



EKOGEA

Biogas Enhancement Solutions

Advanced Biogas Process Technology

Higher Methane Yield | Lower Operating Costs | Sustainable Energy

Ekogea d.o.o.





Advanced Biogas Process Technology

Higher Methane Yield | Lower Operating Costs | Sustainable Energy

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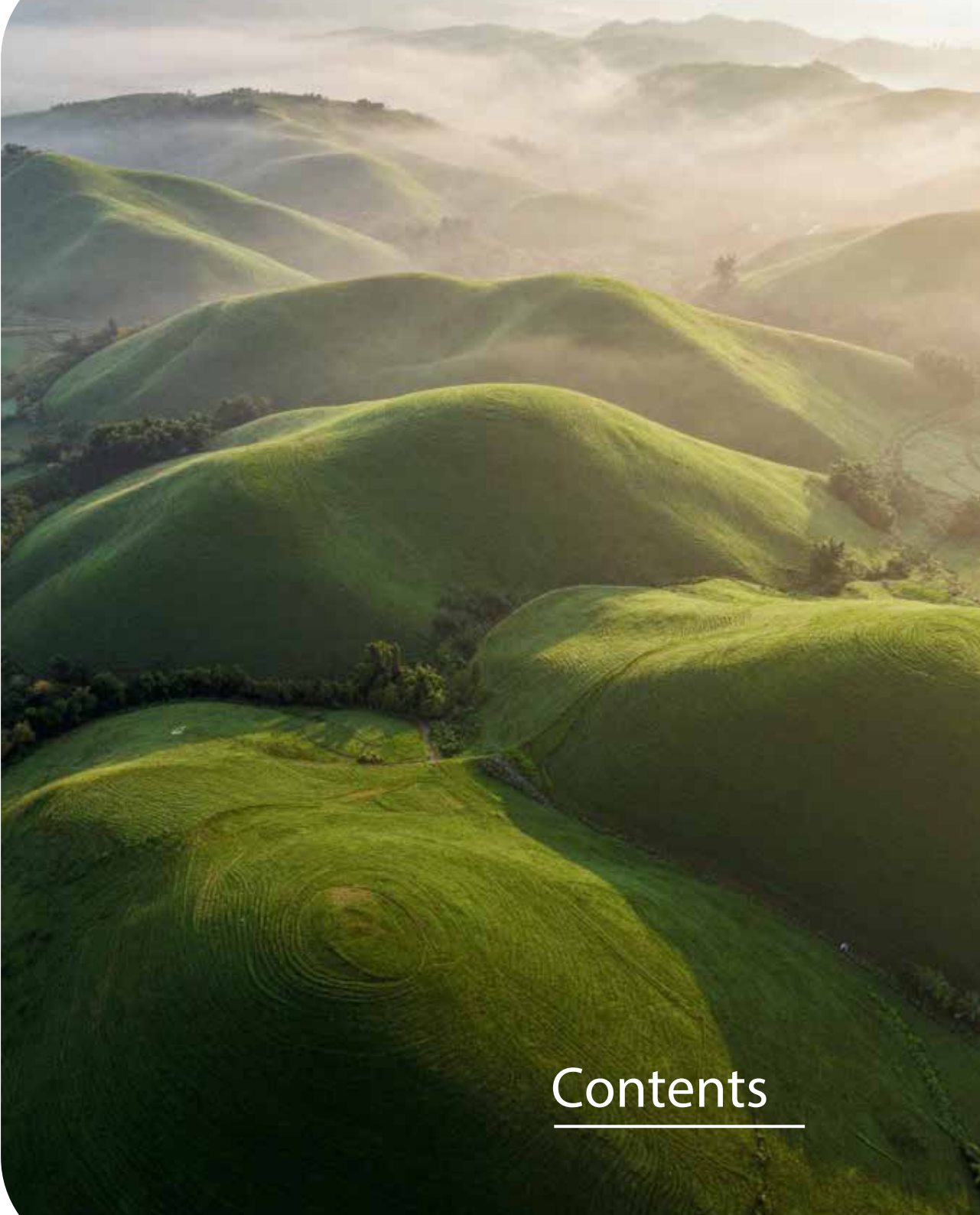
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Company Overview



01. Company Overview

Ekogea Agri Limited was founded in 2017 by Ian Sawle and Philip Hughes, building on Dr. Goran Dordic's pioneering biochemical research using *Ascophyllum Nodosum* (brown seaweed) to enhance anaerobic digestion.

Our patented Biocomplex (BCx) technology, combined with advanced milling, micronisation and water treatment systems, delivers proven results across farm-scale and industrial biogasplants.

