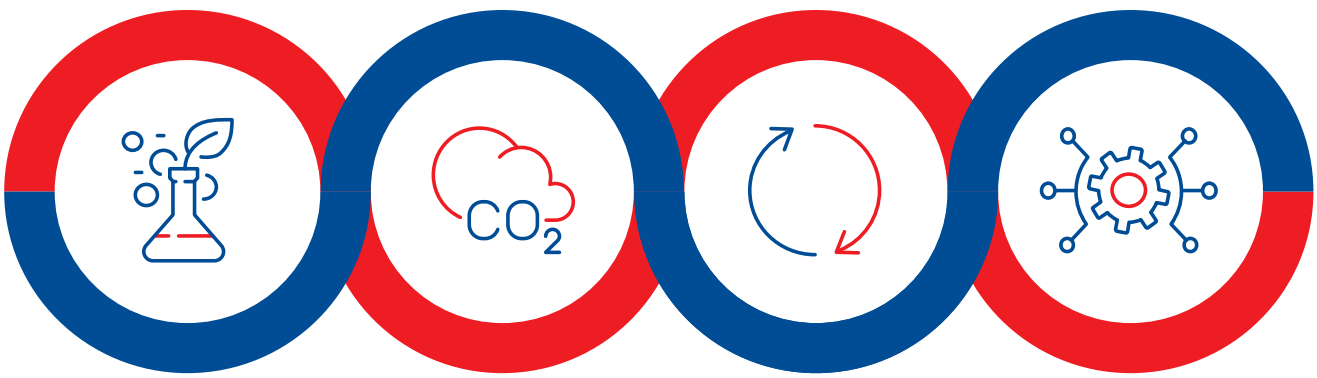
Frencham believes that the global climate response demands vision, innovation, and collaboration. He believes a low-carbon future for chemicals is possible. And that it can be one that sustains the environment and our lifestyles, all within our social expectations.

"It's about visualizing and working together along the supply chain to drive technological advancements at pace and scale, implementing strategies and policies and utilizing the resources we have in a responsible way.

"We know we're on a journey with our customers," says Frencham. "And more than ever, we're committed to our purpose of delivering a more sustainable world."

Scan the QR code to learn more about Worley's commitment to delivering a more sustainable world.

Future-proofing the chemical industry



Alternative feedstocks

- Synthetic feedstock from captured carbon
- On-purpose biomass feedstock
- Feedstock from municipal, industrial or biomass waste
- Blue or green hydrogen

Process decarbonization

- Generating and/or sourcing renewable electricity and fuels
- Microgrids and energy storage
- Energy efficiency and electrification
- Carbon capture, use and storage
- Regulatory and social license requirements

Resource stewardship

- Product recycling
- Circular recovery to new feedstocks
- Product recovery to alternative uses (e.g. fuels)
- Product waste-to-energy
- Water reduction and re-use

Digital transformation

- Digital twin for asset management
- Process simulation and optimization
- Operational monitoring and analytics
- Carbon accounting and compliance
- Information and regulatory control
- Data collaboration best practices

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First-of-a-kind: from vision to market

The path to net-zero in the chemical and related industries will rely on a mix of known and novel process technologies. Worley's experience in bringing emerging technologies to scale quickly and effectively and its expertise across many industry sectors gives it a holistic thinking process that ranges from lab-scale developments to megaton installations.

"Scaling up first-of-a-kind (FOAK) solutions from a lab, pilot, or demonstration plant to industrial is complex" says Frencham. "With a portfolio of more than 90 FOAK projects, we have an unrivalled track record of working alongside our customers at different project stages – from technology development right through to commercialization."



> "A huge amount of talent is invested every day to develop innovative solutions for our industries. We're here to help our customers bring these ideas to fruition."
> Geert Reyniers,
> Senior Director, Process & Technology

