SCFG PLATFORM SUMMARY

Supercritical Fluid Gasification

v 0.1

https://aorangi.eu/scfg/SCGF-PLATFORM-SUMMARY-v0.1-ENG.pdf

February 27, 2026

Contents

Industrial technology for molecular waste destruction and clean energy production.

1. The problem it solves

The global waste and sludge treatment industry is facing a triple crisis:

1. **Rising disposal fees** (EU >€160/t) and CO_2 taxes.
2. **PFAS and "forever chemicals"** – regulatory pressure, legal risks and bans on the use of digestates.
3. **Energy instability and high energy costs**, especially for municipal and industrial systems.

Traditional methods (incineration, anaerobic digestion, pyrolysis):

- They are spores (weeks instead of seconds),
- Dependent on external energy,
- They generate emissions and secondary toxic streams,
- They do not destroy PFAS molecularly (but concentrate or move them).

SCFG positions waste not as an expense, but as **an energy asset**.

2. Technological principle

SCFG (Supercritical Fluid Gasification) is **a non-oxidative, autothermal process** that uses water in a supercritical state.

- 374 °C
- 221 bars

Under these conditions, water becomes **a supercritical liquid** – an ideal waste and reaction medium that allows:

- Complete molecular deconstruction of organic waste
- Degradation of the largest C–F bonds (PFAS)
- Reaction speed 1–30 seconds
- Operation without external energy (autothermal)

Key features:

- **No oxygen → no oxidative corrosion**
- Reactors made of special non-ferromagnetic super-alloys
- Designed service life: ~50 years
- Sealed airtight system (container, 40 ft module)

3. TRL 9 — Operational validation

The technology is declared as **TRL 9** – fully commercially operable in real industrial conditions (set up in Switzerland and demonstrations in Croatia).

This means:

- Treatment of real municipal and industrial sludge
- Fully integrated into existing infrastructure.
- Industrial scale (up to 150 TPD)
- Proven molecular destruction of PFAS (>99.9%)

This is not a pilot or laboratory technology, but an operational industrial asset.

4. Input – What can be processed?

SCFG handles almost all organic streams, including:

- Sewage sludge
- Biological and agro-waste
- Industrial Sludge
- Hospital medical waste
- Plastics & Polymers
- MARPOL and biohazard waste
- Waste oils
- Waste with POPs

- PFAS Contaminated Streams
- Wet waste up to 90% moisture (no drying)

It does not process inert substances such as glass, stone and metal.

5. Output – What do you get?

For a typical input of 1,000 kg/h:

- ~140 kg of energy gas
- ~850 kg of clean technical water
- No CO_2, H_2S or N_2 in the gas phase

Composition of EnerGas

- ~60% CH_4 (methane)
- ~25% H_2 (hydrogen)
- ~15% C_2/C_3 (ethane/propane)

Energy density:

- 36–50 MJ/m³ (significantly higher than conventional biogas)

Additional benefits

- 95% return on distilled water
- Inert mineral residue (sterile ash/sand)
- Potential for the production of SAF precursors
- Generating carbon credits

6. Economic model

Capital expenditures

- €9 – €12 million per module

Revenue (triple stream)

1. Waste Acceptance Fees
2. Sale of EnerGas / H_2 / electricity
3. Carbon credits

Key economic claims

- Negative OPEX (waste is paid raw material)
- ROI: <10–12 months
- Potential annual gain: €7-12+ million per module
- Elimination of disposal costs
- Elimination of external energy costs

One module can annually:

- Process up to 100,000 tons of organic waste
- Produce >90,000,000 kWh of electricity
- Prevent ~40,000 t CO_2 per year

7. Comparison with alternatives

Technology	Speed	Broadcasts	PFAS	External energy	Corrosion
Anaerobic digestion	Weeks	Methane, CO_2	Does not destroy	Yes	N/A
Incineration	Quick	Dioxin, NOx	Partially	Yes	High
Pyrolysis	Slow/moderate	Broadcasts	Limited	Yes	High
SCFG	1-30 seconds	Zero	99,9%+	No	Minimum

8. Strategic implications

1. PFAS crisis

SCFG offers one of the few solutions for **molecular destruction of PFAS** , instead of filtration or dilution.

2. Hydrogen economy

Production of green H_2:

- No electrolysis
- No additional electricity
- Directly from wet waste

3. SAF Industry

EnerGas of high purity as:

- A precursor to SAF
- Synthesis gas for further processing

4. Decentralized energy

- Modular container systems
- Quick setup (48 hours)
- Autonomous plants
- Ideal for ports, industrial zones, farms, islands, cities

9. Operational and investment advantages

- 50 years of reactor life
- Hermetically sealed system
- Full digital control (PLC/SCADA)

- Possibility of remote control by a single operator
- Compliance with EU IED and EPA standards

Technology redefines:

- Waste Management → Energy Asset Management
- OPEX Center → Profit Center
- Regulatory risk → Carbon income

10. Conclusion

The SCFG represents:

- Industry-Validated (TRL 9) Technology
- Complete molecular destruction of organic waste and PFAS
- Autothermal process without external energy
- Production of high-calorie EnerGas and green hydrogen
- Modular, scalable and long-lasting solution
- Economic model with quick returns and multiple revenues

The basic thesis of the document is simple:

Waste is not a problem. Waste is hidden energy. The difference between cost and revenue is technology.