CONCEPT NOTE

VALORIZATION OF OLIVE POMACE VIA GASIFICATION: A CLEAN ENERGY APPROACH USING THE H2LIFE E-GENERATOR

The **H2Life Biomass E-Generator**, developed, produced, and distributed by **EWA Technologies Group**, offers a sustainable, non-incinerating and high-efficiency solution for the valorization of biomass and other organic waste into clean energy. This innovative technology proposed to convert olive oil process' waste to clean energy.

CONTEXT

In the Mediterranean basin, olive oil production is a deeply rooted agricultural tradition, intertwined with culture, economy, and landscape. However, this industry generates significant volumes of waste, chief among them being olive pomace - the semi-solid residue left after the mechanical extraction of olive oil. Olive pomace, rich in organic matter, moisture, and residual oil content, including toxic compounds, presents both an environmental challenge and an untapped resource for sustainable energy production.

Chemical composition of Olive Mill Waste (OMW), including both liquid (olive mill wastewater, OMWW) and solid (pomace/cake) components:

Component	Typical Range	Comments
Moisture	Pomace 40–70% OMWW 83–95%	varies with extraction process
Total Organic Carbon	30–50% of dry weight	Major contributor to pollution load
Phenolic Compounds	0.5–24 g/L (OMWW)	Toxic to plants and microbes; antimicrobial properties
Fats and Oils (Lipids)	2–13% (solid fraction)	Non-polar organic compounds
Proteins	1–2.5%	Varies with maturity of olives
Carbohydrates	10–25%	Includes soluble sugars, cellulose, hemicellulose
Cellulose	15–25%	Present in solid pomace
Hemicellulose	10–20%	Degradable under mild conditions
Lignin	10–30%	More recalcitrant to degradation
Ash (Minerals)	1–5%	Contains K, Ca, Mg, Na, P
pH	4.5–5.5	Acidic due to organic acids
Volatile Fatty Acids	Present in OMWW	Products of fermentation and degradation
Tannins, Pectins	Trace to moderate amounts	Add to biochemical complexity

Olive pomace is a lignocellulosic biomass primarily composed of skin, pulp, stone fragments, and residual oil. Traditional disposal methods for this residual biomass material, such as landfilling, incineration, or uncontrolled composting, not only waste this valuable organic resource but also having significant negative environmental impact due to the presence of phytotoxic compounds.

In contrast, thermochemical conversion technologies for conversation of such waste to clean energy, particularly gasification, offer a scientifically validated approach to valorizing olive pomace by converting it into synthetic gas (syngas) - a combustible gas mixture primarily composed of hydrogen (H_2), carbon monoxide (CO), methane (CH_4), and carbon dioxide (CO_2). This syngas can be utilized for heat and electricity generation or further refined into synthetic fuels and green hydrogen.

The purpose of this concept note is to propose the deployment of the H2Life waste-to-energy system, an innovative solution designed to convert olive pomace into clean energy while simultaneously detoxifying olive mill wastewater (OMWW). This initiative supports the principles of a circular economy and aligns with broader decarbonization and sustainability strategies.

Extensive literature supports the feasibility and performance metrics of olive pomace gasification. For example, studies by Zabaniotou and Stavropoulos (2003) demonstrated successful gasification of olive kernel residues in a fixed bed reactor, yielding syngas with a lower heating value (LHV) of 4.5–5.2 MJ/Nm³. Later research by Gómez-Barea et al. (2010) applied gasification to similar biomass with high energy conversion efficiency. More recently, experimental work by Arena and Zaccariello (2019) reaffirmed the suitability of olive pomace for downdraft gasification, emphasizing low tar formation and consistent syngas quality when appropriate moisture control and feedstock sizing are applied. These studies highlight the material's compatibility with small-scale, distributed systems - such as the H2Life E-Generator, especially when integrated with a pre-treatment phase for drying and densification into pellets or briquettes.

