



Carbon capture and storage powered by pyrolysis

SkyClean removes CO₂ from the atmosphere

SkyClean is a carbon-negative climate technology that uses biomass to remove carbon from the atmosphere by harnessing the natural ability of plants to capture CO₂ through photosynthesis.

How SkyClean pyrolysis works

In the SkyClean pyrolysis process, biomass is used as feedstock and transformed into biochar and gas. This is done by heating to about 600°C in a special oven with an oxygen-free atmosphere.

During the pyrolysis process, roughly half of the carbon in the biomass is converted to biochar, while the other half becomes gaseous or liquid hydrocarbons, such as oil.

Biochar is a biologically stable material that sequesters carbon effectively, and the carbon that turns into biochar is essentially removed from the atmosphere.

Pyrolysis is a versatile biomass-to-energy platform

The pyrolysis gas can be used as fuel in many applications. Some of the gas can be condensed into bio-oil for use in the energy, industrial, or transport sectors. Both the gas and the oil can also be further processed into PtX solutions, such as biomethane, green methanol, and eventually aviation fuel.

Biochar is a powerful climate tool

Certified biochar

SkyClean biochar is eligible for certification according to the voluntary European standard EBC. The certification adheres to EU thresholds and national legislation, ensuring the production and use of biochar that prevents or reduces hazards to health and the environment. It includes quality criteria for heavy metals and various toxic substances, such as PAHs, dioxins, and PCBs.

No tar contamination

SkyClean's pyrolysis process includes steps that prevent tar condensation on biochar. This safeguards against the risk of tar contamination on biochar, which has historically been a challenge.

Carbon sink stability

SkyClean's pyrolysis process ensures that 75-90% of the carbon in the biochar will be retained in the soil for centuries.

Improved soil properties

Biochar improves drainage in clay soil, retains water in sandy soil, and boosts carbon content in depleted soil. It reduces nitrogen leaching and preserves nutrients. Biochar from biogas fibers, rich in phosphorus, can help balance phosphorus supply between Western and Eastern Denmark.



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www.stiesdal.com



SkyClean handles multiple types of biomass

SkyClean's value streams

SkyClean has two main value streams, each with its own market value and climate impact:

- Biochar, with a carbon-negative climate effect, forms the basis for carbon certificate sales.
- Pyrolysis gas and other green energy products that replace fossil fuels.

20 MW standard plant rating

Stiesdal SkyClean develops pyrolysis units with a capacity of 20 MW. This capacity is calculated based on the calorific value of the biomass processed by the plant.

Multiple types of biomass by-products

Most types of biomass can be used as feedstock in the SkyClean process: straw, deep litter, slurry, residual fibers from biogas plants, press cakes from grass protein production, and other types of organic waste from agriculture or forestry. This includes wood chips, grass and garden waste, and residues from industrial production at dairies, among others. Wet biomass, such as biogas residual fibers, must be dried to a water content of 10-12% prior to treatment in SkyClean. Additionally, raw materials are pelletized before pyrolysis.

Wet feedstock, for example biogas residue fibers

Feedstock processing capacity:

- Hourly: 4,3–4,5 ton feedstock, dry basis.
- Yearly: 35.000-40.000 ton feedstock, dry basis.

Energy production: 6-7 MW heat at 150 °C.

CO₂ storage 22.000–25.000 ton CO_{2e} per year.

Biochar production: 12.700-13.300 ton biochar per year, dry basis.

Power consumption: 1 MW.

Availability: 8.000 hours per year.

Facility footprint: 2.000-3.000 m².

Dry feedstock, for example straw

Feedstock processing capacity:

- Hourly: 4,3–4,5 ton feedstock, dry basis.
- Yearly: 35.000-40.000 ton feedstock, dry basis.

Energy production: 8-10 MW heat at 150°C – 1.000°C.

CO₂ storage: 19.000–23.000 ton CO_{2e} per year.

Biochar production: 8.500-9.500 ton biochar per year, dry basis.

Power consumption: 600 kW.

Availability: 8.000 hours per year.

Facility footprint: 1.000-1.500 m².

Range values are influenced by variations in the calorific value of feedstock, moisture content, certification scheme, plant layout, and other factors.

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