- Founded: 2017, United Kingdom
- Headquarters: North Wales
- Core Innovation: BIOCOMPLEX (BCx) algae-based additive
- Key Achievement: 96% capacity utilisation at Hendwr plant
- Recognition: Industry award winner 2019
- Focus: Biogas yield optimisation & waste-to-energy

+20%

Methane Yield

-80%

Digestate Volume

21 days

Retention Time

-30%

Feedstock Reduction

96%

Plant Uptime



World Biogas Association - Best AD Plant Under 1MW (2019)

Core Technology



02. Core Technology

Ekogea's proprietary process combines two synergistic approaches to maximise biogas yield from anaerobic digestion:



Mechanical Pre-Treatment

- Particle size reduction to 8mm or less
- High-pressure micronisation at 35 bar
- Explosive decompression ruptures cell walls
- Increases surface area for microbial access



Biological Enhancement

- BIOCOMPLEX (BCx) algae extract
- Derived from Ascophyllum Nodosum
- Enhances microbial colony activity
- Reduces ammonia and H₂S inhibition

The synergy between mechanical disruption and biological enhancement delivers up to 30% more methane per tonne of feedstock.



03. Biocomplex (BCx)

Ekogea's proprietary biological additive derived from marine brown algae (*Ascophyllum Nodosum*). BCx enhances microbial activity within the anaerobic digestion process, delivering measurable improvements in gas yield and quality.



Enhanced Microbial

Stimulates and sustains healthy microbial colonies for more efficient digestion



Activity Reduced Inhibitors

Lowers ammonia and H₂S levels, preventing process inhibition



Improved VFA Destruction

Accelerates volatile fatty acid breakdown for stable operation

Dosing Rate

150 - 250 ml per tonne of feedstock

Enables 21-day retention time vs 30-50 days typical

Stabilises Biology

Maintains optimal microbial balance even with variable feedstock composition

Reduces NH₃

Ammonia levels kept below 2000mg/L vs 5000-8000 typical

Increases CH₄

Methane concentration improved from 50% to 58-61%

Reduces H₂S

Lower hydrogen sulphide for cleaner biogas output



60%

Methane Concentration

95%+

Uptime Achieved

222%

Max Yield Improvement

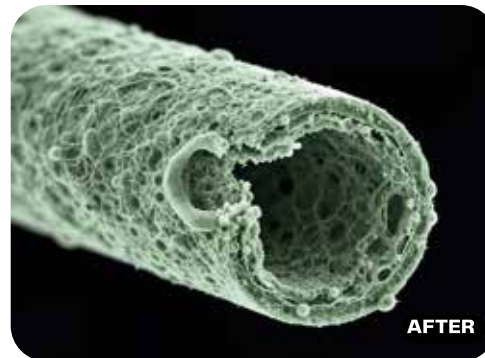
Scaling & Sites



04. Micronisation Process

Ekogea's proprietary explosive decompression process operates at 35 bar pressure, mechanically rupturing cell walls to dramatically increase the surface area available for microbial digestion.

- 01 **Pressurisation**
Feedstock compressed to 35 bar in sealed chamber
- 02 **Explosive Release**
Rapid decompression ruptures cellular structures
- 03 **Surface Exposure**
Massively increased surface area for microbes
- 04 **BCx Integration**
Combined with Biocomplex for maximum yield



Micronisation High-pressure explosive decompression at 35 bar rupturing exposing maximum surface area for microbial degrada



05. Milling & Feedstock Preparation

Modular, automated milling systems ensure consistent particle size reduction to 8mm or less, optimising feedstock for digestion. Each line features 3 mills with remote monitoring capability.

-  **Size Reduction**
Particles reduced to 8mm max for optimal digestion surface area
-  **Flow control**
Precise feedstock metering for consistent digester loading
-  **Foreign Body Removal**
Automated detection and removal of contaminants
-  **Remote Monitoring**
Full SCADA integration for 24/7 operational oversight



Smaller Particle Size

Increases surface area for microbial access

Better Mixing

Homogeneous substrate improves digestion kinetics

Higher Availability

More organic matter accessible for conversion

Modular Design

77 kW connection per line, scalable to demand



Target: Dry matter 10% max
Particle size 8mm max
3 mills per line
Fully automated

06. Digestate & Water Treatment

Ekogea's closed-loop water management system combines concentrator towers for solid-liquid separation with the H2E biological polishing plant, achieving up to 95% BOD reduction and full compliance with EU BAT-AEL standards.

Concentrator Towers

Separates digestate into three streams: solid fraction (fertiliser), grey water (for polishing), and effluent. Capacity: 18 m³/hr with 15-17 kW load.

H2E Water Polishing

Biological treatment of grey water for safe reuse or discharge. Achieves 95% BOD reduction using anaerobic biomedica filtration, meeting EU BAT-AEL discharge standards.



95%
BOD Reduction

18 m³/hr
Throughput

80%
Volume Reduction



07. Case Study: Hendwr Farm

First commercial EKOGEA installation — operational since 2022.

