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REALIZE THE FUTURE

TECHNOLOGY HORIZONS

A publication by Zeton, the pilot plant specialists

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IN THIS ISSUE

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JOINING FORCES TO CREATE VALUE CHAINS IN THE CIRCULAR ECONOMY

Great initiatives arise when companies, universities, knowledge institutes and coordination partners join forces, share knowledge and work towards a common goal. Together, they create a value chain.

As mentioned in our Fall 2019 Horizons newsletter, we see a clear trend in the contribution of companies to a circular economy, where eliminating waste and the reuse of resources are central goals. Now, two years on, we see this has reached the next level as different industries and sectors are actively working to make the circular economy a reality.

These collaborations result in innovative projects, and multi-functional lab scale systems, pilot plants, demonstration plants and small modular production plants. The installations are designed and built in such a way that they are not only movable – transportable and modular - but also can be used by several parties from different industries.

Steel2Chemicals is an example of such a project. The project focuses on the development of a closed value chain in which CO (carbon monoxide) from residual gases from steel production can be used as raw material in the chemical industry. The overarching theme is the reduction of CO_2 emissions, and ArcelorMittal (Ghent), Tata Steel (IJmuiden), Dow Benelux (Terneuzen), Ghent University, TNO, and ISPT have been working on this joint project since 2015.

How does it work? At steel plants, blast furnace gas is captured and purified to remove N_2, CO_2 and sulphur, amongst others, after which naphtha is made from the carbon monoxide. This waste-based synthetic naphtha can serve as a raw material for the chemical industry.

After design and construction of the pilot plant at Zeton, the modular Steel2Chemicals pilot plant was shipped from Enschede to ArcelorMittal in Ghent, giving all parties sufficient opportunity to validate and optimize their part of the process.

After the project, the flexible pilot plant will move to Dow in Terneuzen to validate other syngas conversion technologies.

We are proud that all these parties chose Zeton as their design-build partner in their innovative projects and collaborations.

For more information on the Steel2Chemicals project, please visit S2C-Steel2Chemicals-ISPT, www.carbon2value.be, or www.dowcircles.nl.

FIRST LITRES OF SUSTAINABLE AVIATION FUEL PRODUCED BY SAF+ CONSORTIUM IN MONTREAL

SAF+ Consortium brings together companies and experts in the aviation industry with the mission to reduce greenhouse gas emissions in Canada through a drop-in, low-carbon jet fuel alternative. Drop-in fuels don't require any adaptation of the engine system and can be used the same way as conventional fuels, making the transition to cleaner alternatives easier, especially for aircrafts that can't turn to alternative energy sources and continue to need liquid fuels.

Their innovative design captures industrial CO_2 that is then mixed with hydrogen (obtained through water electrolysis) to produce syngas (CO and H_2). Using a catalytic synthesis process in a Fischer-Tropsch reactor, this syngas is then converted to a liquid drop-in jet fuel with an 80% smaller carbon footprint than its conventional counterpart.

Zeton came into this project in 2019, when SAF+ was chosen as one of four finalists in Impact Canada's The Sky's the Limit Challenge, which aims to further the availability and affordability of sustainable aviation fuel. SAF+'s Chief Technical Officer and Co-Founder, Alexandru Iordan, asked Zeton to help design and build their circular economy pilot unit to produce one of the world's first sustainable aviation fuels.

Scaling Up Challenges

Zeton's involvement at the earliest stages of basic engineering of the pilot unit meant we were prepared for the challenges that arose in the detailed engineering stage, such as accounting for the high temperatures at which the system needed to operate.

A particular concern was the use of an inefficient chemical in one of the process steps. We turned to our sister company, CDI, to help us with this costly, difficult-to-handle, and special disposal chemical that had to be reconsidered in the middle of the project. It was thanks to CDI that an elegant solution was found that regulated the feed gas composition and obviated the need for the chemical.

As a result of process changes like these during detailed engineering, the size of the plant became significantly larger and the intended indoor location was no longer feasible. Zeton considered several alternative approaches, including a hybrid with the plant partially indoors. Ultimately, the plant design was completely transformed, and the unit was situated entirely outdoors.