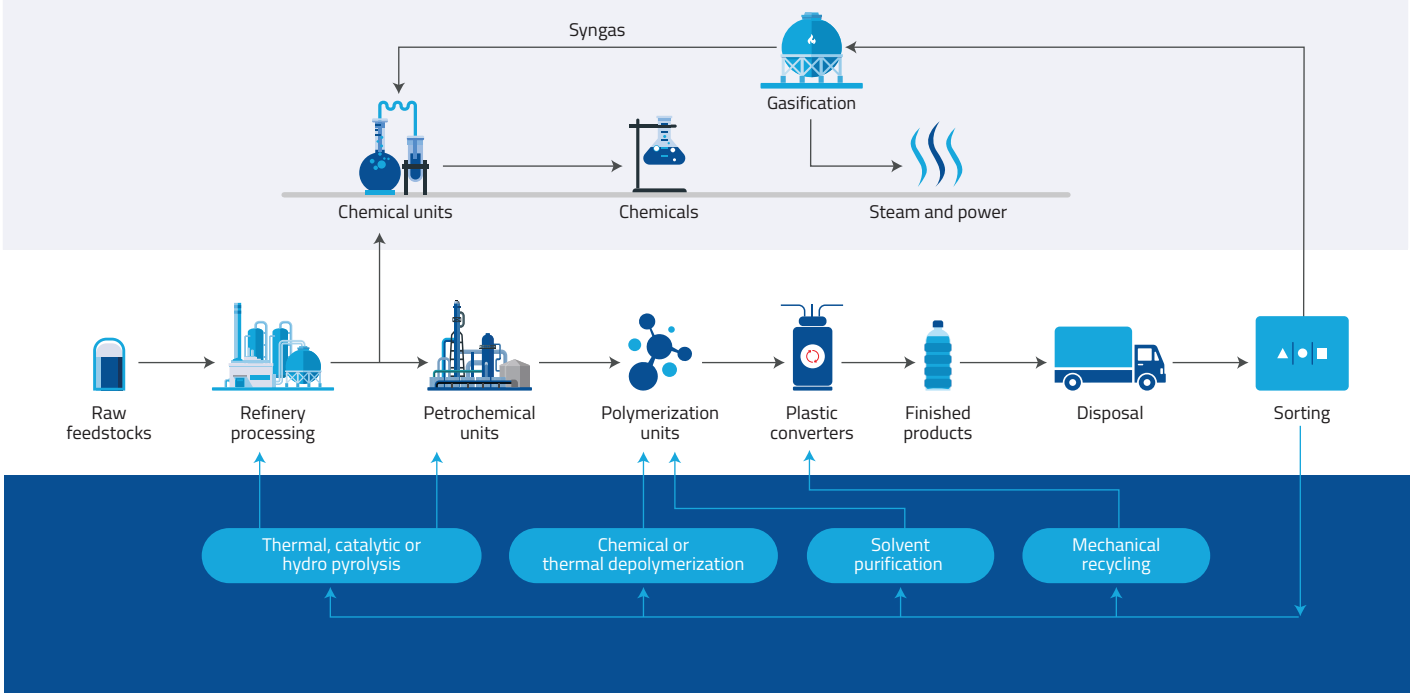
Geert Reyniers, Worley Senior Director for Process & Technology continues, "A huge amount of talent is invested every day to develop innovative solutions for our industries. We're here to help our customers bring these ideas to fruition.

"When we consider the variety of technologies being introduced to decarbonize products and processes, FOAK expertise is essential for navigating the energy transition successfully. Whether it be one of the circular processes in the diagram below, or another transformational process, the structured approach is the same."

Worley has a process for assessing the technology and then systematically moving it through the development of how to scale every dimension. This includes the design and engineering itself, factoring in sustainability, the utilities and logistics required, the fabrication and construction, and then all the way through to ongoing operations.

"Essential to the process is a learning mindset that brings the experience of the past and includes insights and improvements at each assessment stage," says Reyniers. "At the same time, risk management is always a focus element and is balanced with innovation. Successfully implementing and commercializing these new technologies is the goal: for our customers, for Worley, and for a net-zero future."

FEEDSTOCKS. PROCESSES. END-OF-LIFE. Worley has over 60 years of experience covering a broad range of chemicals and delivering solutions that introduce sustainable production pathways for the industry. ▼



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Turning net-zero ambitions into reality

If we develop energy infrastructure the way we always have, we won't get to net zero by 2050. We might not even get halfway. To decarbonize the world and meet the net-zero challenge there is only one choice around infrastructure. We need to entirely reinvent the way we deliver it.

Worley and Princeton University's Andlinger Center for Energy and the Environment explore the practical shifts required to develop and deliver the energy infrastructure needed to achieve our net-zero ambitions.

Drawing on research and analysis in Princeton's Net-Zero America study, it's apparent that achieving net zero is technically feasible and affordable. However, to do so is an immense infrastructure delivery challenge – unprecedented in global terms – which will require businesses and governments to transform how they engage communities and develop and deliver projects.

This paper focuses on supply-side energy infrastructure and outlines what's required to deliver a net-zero transition. It illuminates the significant delivery challenges that we face and outlines key shifts needed to transform project delivery to enable the necessary changes.

Scan the QR code to read our paper in collaboration with Princeton University's Andlinger Center for Energy and the Environment.



"We're excited by the opportunity to marry the research and analysis of the Andlinger Center with Worley's experience providing solutions to the sustainability challenges facing the energy, chemicals and resources sectors."
Chris Ashton,
Chief Executive Officer

About Worley

- 47,700 people in 49 countries
- 105+ hydrogen projects
- 90+ first-of-a-kind chemicals and fuels projects
- Early engineering services for one of the world's largest commercial green hydrogen facilities
- 3,015+ energy transition projects
- 30,000+ environment and society projects delivered
- No. 1 on Rystad's Energy Transition score[1]
- A top 20 ASX performer on ESG disclosure and alignment with UN sustainable development goals

[1] Rystad Energy, 17 June 2021

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