HENDWR-STYLE BIOGAS PLANT: INVESTMENT-READY RENEWABLE ENERGY

- 🌿 Location: North Wales, UK
- 🌿 Feedstock: Dairy slurry + food waste
- 🌿 Capacity: 10,000 tonnes/year
- 🌿 Biogas output: 4,500 m³/day
- 🌿 Digestate: Grade-A biofertiliser
- 🌿 Footprint: 0.25 hectares
- 🌿 ROI: < 3 years projected



KPI 1: ANNUAL ENERGY OUTPUT (MWh)



KPI 2: CO2 REDUCTION (TONNES)



KPI 3: FEEDSTOCK CAPACITY (TONNES)



KPI 4: OPERATIONAL EFFICIENCY (%)

08. Scaling & Deployment

Ekogea's modular architecture allows each component to scale independently. Milling lines, micronisation units, concentrators, and H2E systems can be added incrementally to match growing capacity demands.

-  **Milling Lines**
Add lines as feedstock volume grows
-  **Micronisation**
Scale pressure units to match throughput
-  **Concentrators**
18 m³/hr per unit, stackable
-  **H2E Polishing**
Modular biological treatment trains

Global Deployment

Hendwr, Wales	200 kWe - Operational since 2018
Anonymised Site, UK	500 kWe - Operational
Australia	In development
Louth, UK	In design phase



09. Operational Sites

Hendwr Farm, North Wales

200 kWe biogas plant achieving 96% capacity utilisation.

Award-winning facility demonstrating full Ekogea technology stack including BCx dosing, micronisation, and H2E water treatment.

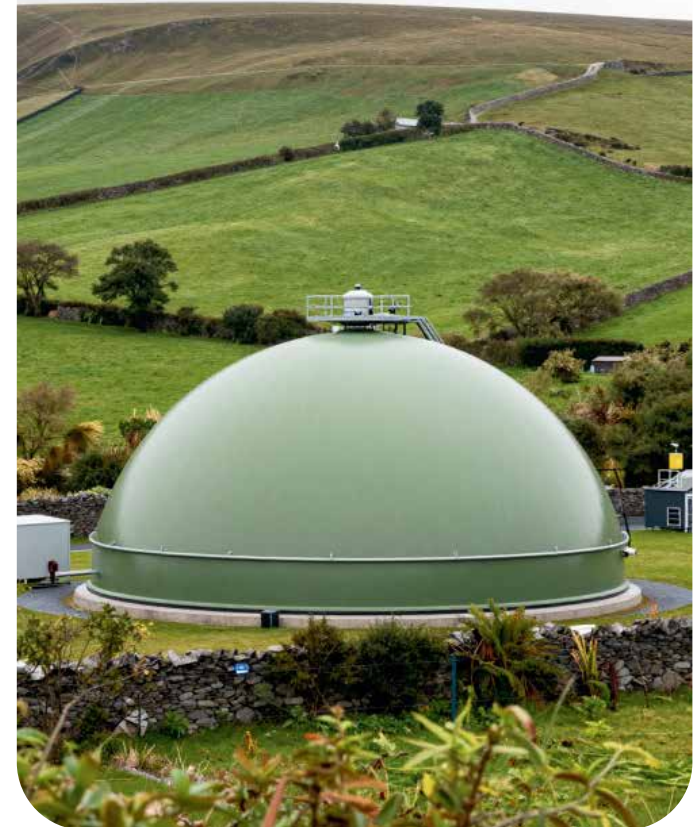
- Feedstock: Chicken litter, cow manure, straw
- Methane: 58-59% CH₄
- Retention time: 21 days
- Uptime: 95%+

Anonymised Site, UK

500 kWe facility with expanded milling and micronisation capacity. Demonstrates scalability of Ekogea systems to larger commercial operations.

- 30% overall methane improvement during commissioning
- Reduced ammonia levels enabling higher protein feedstocks

Hendwr Farm, North Wales



10. Hendwr Performance Trials

Long-term trials at Hendwr demonstrated progressive chicken litter inclusion upto 65% dry matter, with sustained methane yields and stable digester biology throughout the ramp-up period.

65%

Max Chicken
Litter Inclusion

58–59%

CH₄
Concentration

222%

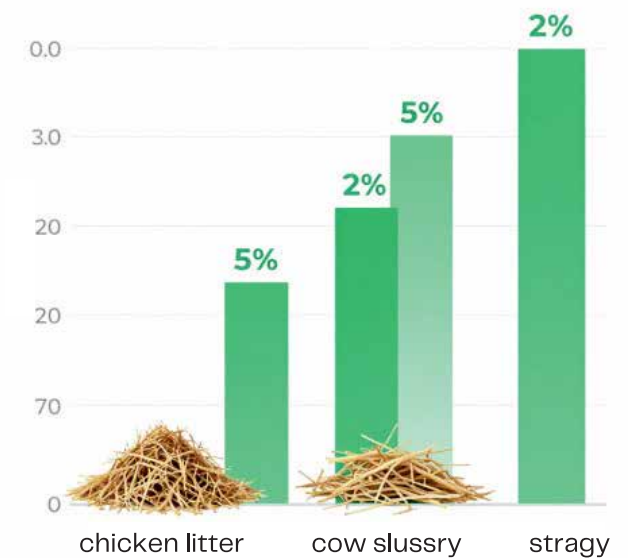
Yield Improvement
(Chicken Litter)

