

Intermittent production of high-purity “green” methane, using CO₂ extracted from the air (DAC) and hydrogen produced from electrolysis.

THE NEED

- Sourcing high-purity “green” methane that is required in the synthetic diamond production process, converting the CO₂ removed from surrounding air from a direct air capture technology
- A sustainable process for methane production to fit the carbon-neutral and ethical goals of Skydiamond, oppositely to traditional diamond mining, which releases enormous quantities of CO₂ in the process
- A way to control the methane production rate. Produce only as much needed for the manufacturing stream and avoid waste
- Absolute novelty, so the whole process had to be engineered and designed to fit into the overall production chain
- Meeting the stringent criteria of methane purity required (99 Vol.% CH₄ and less than 100 ppm residual impurities)

DID YOU KNOW ?

- The first Skydiamond was produced in 2018
- A ‘Life Cycle Analysis’ report was completed by Imperial College London consultants giving Skydiamond a negative carbon footprint of -6kgs CO₂e per one carat. This means the production process eliminates more CO₂ than it releases in the atmosphere!
- To achieve the required objective of highest purity and carbon-neutral methane production, Krajete GmbH designed a fully integrated and automated 40ft container with all the required process elements
- The container solution integrates 3 different technical areas (zones). A lab preparation zone, an electronic cabinet with all the automation and instrumentation for remotely operating the process and an ATEX reaction zone with the biological conversion step and the two-step off-gas purification to reach high purities

BENEFITS

- **Entirely carbon neutral & eco-friendly process: Methane produced from captured CO₂ + Renewable energy needed for the electrolysis step**
- **The entire production system can be remotely monitored and activated through an “ON/OFF” switch, thus avoiding excess production or waste.**
- **The container can intermittently produce a tuneable mix of H₂/CH₄ with up to 99.2 Vol.% CH₄ and less than 100 ppm residual impurities other than the gases of interest.**

AT A GLANCE

Skydiamond needed a solution to produce high-purity methane as a feedstock into their synthetic diamonds manufacturing process.

We enabled this methane production through our biomethanation technology with the added value of contributing to CO₂ removal from the surrounding air.

KEY TAKEAWAYS

If you have excess CO₂ or NO_x production involved during your manufacturing process, we can employ similar technologies to turn your polluting gas emissions into valuable products, that you can either re-scope in your production line or potentially sell to a third party.

If you need high-purity gases to fulfil specific manufacturing requirements, we can help you do that while achieving carbon neutrality simultaneously.



What stood out for us was the flexibility of the process, which operates flawlessly and can be adjusted to run intermittently, aligning perfectly with our workflow.

Krajete enabled us to create an ongoing and workable solution in our journey to build a world’s first process here in the UK to create a carbon -negative man-made diamond.

They brought a level of innovation and insight that was previously lacking in the industry. They also understood our complex requirements, leading to the successful integration of their technology into our diamond production line.

Kevin Emery

Head of Innovation - SKYDIAMOND

