



ICABUS

Toilet paper pulp harvested from wastewater

**Taking the Waste
from Wastewater
and harvesting a lucrative resource**



15 million toilet rolls per week



On average, the Dutch use 1 roll of toilet paper per person per week. This means that around 15 million rolls enter the sewer system every single week. Wastewater from the sewer system is collected and cleaned in wastewater treatment plants, then discharged to surface water.

The toilet paper in the water generates about a third of the load to these facilities, resulting in energy consumption for aeration and sludge for incineration.

▶ **At Purgatoria, we stand behind the 3 S's:**

- *Sustainable relationships*
- *Sustainable companies*
- *Sustainable products*

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**Toilet paper pulp
harvested from
wastewater**



Purgatoria introduces the ICABUS



- ▶ The innovative sieving system of the ICABUS removes toilet paper pulp from wastewater before the treatment process begins.

This reduces the load to the sewage treatment system, which helps in aeration energy, sludge disposal. It also has proven to be beneficiary for nitrogen removal and the greenhouse emissions of methane and nitric-oxide. Paper pulp can be reused in various ways - to generate biogas, for example. Green energy and raw materials from toilet paper waste: Purgatoria's ICABUS makes it possible!

Sieve first, then purify

In a wastewater treatment plant, coarse materials are first removed from wastewater to prevent clogging of pipes and pumps. This is usually done with sieves that have an opening of up to 6 mm. However, these sieves do not filter out toilet paper pulp.

Green energy and raw materials from toilet paper waste

For this, fine-mesh sieves with openings of 0.35 to 0.50 millimeters are typically required. Although various wastewater treatment plants are now equipped with these ultra fine sieves, the roll out of this technology has been hampered due to high investments and operational costs, and operational issues with the existing technologies.



Paper is typically reused up to 25 times before the fiber is made into toilet paper. Purgatoria aims to give the fiber at least one more cycle as a raw material or to use it to generate green energy.

The ICABUS is the number-one solution for the removal of toilet paper pulp from wastewater

Thanks to its relatively large screening holes, Purgatoria's ICABUS not only allows toilet paper to be filtered from wastewater, it does so in a cost-effective manner.

Better technology for a better world

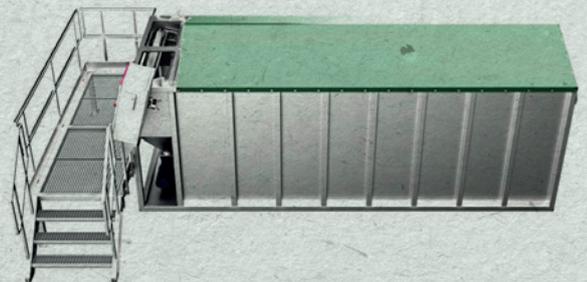
De ICABUS

The innovative sieving system of the ICABUS is designed to filter fibers from wastewater. It is built for large water flows (700 - 1000 m³ per hour for wastewater). The patented small angle of the ICABUS sieve makes it possible to remove most of the paper fibers with relatively large sieve holes (1 and 1.5 millimeters). The harvested pulp is not contaminated with other small waste particles as is normally the case with fine- mesh screening.

Larger sieve holes have the advantage of being easier to keep clean. The sieves of the ICABUS are cleaned with brushes that push the harvested pulp into a discharge chute. The speed of the brushes is determined by the water level in the filtration zone of the ICABUS. Increases in the volume of water or fibers result in a higher speed, optimizing the performance of the ICABUS. Clogging by organic matter or grease is not an issue with this system. The ICABUS continues to do its job without an operator having to supervise it.