Despite the many challenges and tight deadlines, first litres of product were produced at the plant's ParaChem industrial site, east of Montreal in August 2021, and SAF+ is on track for Round 2 of The Sky's the Limit Challenge. The winner of the challenge will be announced in the spring of 2022, and Zeton wishes SAF+ good luck and all the best with the forward momentum on this exciting project that our team has helped them achieve. ■

ZETON DELIVERS HIGH ALLOY DISTILLATION UNIT TO NESTE

In collaboration with Neste, the world's largest producer of renewable diesel and sustainable aviation fuel refined from waste and residues, Zeton has designed a multi-purpose research plant in Porvoo, Finland where the wetted process materials consist almost exclusively of Hastelloy. This flexible and functional installation allows Neste to run multiple processes on the same plant.

Neste's creates solutions for combating climate change and accelerating a shift to a circular economy. They refine waste, residues and innovative raw materials into renewable fuels and sustainable feedstock for plastics and other materials.

With this distillation unit, Neste can support the growth in these areas by producing product samples for testing and customer trials in larger volumes.

Zeton and Neste have been successfully cooperating on pilot plants for over ten years.

Dr. Minna Westersund, R&D Manager, Piloting and Refining Research, Neste Innovation: "I want to thank the Zeton project team for showing excellent commitment and expertise to finalise the project on schedule. The cooperation with Zeton has been successful and smooth." ■

TEAM **SPIRIT** HIGHLIGHTING THE ACCOMPLISHMENTS OF OUR STAFF IN THE DUTCH AND CANADIAN OPERATIONS

COMING TOGETHER FOR A FUTURE WITHOUT CANCER

In recent years we have been confronted with cancer and the terrible consequences of this disease several times at Zeton, which is why we have decided to raise money for the Erasmus MC Foundation - Daniel den Hoed this year.

The Daniel den Hoed Foundation is taking on the fight against cancer by funding successful cancer research, carried out by the Erasmus MC Cancer Institute. They raise money for more scientific research at the Erasmus MC Cancer Institute. Every step closer to cancer cure is extremely important. Their goal is that every patient receives a unique, tailor-made treatment based on the most recent scientific results. A direct bridge is created between the research in the laboratory and the treatment of the patient.

The foundation organized the **TourforLife**, a spectacular bike ride of 1,300 km from Italy to the Netherlands, climbing through world-famous mountain passes from the Tour de France. One of our employees is friends with a group of people who took on this challenge. Zeton sponsored them, not only by raising money, but also through active participation. A group of colleagues, helped by the younger generation, collected litter in the Marssteden industrial park in Enschede. This beautiful initiative resulted in a total contribution of Euro 1,200 for the Erasmus MC Foundation - Daniel den Hoed, while also leading to an improvement in our local environment. Many thanks to all those who took part!

IN BRIEF

HIGHLIGHTING RECENT AND COMPLETED PROJECTS AND ENGINEERING STUDIES

- A biogas to methanol pilot plant
- An epoxidation demonstration plant
- A polymer testing plant
- An advanced catalyst activator pilot plant
- A chemical flow battery pilot plant
- A pilot plant for recycling PET polymer
- A fractional distillation pilot plant for a specialty chemicals application
- An engineering study for an HTL demonstration plant
- An engineering study for a modular flow chemistry API pilot plant

A hydrotreater pilot plant

A novel gas fermentation demonstration plant

The Marssteden Magicians – making litter disappear in Enschede, NL

A high-shear, chemically-assisted exfoliation pilot plant (under factory testing)

CONTACT US

TO DISCUSS YOUR PROJECT REQUIREMENTS, OR ITEMS IN THIS ISSUE OF HORIZONS, PLEASE CONTACT:

ZETON INC.

740 Oval Court
Burlington, Ontario
Canada L7L 6A9

455 Michigan Drive
Oakville, Ontario
Canada L6L 0G4

Phone: +1 905 632 3123
E-mail: info@zeton.com

David Edwards
Ravin Davè
Catalina Bayona Velez
Pratik Bhishikar

ZETON B.V.

Marssteden 206
7547 TD Enschede
The Netherlands

Marssteden 210
7547 TD Enschede
The Netherlands

Phone: +31 (0)53 428 4100
E-mail: info@zeton.nl

Herman Bottenberg
Robert-Jan Zwiers
Thomas Ladrak
Wouter Bolt

Visit us online at www.zeton.com