CONCEPT NOTE

H2LIFE BIOMASS E-GENERATOR FOR GREEN ELECTRICITY PRODUCTION FROM *WOODEN MATERIAL*

BACKGROUND AND CONTEXT

H2Life E-Generation is a non-incinerative thermal technology designed to convert any organic waste, including plastics, biomass, food waste, sludge, and more, into energy products such as electricity, synthetic natural gas (SNG), hydrogen, or steam, all with minimal environmental footprint.

The H2Life process consists of four main stages:

1. **Pre-treatment:** Homogenizes and standardizes any type of carbon-based material to create a consistent feedstock.
2. **Gasification:** Conducted at moderate temperatures ranging from 200°C to 700°C, producing synthetic gas (syngas) with minimal harmful emissions.
3. **Syngas purification and enrichment:** Involves a series of chemical manipulations including hydrogen enrichment, conversion of carbon dioxide to methane, and removal of particles, residual carbon dioxide, and sulfur gases.
4. **Energy production:** The purified syngas is then converted into green electricity, synthetic natural gas, or steam for consumption.

H2Life offers 21 different models, with daily electricity production capacities ranging from 10 kWh to 1,000 kWh. The system is compact, fully automatic, and controlled by a sophisticated AI-based PLC. The H2Life E-Generator is an ideal solution for decarbonizing biomass of any type, producing clean energy for hotels, shopping centers, natural parks, industries, agriculture, waste treatment plants, and for domestic electricity supply or backup.

The preferred feedstock for gasification is woody material. From one ton of dry wood, the potential syngas production is approximately 2,000Nm³, which can be converted to 9.8GJ of heat, enough to produce 3 tons of dry steam at 300°C, or 600kWh of electricity using the syngas E-Gen set developed by the EWA Group.

Acacia Case

Recent studies have highlighted the potential of gasification as a viable solution for converting *Acacia* biomass into clean energy. Research indicates that gasification technologies can efficiently process *Acacia* biomass to generate green electricity.

Pyrolysis Alternative

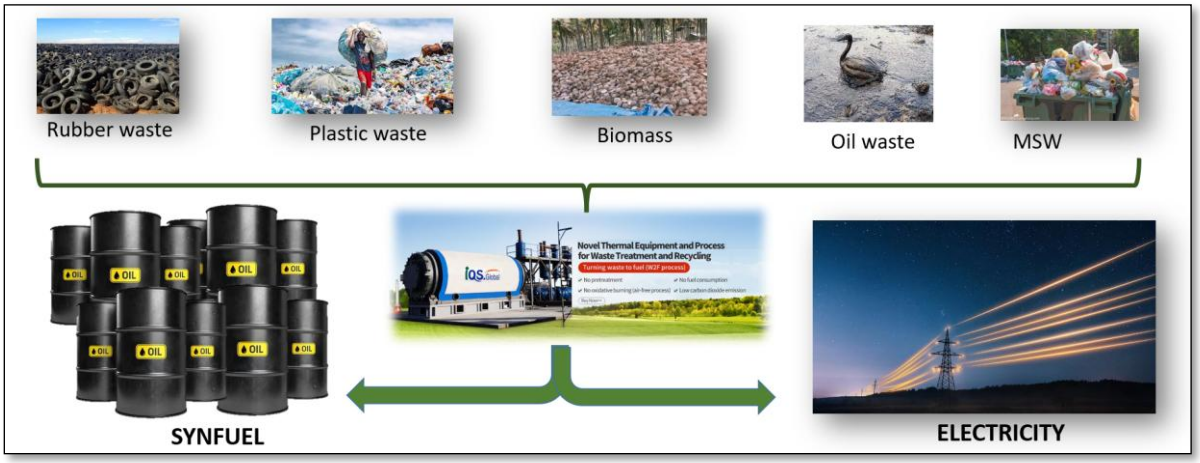
The valorization of *Acacia* biomass through pyrolysis to produce synthetic fuel (synfuel) and biochar is an option that must be considered in parallel to gasification. Pyrolysis is often regarded as a preferable method for biomass-to-energy conversion. However, it has several disadvantages, including:

1. High CapEx;
2. Low capacity relative to CapEx and space requirements;

3. Significant operating and maintenance costs, including, at least, 2-3 operators in each shift, 2kWh electricity per ton biomass, 2MWh heat energy for heating the reactor, etc.
4. The final energy product is synthetic fuel (sometimes called non-standard biodiesel), which cannot be used to operate conventional electric generators and produces harmful gas emissions when burned.