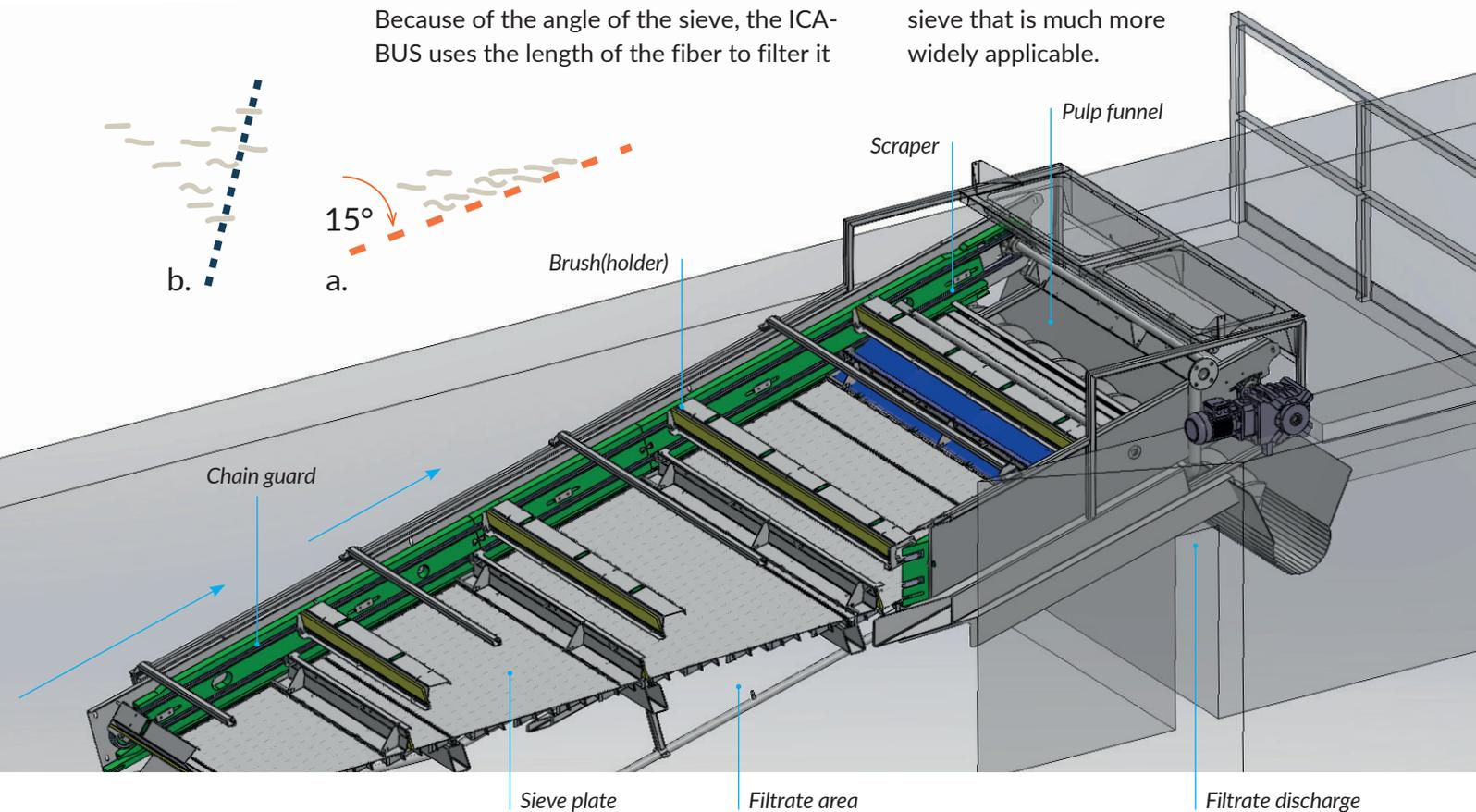
Working with a number of water authorities, Purgatoria developed a business case. This shows that an ICABUS sieving system pays for itself within three to four years if an existing fermenter is used to ferment the toilet paper pulp. Recovering cellulose from toilet paper is not only ecologically sustainable, it's also economically lucrative.