Feedstock	Traditional Yield	Ekogea Yield	Improvement
Chicken Litter	80 m ³ /t	178 m ³ /t	+122%
Cow Slurry	25 m ³ /t	45 m ³ /t	+80%
Straw	250 m ³ /t	340 m ³ /t	+36%
Mixed (Hendwr)	90 m ³ /t	200 m ³ /t	+122%

Key Finding: Chicken litter inclusion ramped from 0% to 65% DM over 12 months with no biological instability

Biogas Yield

Traditional vs Ekogea process



11. Nutrient Analysis – water quality

Digestate composition analysis comparing raw digestate, grey water (post-concentration), and concentrated slurry. Results demonstrate effective nutrient separation and water quality improvement.

Parameter	Raw Digestate	Grey Water	Conc. Slurry
pH	7.8	7.2	8.1
Total N (mg/l)	4,200	890	12,400
NH4-N (mg/l)	2,800	620	8,200
Total P (mg/l)	680	45	2,100
Total K (mg/l)	3,100	2,800	4,200
BOD (mg/l)	18,000	950	42,000
COD (mg/l)	45,000	3,200	98,000
Dry Matter (%)	5.2	0.8	18.5

Key Result: 95% BOD reduction in grey water stream, enabling safe discharge or reuse as process water





Sustainable Energy from Organic Waste

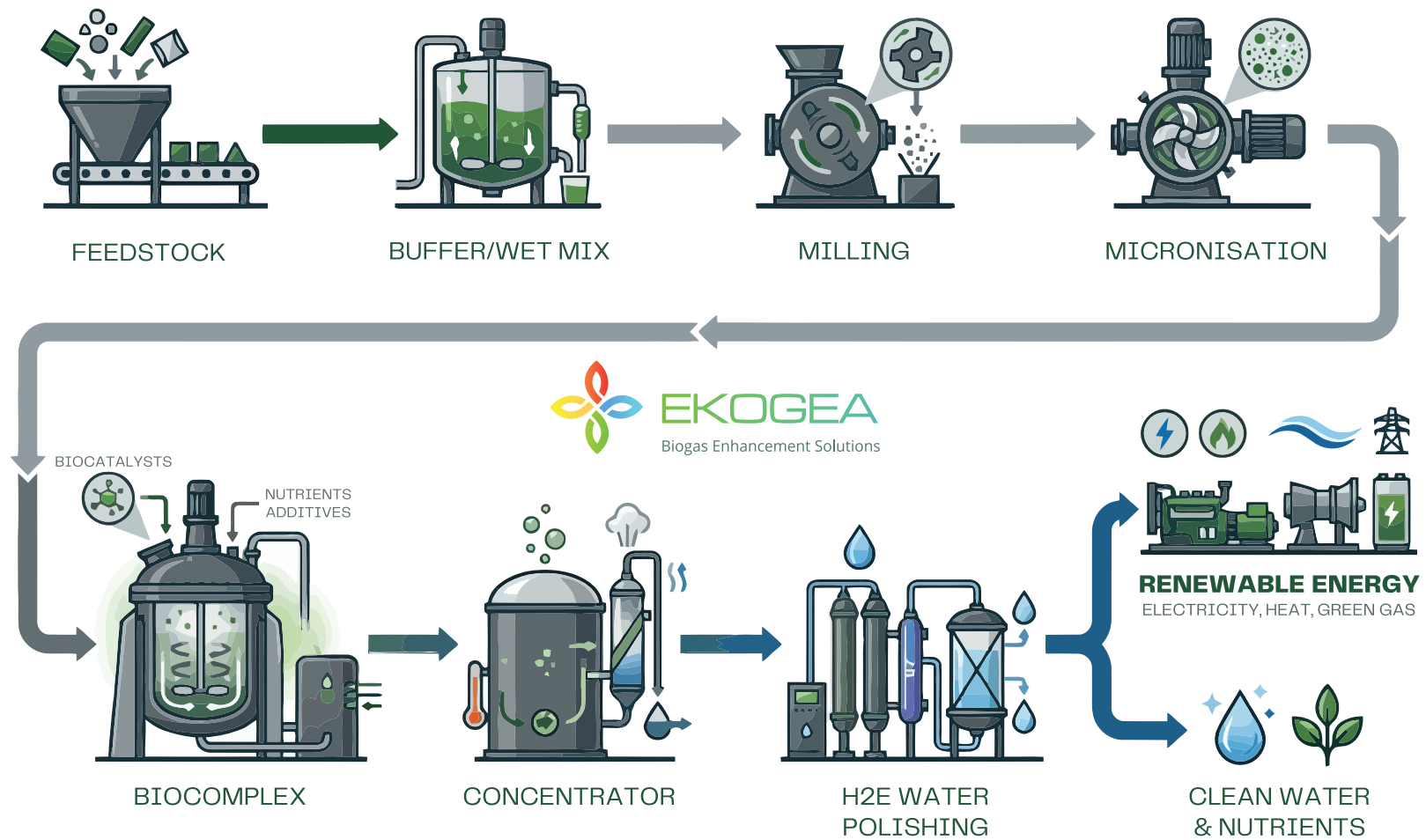
Turning agricultural by-products into clean power, heat, and fertiliser

Performance Data



12. Process Flow Diagram

Complete process from feedstock intake to energy output and digestate treatment.



