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Researchers at Wageningen UR are investigating the possibility to use biomass as fuel and as starting material for bulk chemistry, for the Port of Rotterdam. In addition, they are trying to make better use of the residual streams from various industries. Objective is to respond to an increasingly green market.

# BIO-BASED HARBOR ECONOMY

**B**iomass' is a very vague term, they say in Rotterdam. "Everything is biomass, and that includes us", says Wijnand Schonewille. He is *business developer* at the Port of Rotterdam, which among other things is responsible for development, management and exploitation of the port. He feels that 'green fuel' would be a better term. "Well-known examples are ethanol from sugarcane, and glycerol, a residual product of the production of biodiesel from vegetable oils." At the Agrotechnology & Food Sciences Group of Wageningen UR, they are now finding out for the Port of Rotterdam to see whether there are other candidates. Schonewille: "That is important for our customers: the transporters, traders and transshipment businesses, but above all for the plants in the port area which is where a large portion of Dutch oil refinery and chemicals production takes place."

Various industries are currently striving for greener production, encouraged by legislation and subsidies. Moreover, the Port of Rotterdam has set itself the goal of having halved the local CO<sub>2</sub> emissions in 2025, within the framework of the *Rotterdam Climate Initiative*. There is a call to replace fossil fuels by green fuels: a *bio-based economy*.

## A plethora of polymers

"Four years ago, we started thinking about what this might mean for the Port of Rotterdam", explains Schonewille. "We had already set our sights on biofuels, but we hadn't done a thing yet with green

The oil port near Shell Pernis, with a new plant for biofuel in the background.

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bulk chemistry. So we started looking at who might be able to support us with that." Professor Johan Sanders of the Wageningen chair 'Valorization of plant production chains' knew us from conferences and that's how the cooperation came about.

Sanders describes the bio-based economy as a society in which we are less dependent on oil, coal and natural gas for our raw materials and energy. "Our current surroundings contain a plethora of polymers: they are currently still mainly produced on the basis of oil, via all sorts of intermediate products." Sanders explains that oil consists of mainly carbon and hydrogen, and chemical reactions are used to attach nitrogen and oxygen atoms at the right sites. "That takes quite an effort. It can only be done with the aid of a lot of energy and with ancillary compounds such as chlorine. In nature, however, the nitrogen and oxygen atoms are often already present in the right spots, for example in amino acids and glycerol. If you can use these plant compounds, you are able to skip many of those daredevil petrochemical steps." His research group established that seventy percent of the production of chemicals in Rotterdam could take place on the basis of green ingredients.

## In the pipeline

"We want to be able to spot changes in the industry so that we can continue to serve our customers well", says

Jan van der Zande, a colleague of Schonewille at the Department of Process Industry and Bulk Goods.

"Bioethanol from edible grain kernels currently spawns a lot of discussion, however. But you would be able to use the leaves and stems for chemical source materials without any problems.

You can convert what's left into liquid transport fuels and the lowest-grade

material that's left behind after that, you can combust it to generate electricity. With the aid of biorefinery, you can get more from plants."

There are currently several pilots in the pipeline. One of those is the separation of various components from the residual streams from a rape seed oil plant. The rests remaining after the oil has been pressed from these seeds is used as pig feed. Sanders: "We are looking into whether it is possible to extract the valuable potassium and phosphate, which the pigs largely excrete again, and the cellulose, which they don't digest at all. That way, the pigs get the proteins and you can sell the minerals for the production of fertilizer and the cellulose as fuel. This also increases the profits."

According to Schonewille and Van der Zande, Wageningen UR possesses a lot of knowledge of the developments around green source materials and their meaning for the industry. "They understand production and origin of biomass, and that is important to us as a large transshipment port."

photo: Hollandse Hoogte

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