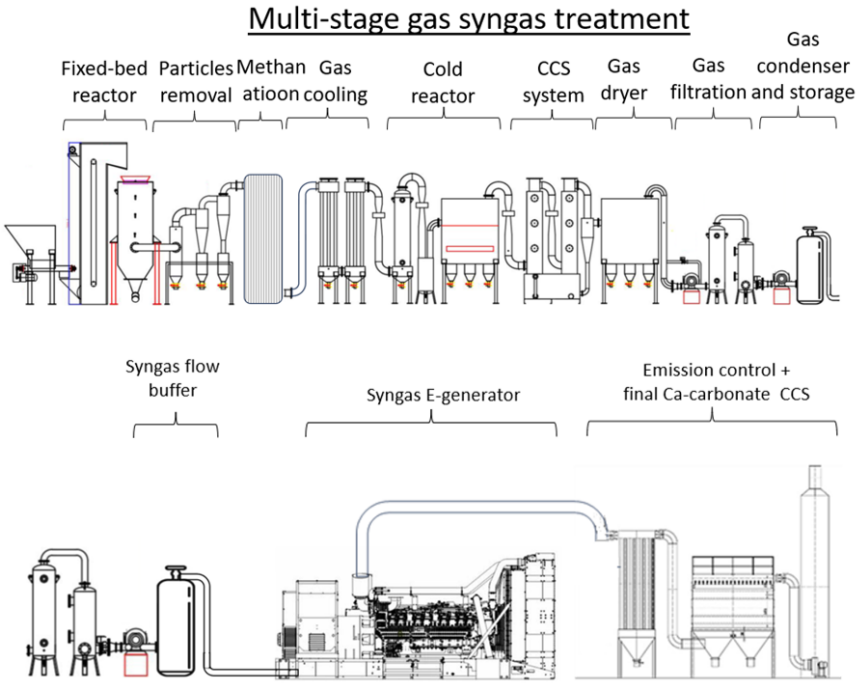
ABOUT H2LIFE SYSTEM

The deployment of such a system has broader implications beyond energy production. By substituting fossil fuels and mitigating waste-related emissions, gasifying olive pomace contributes to EU and national climate targets under frameworks such as the Green Deal and Fit for 55 package. Moreover, it strengthens local resilience by empowering olive farmers and cooperatives with autonomous energy sources, thereby reducing their dependence on volatile energy markets and lowering their carbon footprint.

The **H2Life System** is designed to convert up to **95% of dry carbon-based material into syngas**, maximizing energy production from biomass while minimizing environmental impact.

Unlike pyrolysis, which typically converts only around **35%** of dry feedstock into syngas, with the remainder becoming synthetic fuel that carries similar environmental drawbacks to fossil fuels, **H2Life** achieves over **95% conversion efficiency** into syngas **without requiring additional energy input**.

This makes the H2Life system a highly efficient and environmentally responsible alternative for sustainable energy generation.



H2LIFE PROCESS: FOUR KEY STAGES

1. **Pre-treatment** – Homogenizes and standardizes any carbon-based material into a uniform feedstock.
2. **Gasification** – A non-incineration thermal process operating at moderate temperatures (200–700°C), converting biomass into synthetic gas (syngas) with **no harmful gas emissions**.
3. **Syngas Purification & Enhancement** – Includes hydrogen enrichment and refinement for clean energy use and Carbon Capture system (CCS).

4. **Energy Production** – The purified syngas is used to generate **green electricity, steam, synthetic natural gas (SNG),** or **hydrogen**.

The H2Life system is **AI-driven, fully automated**, and available in **21 models** ranging from **10 to 1,000 kWh per day**. Its compact and modular design requires as little as **40 to 150 m²** of space.

Technical Advantages of H2Life Over Pyrolysis

1. **Energy Efficiency**
   H2Life produces electricity, steam, SNG, and hydrogen with high conversion rates, while **pyrolysis**, by contrast, primarily yields synthetic with similar characters of fossil oil, which require further distillation processing and not suitable for conventional engines.
2. **Automation & Maintenance**
   H2Life is **fully automated**, featuring AI-driven PLCs for 24/7 operation with minimal human oversight. **Pyrolysis** systems are labor-intensive, and require frequent maintenance.
3. **Space Efficiency**
   H2Life systems require up to **150 m²**, compared to minimal space of **375 m²** for equivalent **pyrolysis** setups.
4. **Sensitivity to water**
   H2life accepts feedstock containing up to 20% moisture, while **pyrolysis** can't effectively be operated with more than 10% moisture.
5. **Operational Reliability**
   With **no moving parts**, **H2Life** boasts greater durability and fewer mechanical failures. **Pyrolysis** systems involve heavy, rotating components that are more prone to wear.
6. **Environmental Impact**
   H2Life operates smoke-free, generates no wastewater, and captures CO_2, making it one of the most environmentally friendly biomass valorization technologies available. In contrast, **pyrolysis** consumes more than **2 kWh of electricity per ton of biomass per hour**, and the continuous heating of its reactors requires at least **200 kg of fuel or syngas per hour**. This process results in significant **emissions of smoke and CO_2**, reducing its environmental efficiency.

ABOUT EWA GROUP

Founded in 2016, **EWA Technologies Group** is a pioneering global consortium specializing in the research, development, and distribution of solid waste recycling and sustainable waste-to-energy conversion solutions.

The Group's proprietary technologies are marketed under the **Hygimed®**, **H2Life**, and **IQS** brands, all exclusively developed and distributed within its own network, not through distributors or online sale's platforms.

EWA Technologies Group is committed to continuous innovation and scientific excellence. The company has earned industry recognition and maintains **CE** and **ISO** certifications, reflecting its dedication to quality and environmental responsibility.

Financial & Operational Benefits

- **Energy Output**: Up to **600 kWh** electricity or **3 tons of steam per hour per ton CHs**
- **Sort ROI**: Payback within **10–12 months** in case of electricity and significantly shorter in case of steam**,** depending on energy costs and biomass availability
- **Flexible Feedstock**: Compatible with a variety of organic materials, including plastic or biomass-plastic mix.
- **Scalable & Modular**: With 21 different models, H2life is ideal for both small and large operations, up to 1.5T feedstock per hour.
- **Low Operating Costs**: Highly automated with minimal maintenance
- **Compact**: Small footprint with no need for fuel, water, or solid waste disposal
- **100% Circular**: No pollution, low carbon emissions, and full resource utilization

CONCLUSION

In conclusion, the H2Life E-Generator represents a timely technological solution for the sustainable management of olive pomace, transforming a pressing agricultural waste challenge into an opportunity for clean energy, rural development, and environmental stewardship. Building on a robust foundation of academic and applied research, this initiative can position olive-growing regions at the forefront of green innovation, blending tradition with forward-looking sustainability.

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