13. Feedstock Design

Ekogea's process requires careful feedstock characterisation and blending to achieve optimal biogas yields. The system handles multiple feedstock types with precise dry matter control.

Straw

Dry Matter: 85% | C:N Ratio: 80:1 | Biogas Yield: Medium

Chicken Litter

Dry Matter: 60% | C:N Ratio: 10:1 | Biogas Yield: High

Cow Manure

Dry Matter: 8% | C:N Ratio: 20:1 | Biogas Yield: Medium



Target: Particle size < 8mm | Dry matter < 10% | Consistent homogenisation

14. Mass Balance & Energy

The mass balance demonstrates how feedstock inputs are converted into biogas, digestate solids, and treated water — with minimal waste and maximum energy recovery.

INPUT

50 tonnes/day

Mixed feedstock blend



BIOGAS

2,400 m³/day

58-59% methane concentration

DIGESTATE

35 tonnes/day

High-value fertiliser output



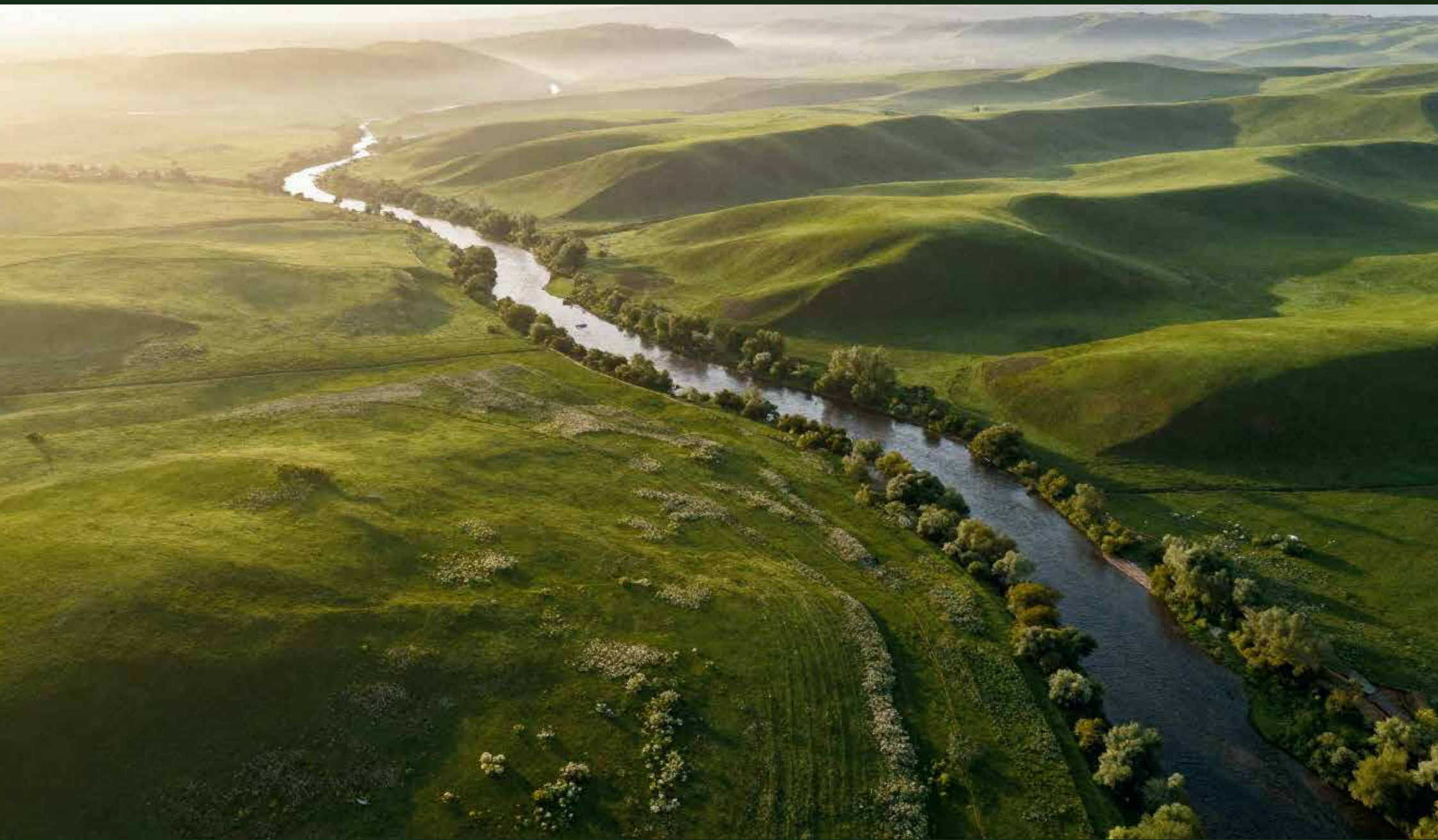
GREY WATER

12 m³/day

Treated to BAT-AEL standards

Parasitic Load: 10% of gross output
Net Electrical Output: 180 kWe | CHP Efficiency: 38%





