

TECHNOLOGY HORIZONS

A publication by Zetron, the pilot plant specialists

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IN THIS ISSUE

Expansion of a continuous flow pharmaceutical pilot plant for Roche

VITO takes delivery of Lignin-to-bio-aromatics pilot plant

Zetron delivers Permylene™ technology demo plant to Imtex Membranes

Zetron celebrates the expansion of our Michigan Drive facility

In Brief

AND MORE!



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A modular pilot plant for the continuous production of APIs

REALIZING THE FUTURE OF CONTINUOUS PROCESSING WITH ROCHE

Roche and Zetron have taken the next step in the realization of modular continuous processing. The Modular Pilot Plant for continuous chemical production of pharmaceuticals installed 2 years ago at Roche in Basel, Switzerland has been further expanded this year using Zetron's **ContiUnity™** platform; "Continuous production of a high-quality product with smart modules that work together in unity."

The adventure started three years ago. Roche and Zetron worked closely together to design and build a modular production platform for continuous processing. The novelty of this project was the introduction

of a very high degree of reconfigurability into a modular concept both in the hardware and the digital layers.

The project started with a Basic Design Study in which the scope was further developed. Points of attention included the limited footprint at site and the possible future integration into the customer's existing batch infrastructure. Zetron provided added value by offering solutions based on our previous project experience combined with our expertise in pilot plant design.

In 2022, the existing module portfolio was expanded with the addition of two

new module types. By incrementally adding new modules, Roche can quickly and easily transform and expand the existing line for a new process. The **ContiUnity™** modules are designed as building blocks, which can be used within multiple projects in different locations, providing sustainable and value-retaining solutions. Click here to view our animation about **ContiUnity™**

Kevin Gabriel, Project Leader, Roche: "With the ability of combining in house expertise with customer requirements, Zetron proved to be a valuable partner for the creation of our continuous processing platform." ■

VITO INVESTIGATES LIGNIN AS AN ALTERNATIVE SOURCE FOR FOSSIL-BASED CHEMICAL BUILDING BLOCKS



VITO, the Flemish research organization focusing on sustainability, has realized a pilot plant to demonstrate technologies to depolymerize lignin (or cut it into usable pieces) in a continuous processing mode, namely LignoValue Pilot. Replacing fossil raw materials products with bio-based, high-performance, and safe alternatives represents an important economic challenge for the European chemical industry.

Several studies have identified biomass containing lignin (e.g. wood, grass, straw, maize straw) as the choice for the sustainable production of chemicals and especially of bio-aromatics. The LignoValue Pilot is located on a specialized site, where safety, supply of raw materials, and removal of products are guaranteed.

Most of the processes to produce lignin-based bio-aromatics have already been developed and demonstrated at the lab scale. Since 2018, VITO has been committed to designing and building the LignoValue Pilot unit, enabling the first production of

bio-aromatics from lignin. Proofs-of-concept of the various process steps can be delivered with this installation. The LignoValue Pilot was built by Zeton B.V. and was installed at the pilot site at VITO in early 2022.

To realize an industrially relevant breakthrough in this domain, the pilot installation was designed to produce more than 100 kg of innovative bio-aromatics daily, via a continuous process. To this end, lignin in a solvent will be cut into smaller chemical building blocks in the presence of a catalyst and hydrogen. The availability in sufficient quantities of these small lignin-based building blocks will create a new value chain of innovative bio-aromatics in collaboration with material producers. The new value chains will contribute to a reduction in the dependence of the chemical industry on fossil and secondary raw materials and thus contribute to reducing the effects of climate change (CO₂ reduction).

In addition, the intended pilot line has been designed flexibly so that different process conditions can be adapted and tested to

produce the desired bio-aromatic fractions for market-oriented applications and product developments. All of this should lead to the delivery of the necessary techno-economic proofs-of-concept to achieve the next goal: building and operating a demo installation in Flanders for the conversion of lignin to bio-based, functionalized aromatics and the development of a lignin-based value chain of new chemicals.

"With the LignoValue Pilot unit we want to contribute to a more sustainable chemical industry by delivering the techno-economic proof-of-concept of lignin as an alternative source for fossil-based chemical building blocks for materials and applications. In this way, VITO wants to act as enabler, bridging the gap between lab and demonstration scale and hence paving the way towards future demonstration and commercial scale production of lignin-based chemical building blocks." Dr. Kelly Servaes, Lignin Project Manager, VITO ■

The ERDF LignoValue Pilot project is financially supported by the European Regional Development Fund (ERDF), the province of Antwerp and the Flemish Department of Economy, Science and Innovation.