The ICABUS sieve

ICABUS technology is unique because of the height of the sieve. This sieve lies almost flat, at an angle of 15° (see a) instead of 70 to 80° (see b), which is typical for wastewater treatment plants. There is an important reason for this: particles in water orient themselves in the direction of the water flow. A log in a river turns until it is parallel to the direction of flow. Fibers in water behave similarly. Because of the angle of the sieve, the ICABUS uses the length of the fiber to filter it

out of wastewater. In contrast to other sieves, the ICABUS does not filter by using the diameter of the fiber, which is much smaller. Thanks to this unique technology, the ICABUS is the only system able to use larger holes to filter out toilet paper. Thus, the ICABUS provides an inexpensive, high-capacity fine-mesh sieve with low operating costs, resulting in a fine-mesh sieve that is much more widely applicable.



The machine requires very little attention from the management organization, and combines low operating costs and limited investment with high capacity.

The ICABUS is a simple, robust installation made of stainless steel (304 or 316) and polyethylene (mainly UHMPE), and is available as plug-and-play container or as a plug-in system for a concrete channel. The complete unit includes a receiving chamber with a large intake, a sieving chamber, sieving plates, brush holders with brushes, chains to pull the

brush holders, a drive shaft with sprockets for the chains, a motor, a scraper to keep the brushes clean, and nozzles to clean the base of the sieving plates. A shaftless screw for pulp discharge is included. The system can be equipped with an operator platform if desired, and with or without controls.

The standard ICABUS has 10 m² of sieving area, and an installation size of approximately 6.5 x 2.2 x 2 meters (L*W*H). The system has a capacity of 700 to 1,000 m³ per hour for municipal wastewater (300 mg per liter of undissolved constituents).

The advantages of the ICABUS

De ICABUS: patented new technology for the recycling of toilet paper fibers

- **Energy-efficient**
The ICABUS requires only 250 W of energy for a capacity of 700-1000 m³ per hour.
- **Very robust, in concrete or in a container, and low-maintenance**
The ICABUS operates smoothly and requires minimal maintenance. Management and maintenance costs are low, as are investment costs.
- **No clogging problems caused by grease or other contamination**
Thanks to its unique design, the ICABUS handles organic material and grease effortlessly, without any risk of clogging. This results in a worry-free process for your operator.
- **Cost benefits**
The ICABUS provides significant cost benefits compared to other fine-mesh sieving systems. The payback period is 3 to 4 years if you are using an existing fermenter. When using a new fermenter, the payback time is 6 to 8 years.
- **Fermentation**
The pulp from the sieving process can be fermented and used to produce biogas (40% more biogas compared to surplus sludge alone) or to make a carbon source for phosphate and nitrogen removal.
- **Circular economy**
The harvested toilet paper fibers can be reused to produce new, sustainable products, thus completing the value chain.



By 2030, 20% of the natural gas used by households for cooking, showering and heating must be of renewable origin. Purgatoria's ICABUS brings this goal one step closer.

- **Wastewater Treatment**
The ICABUS reduces the amount of undissolved components that enter the wastewater treatment plant by 30%. When the wastewater no longer contains fibers, it leaves more room for the bacteria that 'clean' the sewage. This increases sludge activity, which in turn benefits phosphate and nitrogen removal (P and N removal). This can help meet the requirements of the Water Framework Directive. It also requires 14% less aeration energy and reduces the amount of surplus sludge by 20%.
- **CO2 reduction**
Approximately 1,300 kilograms of CO₂ is reduced per ton of sieved material.

Total implementation costs for the ICABUS are about 50% lower than those of a belt sieve.

According to the Aa and Maas Water Authority's estimate, its implementation costs are more than 50% lower. This is due to the simplicity of the ICABUS. It requires no compressed air and no pumping phase to feed the ICABUS.

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Purgatoria comes from the Latin Charta Purgatoria, which means toilet paper. Toilet paper is thrown away after use and often burned as sewage sludge. Purgatoria believes that this should be done differently. Our ICABUS sifts toilet paper pulp from wastewater and gives it a new purpose. By doing so, Purgatoria contributes to a circular economy and a more sustainable world.

The ICABUS system offers several options for recycling toilet paper fibers and improving your water treatment process. Discover the potential of Purgatoria and contact us for more information, a pilot test or a detailed business case.

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