15. Equipment Specifications

Ekogea's modular equipment is designed for scalability, remote monitoring and minimal maintenance. Each component integrates seamlessly into existing AD plant infrastructure.



Milling Line

- 3 mills per line
- 15 kW per mill
- Particle size < 8mm
- Remote monitoring

Microniser

- 35 bar pressure
- Explosive decompression
- 5 m³/hr throughput
- Stainless steel construction

Concentrator

- 18 m³/hr capacity
- 15-17 kW load
- Solids separation
- Grey water recovery

H2E System

- Anaerobic treatment
- 95% BOD reduction
- Biomeia filtration
- BAT-AEL compliant

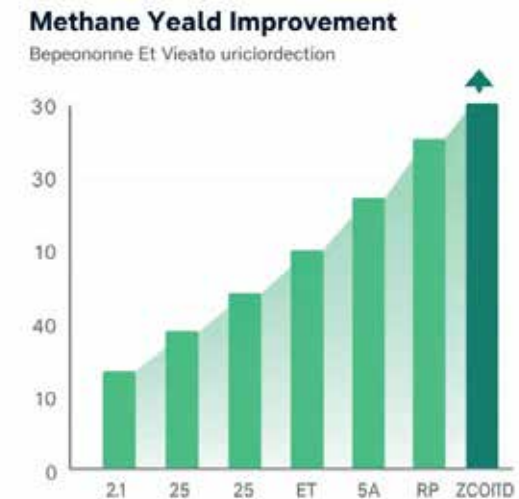


16. Commissioning Results

Commissioning data from operational sites demonstrates significant and sustained improvements in methane yield and concentration following Ekogea technology deployment.

Key Findings

- Feedstock requirement reduced by approximately 30%
- Ammonia levels significantly decreased post-treatment
- Consistent methane output maintained over extended periods
- No biological inhibition observed at high inclusion rates
- System stability confirmed across multiple feedstock types



50% to 60%

Methane concentration
increase

30%

Overall yield
improvement

21 days

Reduced
retention time

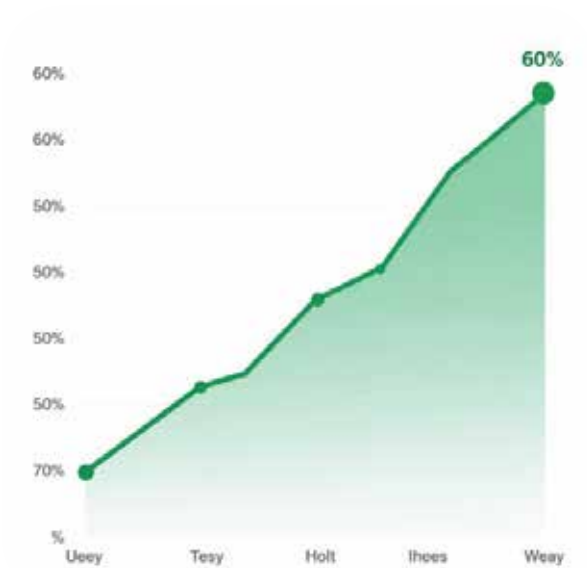
96%

Capacity utilisation
achieved

17. Performance Data

Extensive trials at Hendwr demonstrate exceptional biogas yield improvements across multiple feedstock types, with chicken litter achieving up to 65% inclusion without ammonia inhibition.

Feedstock Type	Biogas Yield	Improvement	CH4 %
Cow Slurry	High	+227%	58%
Chicken Litter	Very High	+222%	60%
Straw Blend	Medium	+180%	57%
Mixed Feedstock	High	+200%	59%



Post-digestate volume reduced by 80% | No ammonia inhibition at 65% chicken litter inclusion

18. Chicken Litter Trials

Hendwr trials demonstrated that chicken litter can be included at up to 65% of the feedstock blend without triggering ammonia inhibition — a significant breakthrough for the AD industry.