The two main advantages of pyrolysis are:

1. High energy efficience, as heat source (synfuel);
2. Production of significant amount of biochar as a valuable byproduct.



Pyrolysis product-line of EWA Group: Continuous, batch, compact-semi continuous

Optimal Biomass Conversion: Gasification vs. Pyrolysis for *FORESTING WASTE*

EWA Group provides both gasification and pyrolysis solutions, but comprehensive elemental and real-time analysis of multiple Acacia species confirms that gasification is the superior method for energy valorization of Acacia biomass.

Key Biomass Parameters (Average)

Parameter	Value (Range)
HHV	17 MJ/kg
Moisture	14% (3.9–20%)
Volatiles	49.7% (3.42–55%)

Parameter	Value (Range)
Fixed Carbon	32.1% (91.5–95%)
Ash	4% (5.0–8%)

Elemental Analysis (%)

- **Nitrogen**: 0.3 (0.38–0.5)
- **Carbon**: 44.1 (51.4–55)
- **Hydrogen**: 5.6 (5.7–6.2)
- **Oxygen**: 49.9 (51.4–55)

Why Gasification Outperforms Pyrolysis for wooden material?

Pyrolysis generates three outputs:

1. **Syngas** – Mostly consumed to sustain reactor heat, leaving little for electricity.
2. **Synfuel** – Forms from carbohydrate breakdown, but **low volatile content (<4%) and hydrogen (<6%)** drastically limit yield.
3. **Biochar** – Dominates output (~77% of dry biomass), making pyrolysis **inefficient for energy recovery**.

In contrast, **gasification maximizes energy output** by converting biochar-rich pyrolysis residue into **high-efficiency syngas**, aligning with Acacia's composition (high fixed carbon, low volatiles).

Conclusion

For wooden biomass, **gasification ensures superior energy recovery**, whereas pyrolysis predominantly yields biochar, valuable primarily as a gasification feedstock rather than a direct energy source.

ADVANTAGES OF H2LIFE GASIFICATION TECHNOLOGY OVER PYROLYSIS

1. **Versatility and Environmental Impact:**

The H2life system valorizes any organic material into clean energy products such as electricity, industrial steam, green hydrogen, or SNG, with minimal environmental impact. Gasification is considered a renewable energy source, which qualifies for carbon credits. In contrast, pyrolysis produces mainly synthetic fuel, which has a similar environmental footprint to fossil fuels, resulting in minimal decarbonization credits, mostly from biochar production.

2. **Automation and Efficiency:**

The H2life system generates clean electricity with full automation and AI-controlled PLCs, maximizing efficiency without the need for constant human intervention. It provides stable, 24/7 electricity supply with low operating and maintenance costs. Pyrolysis, on the other hand, consumes electricity and requires external heating, demands at least two operators during operation, lacks sophisticated

control systems, requires continuous maintenance, and often operates in batch mode. Pyrolysis efficiency is strongly dependent on feedstock nature and is sensitive to moisture content.

3. **Space and Model Availability:**

H2life optimally balances space and energy output, occupying approximately 150 m², whereas pyrolysis requires a minimum of 375 m². H2life offers 21 different models based on feedstock capacity and energy production, while pyrolysis technology is available in only three models, with no small-scale or low-cost options.

4. **Reliability and Maintenance:**

H2life features no moving parts, making operational failure extremely rare. Pyrolysis reactors include heavy rotating components (weighing 25-30 tons), which pose a significant failure risk. Moreover, batch or semi-continuous pyrolysis units require frequent start-stop cycles every 9–24 hours, leading to high wear and shorter lifespans of key components such as the reactor. On the same time, gasification is working 24h/365 days per year, non-stope, self-consuming 5kWh electricity only with no moving parts.

H2LIFE TECHNOLOGICAL ADVANTAGES AND IMPACT

The H2life system offers significant benefits:

Key Advantages of the H2Life Biomass E-Generator

- ✓ Sustainability
  - Zero-emission process – No smoke, wastewater, or hazardous pollutants
  - Carbon-negative potential – Actively captures CO_2 for environmental benefits
  - Non-incineration technology – Preserves air quality while converting waste to energy

- ✓ High Efficiency
  - Industry-leading conversion rates – Up to 1,000 kWh per ton of dry biomass
  - Maximized energy recovery – Superior output compared to conventional systems

- ✓ Proven Cost-Effectiveness
  - Rapid ROI – 12-18 month payback period (varies by feedstock and energy prices)
  - Scalable economics – Cost-efficient for both small farms and industrial operations