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IMTEX REALIZES PERMYLENE™ TECHNOLOGY PLANT

Imtex Membranes Corporation is a Canadian-based company that is revolutionizing the olefin extraction and purification process. They have developed a novel membrane technology, the Permylene™ membrane, that separates the olefin-paraffin mixture to deliver polymer-grade olefins. This system is a high-performance alternative to traditional distillation separation processes that are energy-intensive and have long been considered uneconomical.

Permylene™ membranes use a naturally sourced polymer designed for industrial conditions. They are self-contained in modularized units that can be integrated into existing petrochemical refineries using industry standard spiral-wound membrane elements. This flexibility allows for the installation of any number of elements depending on the plant production capacity.

Zeton first worked with Imtex in early 2020 on a modular, pilot-scale plant (3 kg/h) for installation in the Middle East. Even as the pilot-scale plant was under construction, however, Imtex asked Zeton to begin work on a larger scale, demonstration plant (500 kg/h) meant for Canada. The core of

this plant design was flexibility and safety. It integrated two interchangeable membrane lengths and was designed to handle two different feedstocks at varying pressures, temperatures, and flow rates while complying with standards in both Ontario and Alberta.

Unfortunately, due to external factors, the initial site location for the demonstration plant had to be switched when the project was 90% complete. Both Imtex and Zeton worked diligently to complete the required design modifications. The primary focus for the adjustments came from a safety perspective to ensure that the unit could be successfully operated under the new scenario.

With good teamwork and flexibility, Zeton and Imtex were able to maintain the project schedule by adapting on the spot to work around the unexpected external factors. We were pleased to be able to deliver on our commitment and successfully ship the plant in 2021.

These projects highlight the importance of collaborating early in the project timeline, even while the process details are still being finalized. Our strong result could not have been achieved without a commitment to

communication between our companies in order to find the most efficient and rewarding way forward.

We are proud that Imtex Membranes, a local company, chose to team up with Zeton to realize their Permylene™ technology. Congratulations to both project teams on this impressive achievement!

"Imtex offers an economically viable solution to olefin purification, recovery and upgrading that serves a low-carbon economy. Zeton's engineering expertise has provided a significant contribution to the advancement of our technology." Karlis Vasarais, CEO, Imtex Membranes ■



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

CELEBRATING THE EXPANSION OF OUR MICHIGAN DRIVE FACILITY

Since 2016 the Zeton team has been tirelessly working in the expansion of the Michigan drive facility to accommodate project workload and personnel. And now, six years after Zeton first opened the new satellite manufacturing facility in Oakville, we are celebrating the grand opening of the next phase of the building expansion, which is large enough to accommodate Zeton Canada's entire operations.

With over 77,000 square feet, the building was constructed with three high bays that can accommodate skids up to 48 feet in height, three low bays, and a bay designed specifically for the fabrication of sanitary

systems for the food, biotech and pharma industries and electronic chemical systems for the semiconductor industry. The facility is designed in such a way that it can be expanded again in the future to accommodate additional staff and project workload.

The September 29, 2022 grand opening was a great opportunity for everyone to meet again in person and enjoy a nice afternoon socializing, and for our guests to tour around the shop.

A big thanks to the teams that made this amazing building possible!



IN BRIEF

HIGHLIGHTING RECENT AND COMPLETED PROJECTS AND ENGINEERING STUDIES

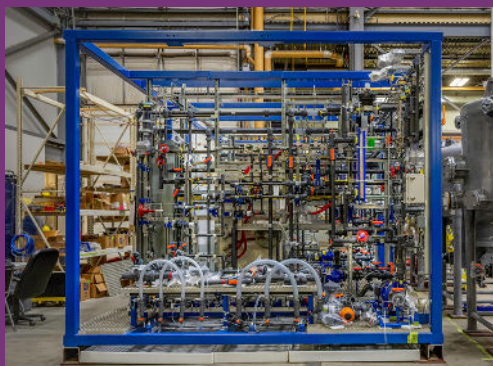
- A production scale heptane recovery system
- A two-column continuous distillation plant for the semiconductor industry
- A basic design study for a CO₂ conversion pilot plant
- A basic engineering study for a continuous polymerization unit
- Multiple pharma production modules
- A lab scale pyrolysis unit
- A basic design study for a biomass to hydrogen pilot plant



A methanol to ethanol conversion pilot plant



An acid leaching pilot plant



A flow battery pilot plant



A CO₂ to fuels and olefins conversion pilot plant



CONTACT US

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