Inclusion: 25%

Stable digestion, no inhibition

+85%

Inclusion: 40%

Increased biogas, stable pH

+150%

Inclusion: 55%

High yield maintained

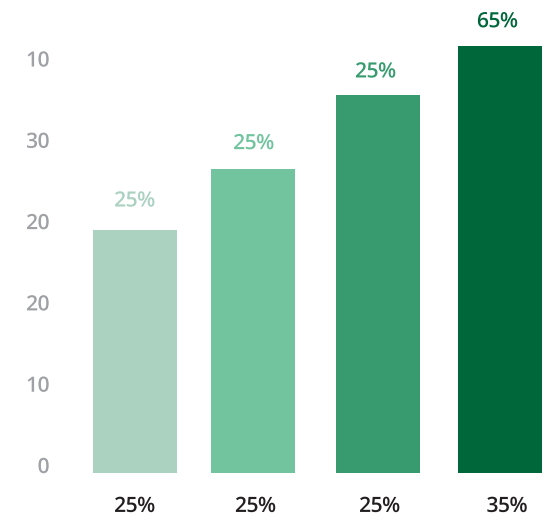
+195%

Inclusion: 65%

Maximum tested, no inhibition

+222%

Chicken Litter Inclusion Rates



19. Biogas Yield Improvements

The combination of micronisation and Biocomplex delivers dramatic improvements in biogas yield across all feedstock types tested, with results sustained over extended operational periods.