- ✓ Feedstock Flexibility
  - Universal biomass compatibility – Processes diverse agricultural residues (rice husks, sugarcane bagasse, cotton stalks, etc.)
  - No preprocessing required – Handles variable moisture and composition

- ✓ Modular & Space-Efficient
  - Plug-and-play installation – Integrates seamlessly with existing infrastructure

- Expandable capacity – Grow your system as operational needs increase

✓ Maintenance Optimized

- Fully automated – Minimal operator intervention required
- Self-regulating systems – Reduced downtime and service costs

Small-Scale Unit (model HT-150W, daily e-production 1MWh)

A small-scale H2life Biomass E-Generator unit could serve for, as well as for electricity supply for small customers consume not more than 50KWh.

H2Life Biomass E-Generator model HT-150W's key Features & benefits

- High-Efficiency Energy Production
  - 75 kg almond shells → 50 kWh clean electricity
  - Annual output: 396 MWh (operating 360 days/year)
- Cost-Effective & Rapid ROI
  - Total CapEx: $95,000 (system, logistics, installation)
  - Annual O&M cost: $5,000
  - Revenue potential: $67,320/year ($0.17/kWh)
  - ROI: 17 months with $5,166/month profit
- Compact & Easy Integration
  - Small footprint: Only 37 m² required
  - Plug-and-play design: Seamless integration into existing facilities
- Advanced Optimization & Compliance
  - Real-time performance tracking: Adaptive operation for different feedstocks
  - Fully certified: Meets CE & ISO standards for safety and environmental compliance
- Market-Ready Solution
  - Proven technology: Hands-on operational experience ensures reliability
  - Scalable adoption: Ideal for farms, cooperatives, and small industries

Industrial-Scale Unit (model HT-1000W, daily e-production 7.2MWh)

- Consumption of **500Kg** almod shells, sufficient to produce **300kWh** electricity.
- Minimal space requirement (120m²)
- Electricity supply for onsite use or connecting to the grid.
- Brief economy analysis:
  Total CapEx (including H2life system, Logistic, installation, infrastructure, etc.): $410,000
  Annual O&M cost: $17,250
  Annual electricity production (360 days): 2,592MWh
  Annual market value of the produced electricity (based on $0.17/KWh): $440,640
  Annual profit and time for ROI: Profit - **$423,390**/annum; $1,283/day; **ROI - 12 months**

Industrial-Scale Unit (model HT-3000W, daily e-production 24KWh)

- Consumption of 1,**500Kg** almond shell, sufficient to produce **1,000kWh** electricity.
- Minimal space requirement (150m²)
- Electricity supply for onsite use or connecting to the grid.
- Brief economy analysis:
  Total CapEx (including H2life system, Logistic, installation, infrastructure, etc.: $1,300,000
  Annual O&M cost: $65,000
  Annual electricity production (360 days): 8,640MWh
  Annual market value of the produced electricity (based on $0.17/KWh): $1.469m
  Annual profit and time for ROI: Profit - **$1,404,000**/annum; $3,900/day; **ROI - 11 months**

H2Life technology is both scalable and adaptable to multiple agricultural sectors including cotton, sugarcane, rice, wheat, chicken and cow manure. This versatility enables widespread adoption across farming operations and industrial applications.

Regional Adaptability: Designed for diverse environments, including remote and off-grid locations, enabling decentralized clean energy generation.

Modular Expansion: Incremental scalability allows farmers to start small and expand capacity as needed.

Regulatory and Policy Alignment

The H2life Biomass E-Generator aligns with global renewable energy goals and climate strategies:

- Supports emissions reduction targets by converting biomass into clean energy.
- Eligible for government incentives and subsidies promoting renewable energy.
- Contributes to UN Sustainable Development Goals, particularly Affordable and Clean Energy, Responsible Consumption and Production, and Climate Action.

CONCLUSION & CALL TO ACTION

The H2Life Biomass E-Generator delivers a transformative clean energy solution that:

- ✓ Converts agricultural waste into low-cost, renewable electricity
- ✓ Operates through a carbon-neutral process eligible for emission reduction incentives
- ✓ Provides cost-competitive green power while solving waste management challenges

Now is the time to act!
EWA Group invites farmers, cooperatives, investors and energy stakeholders to:

1. Schedule a consultation to assess your biomass-to-energy potential
2. Explore financing options and incentive programs
3. Join the renewable energy transition with our proven technology

Contact us today to implement your sustainable energy solution.

For more information, see www.ewatechgroup.com or apply to:

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