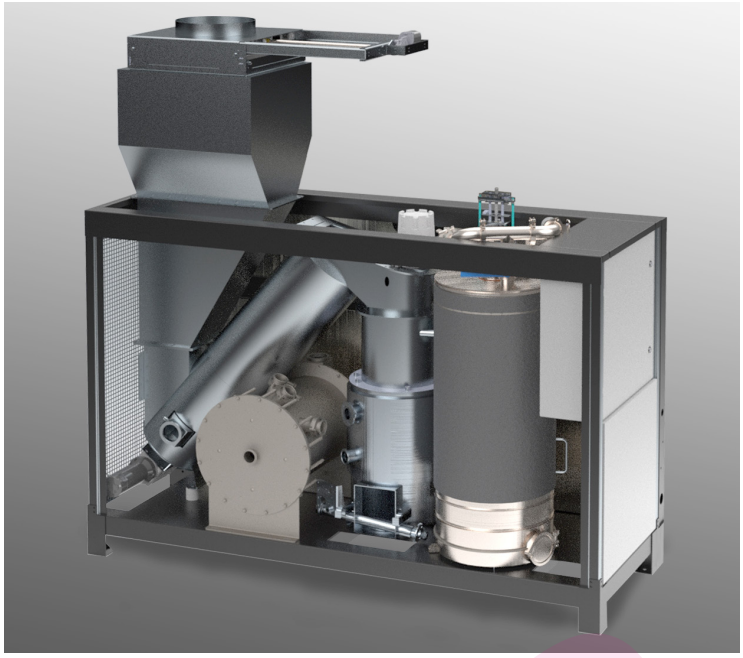
ALL POWER LABS

Carbon Negative Power & Products

CHARPALLET v1.0

SMALL-SCALE BIOCHAR REACTOR



CharPallet Rendering

The ALL Power Labs CharPallet is a compact, Combined Heat and Biochar (CHAB) gasifier system designed to convert waste woody biomass into high-quality high-temperature biochar and thermal energy via a hydronic loop. It is based on our PP30 v3.0 Power Pallet development using APL's newest Swirl Hearth architecture, which includes design innovations expected to widen the range of acceptable feedstocks, reduce feedstock preparation requirements, and improve emissions.

Current Power Pallet architecture integrates two separate skids (power-generation side and gas-making side) into the full genset system. This configuration also presents an opportunity to create a standalone gas-making system optimized for biochar production and sized for community farms and gardens as well as educational institutions. It makes an ideal test platform for R&D and demonstration activities such as validation of various feedstocks, syngas to alternative fuel conversion, and other gasification and renewable energy research.

While most of the heat output of the standard CHP PP30 is from recovered waste heat of the engine, the CharPallet uses the same PP30 Producer Gas Heat Exchanger (PGHx) but with an additional Hx to recover heat from the gas combustor system, providing the ability to add 50 kWth of heat to a customer-supplied hydronic system.

We offer these data with reasonable confidence given our long-running data acquisition in the development of our gasifier-genset systems and distribution of their biochar byproduct.

CORE PERFORMANCE SPECIFICATIONS

GAS MAKING SYSTEM	
Biomass Conversion Rate	5-25 kg/hr
Maximum Gas Flow Rate	60 m^3/hr
Producer Gas Composition	<50 mg/m^3 Tar

THERMAL SYSTEM	
Heat Output	50 kWth
Hot Water temperature Range	80° - 90° C
Interface Plumbing Size/type	1 1/2 inch NPT
Internal Operating Pressure (Relief Pressure)	100 kPa (15 PSI)

PRELIMINARY BIOCHAR VALUES	
Biochar Yield (fraction of input biomass by weight)	20%
Carbon Content	>90%
H:C Ratio	<0.2
Polycyclic Aromatic Hydrocarbons (EPA 16 PAH)	<50 mg/kg
Benzo[a]pyrene PAH - B(a)P-TEEQ basis	0.0 mg/kg

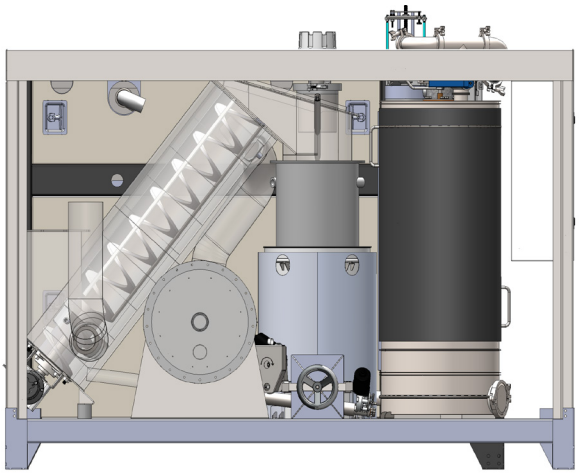
COMBUSTOR SPECS

PRELIMINARY VALUES	
Materials - Combustion sleeve	310 SS 3" rock wool insulation
Duty Cycle	100%
Emissions	AQMD compliant in some districts

BIOMASS FEEDSTOCK

SPECIFICATIONS	
Particle Size	1/8 in. - 1.5 in. (3 mm - 65mm)
Walnut Shells	Compatible
Hardwood Chips (e.g. oak, ash, beech)	Compatible
Softwood Chips (e.g. pine, fir, cedar)	Compatible
Fines Fraction: less than 1/8 inch	<12% by weight
Main Fraction: 1/8 inch to less than 2.5 inches	>75% by weight
Coarse Fraction: greater than 1.5 inches and all must be less than 2.5 inches	<3% by weight
Moisture Content (Dry Basis)	<15% External Drying Required

The specifications provided herein are working values based on standard operation with qualified feedstock & are subject to change without notice



CharPallet Side View Rendering

Woodchips into Biochar

SUPPORTING INFRASTRUCTURE REQUIREMENTS

SPECIFICATIONS	
Form Factor	Half Skid
Footprint	3 feet x 6 feet (1 meter x2 meters)
Clearance: for external components and material loading/unloading	4 feet all sides (125 centimeter)
Shore Power	120/240 Vac 1800 W max
Fuel Drying	15% ± 3% moisture (dry weight) may require External Drying Module
Fuel Loading	Conveyor or Manually
Biochar Handling	Manual or Conveyor
Instrumentation and Controls	Interactive automation, monitoring & datalogging systems

AUTOMATION SYSTEM

FEATURES	
Full Temperature and Pressure Instrumentation	Standard
Smart Grate, Fuel, and Charash Auger Control	Standard
Diagnostic Messages for Error Recovery	Standard
User-Configurable Setpoints for All Critical Systems	Standard
Automatic Safety Shutdown	Standard
Remote Monitoring and Datalogging via wifi	Available

All specifications are subject to change without notice

ALL Power Labs

ALL Power Labs is the global leader in small-scale gasification technology. We make biomass-fueled power generators that are ready for everyday work, to serve real-world, distributed-energy needs. Our compact gasifiers are now at work in over thirty countries, and support research at more than fifty universities around the world.

Our team is an unusual combination of hands-on fabricators and university-trained scientists and engineers. The result is a powerful combination of technical ability and physical know-how for developing innovative energy solutions.

ALL Power Labs makes machines that transform organic waste into useful Power and Products, for work at the intersection of industry, agriculture, and climate. APL intends to make a consequential impact on global energy poverty and greenhouse gas drawdown, through mass delivery of its carbon-negative energy devices.

Our facility is in Berkeley, California. Please contact us to arrange a visit the next time you are in the Bay Area. We would love to show you around.

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