+227%

Cow Slurry
Improvement

+222%

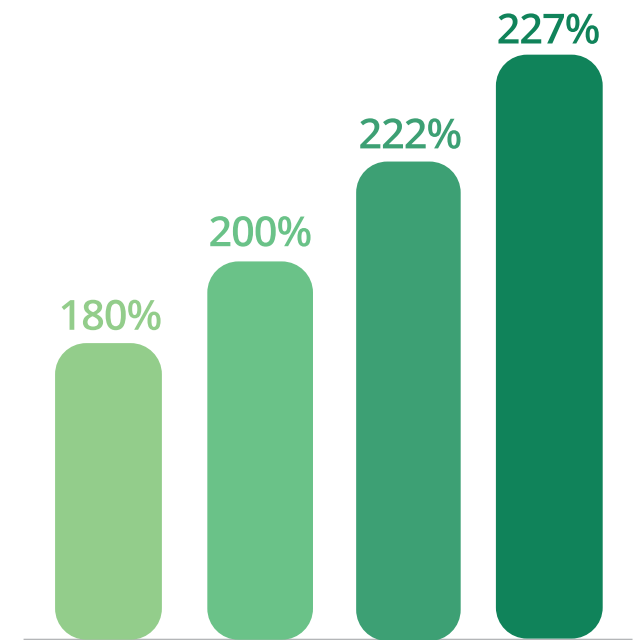
Chicken Litter
Improvement

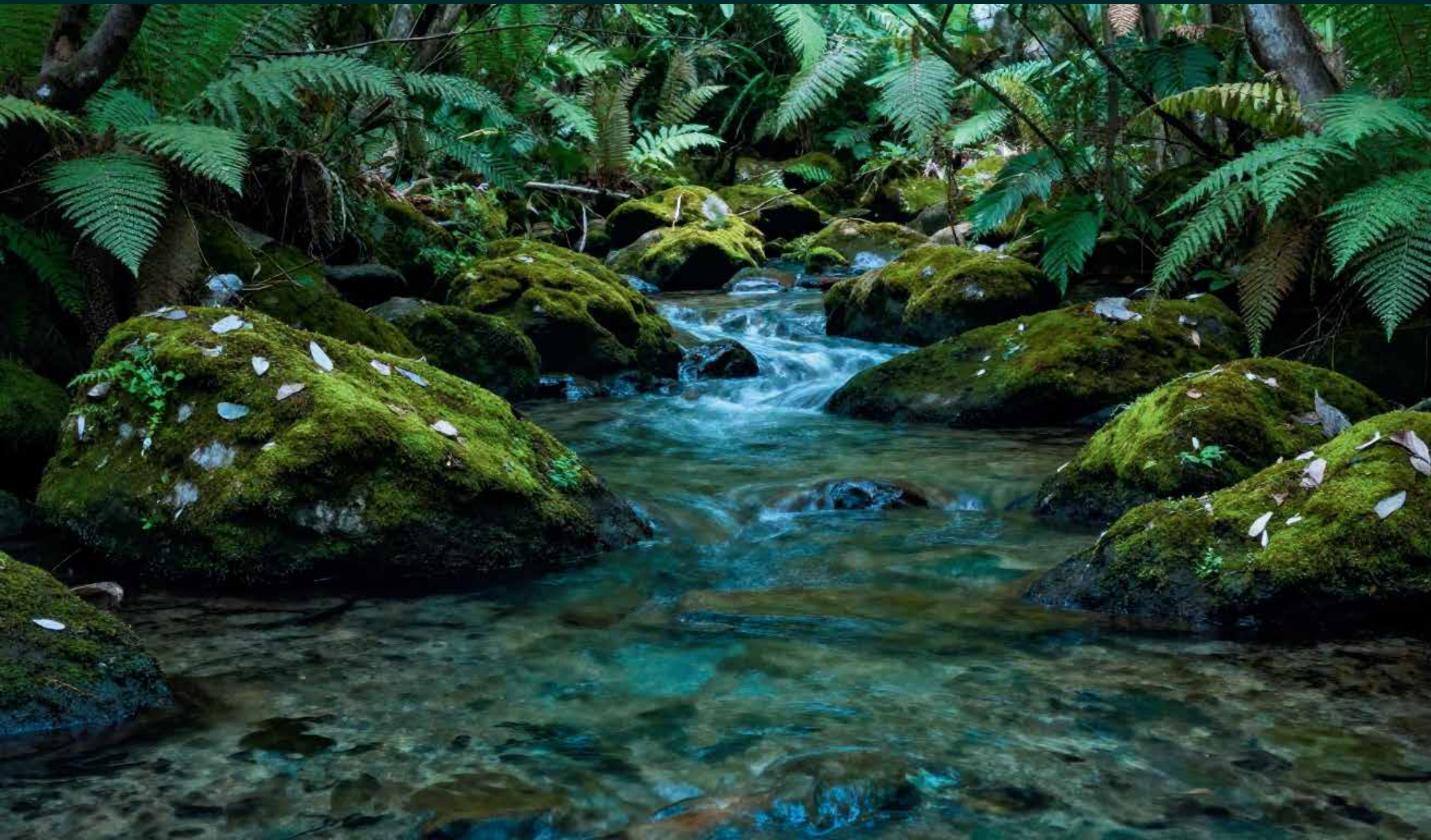
+180%

Straw Blend
Improvement

Contributing Factors

- Micronisation ruptures cell walls, increasing surface area for microbial access
- Biocomplex enhances microbial diversity and activity
- Reduced particle size improves homogeneity and flow
- Combined effect exceeds sum of individual treatments





20. Nutrient Analysis – EU BAT–AEL Standard

Digestate from the Ekogea process yields high-value fertiliser with excellent nutrient profiles.
Grey water treatment achieves compliance with EU BAT-AEL discharge standards.

Nitrogen (N)

4.2 g/L

High plant-available N

Phosphorus (P)

1.8 g/L

Concentrated in solids

Potassium (K)

3.6 g/L

Readily soluble form

Dry Matter

28%

Post-dewatering solids

Grey water BOD reduced by 95% | Compliant with EU BAT-AEL standards | Suitable for land spreading

21. System KPI's

Operational KPIs confirm the reliability and efficiency of the Ekogea system across all deployed sites, with consistently high uptime and low parasitic energy consumption.



Maintenance:

Annual desilting | Nozzle replacements | CHP servicing | Consumables: BCx, ferric chloride, Triox

22. Compliance & Standards

All Ekogea installations operate within strict regulatory frameworks, meeting or exceeding environmental standards for emissions, discharge, and waste management.

Environment Agency Permit

EPR/RP3507BH — full compliance with UK environmental regulations for biogas operations and waste processing.

EU BAT-AEL Standards

Grey water discharge meets Best Available Techniques Associated Emission Levels for wastewater treatment.

PAS 110 Digestate Quality

Digestate output meets quality protocol standards for use as agricultural fertiliser and soil conditioner.

Health & Safety

ATEX-rated equipment, automated monitoring, and remote shutdown capabilities ensure safe continuous operation.



Summary & Outlook



23. Summary

Ekogea's integrated biogas enhancement technology delivers proven, measurable improvements in anaerobic digestion performance through the synergy of mechanical pre-treatment and biological optimisation.

01

Proven Technology

Micronisation and Biocomplex deliver up to 222% biogas yield improvement across multiple feedstock types.

02

Scalable & Modular

Equipment designed for seamless integration into existing AD infrastructure with remote monitoring capabilities.

03

Environmental Excellence

Closed-loop water recycling, 95% BOD reduction, and full compliance with EU BAT-AEL standards.

04

Operational Reliability

95%+ system uptime, 10% parasitic load, and minimal maintenance requirements demonstrated at scale.

05

Waste Reduction

Post-digestate volume reduced by 80%, producing high-value fertiliser and clean recyclable water.



24. Future Outlook

Ekogea continues to expand its technology deployment internationally, with new projects in design and construction phases across multiple continents.

International Expansion

New deployments planned in Australia and Ireland (Louth), extending proven UK technology to global markets.

Biomethane Injection

Adapting the process for grid-injection biomethane production, opening new revenue streams for plant operators.

Feedstock Diversification

Ongoing R&D into additional high-nitrogen feedstocks and industrial organic wastestreams.

Digital Integration

Enhanced remote monitoring, predictive maintenance, and AI-driven process optimisation for maximum efficiency.

FUTURE OUTLOOK

CLEAN ENERGY GREEN TOMORROW



SUSTAINABLE



LOW CARBON



EFFICIENT



RENEWABLE





Brown algae (*Ascophyllum Nodosum*)



25. Get in Touch

Ready to explore how EKOGEA can transform your waste into energy?
Our team is here to discuss your project requirements.



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