



## CHARPALLET 25 (CP25)

### SMART BIOCHAR REACTOR



CharPallet 25 Prototype

The **ALL Power Labs CharPallet 25** is a smart, compact, Combined Heat & Biochar (CHAB) gasifier system designed to convert 25 kg/hr waste woody biomass into high-quality, high-temperature biochar with optional hydronic heat and gas-making modules. It is based on our third-generation gasifier architecture using APL's novel v3.0 Swirl Hearth design, including innovations which widen the range of acceptable feedstocks, reduce feedstock preparation requirements, and greatly reduce biochar contaminants.

APL's Smart Tech links device operation & communications with the emerging universe of carbon-trading platforms. The CharPallet integrates our newest developments in control and UI systems, using the latest Internet of Things (IoT) protocols to allow digital Measurement, Reporting, and Verification (MRV) systems to connect directly with carbon-market platforms to generate carbon credits.

This sophisticated standalone biochar reactor is optimized for maximum high-carbon, low-PAH biochar production. The CharPallet is a highly portable system sized for community farms and gardens as well as research and educational institutions. Perfect for Biochar Carbon Removal (BCR), multiple units can be networked to create a Virtual Carbon-removal Plant (VCP). With optional gas-making features, CharPallets make an ideal test platform for R&D and demonstration activities in syngas-to-alternative-fuel conversion, particularly Renewable Natural Gas (RNG), and Hydrogen (H<sub>2</sub>), as well as other gasification and renewable-energy research. It can also be paired with separate power-generation modules to produce up to 20 kW of electricity.

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 SPECIFICATIONS

##### PERFORMANCE

Biomass Consumption:	25 kg/hr maximum
Biochar Yield:	20% (biomass input by mass)
Maximum Flow Rate:	Biochar: 5 kg/hr Syngas: 60 m <sup>3</sup> /hr
Minimum Flow Rate:	Biochar: 1 kg/hr Syngas: 12 m <sup>3</sup> /hr
Available Thermal Output:	50 kW maximum
Max. Continuous Operation:	~12 hours
Start-Up Time:	20 - 40 minutes

##### PRODUCER GAS COMPOSITION

Hydrogen (H <sub>2</sub> )	22% (by mass)
Carbon Monoxide (CO)	20%
Carbon Dioxide (CO <sub>2</sub> )	10%
Methane (CH <sub>4</sub> )	3%
Nitrogen (N <sub>2</sub> )	45%
Tars (aromatic hydrocarbons)	<50 mg/m <sup>3</sup>

##### BIOCHAR VALUES

Carbon Content	>90%
H:C Ratio	<0.4
Polycyclic Aromatic Hydrocarbons (EPA 16 PAH)	<50 mg/kg
Benzo[a]pyrene PAH - B(a)P-TEEQ basis	0.0 mg/kg

#### SMART AUTOMATION

##### AVAILABLE FEATURES

Remote Monitoring	Temperature, Pressure, Biomass/Biochar Mass
Automated Start Up & Operation	Automated Electric Ignition & Valving
Remote Control	Technical Proof
IoT Data Collection to Cloud	Mobile Connectivity with 3rd Party Apps
Process Optimization	On-board Automation
Measurement Reporting & Verification MRV Process Monitoring	10+ Temp, 5+ Pressure, Lambda, & Mass Airflow
MRV Input	Biomass Consumption
MRV Output	Biochar Production

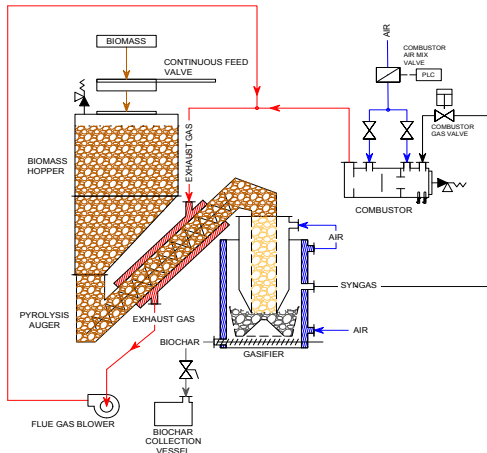
#### SHIPPING PACKAGES

#1 - Main Unit	28x83x56.5 in = 71x211x144 cm - 454 kg = 1001 lbs
#2 - Hopper Feed	28 x 45 x 31 in = 71 x 114 x 79 cm - 206 kg = 454 lbs
#3 - Biochar Takeoff	28 x 28 x 56 in = 71 x 71 x 143 cm - 120 kg = 265 lbs

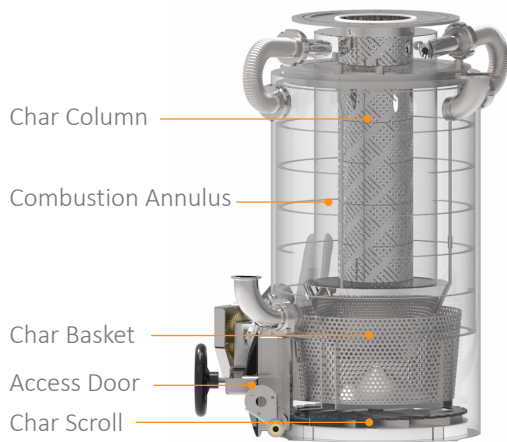
The specifications provided herein are working values based on standard operation with qualified feedstock & are subject to change without notice

## CHARPALLET DRAWINGS

### FLOW DIAGRAM



### SWIRL-HEARTH REACTOR COMPONENTS



## SUPPORTING INFRASTRUCTURE REQUIREMENTS

### SPECIFICATIONS

Form Factor	Half Skid
Footprint	3 feet x 6 feet (1 meter x 2 meters)
Clearance: for external components & material loading/unloading	4 feet all sides (1.25 meters)
Shore Power	120/240 Vac 1800 W max
Fuel Drying	15% ± 3% moisture (dry weight) may require Ext. Drying Module
Fuel Loading	Conveyor or Manually
Biochar Handling	Manual or Conveyor
Instrumentation and Controls	Interactive automation, monitoring & datalogging systems

## 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

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 equipment that is ready for everyday work, to serve real-world, distributed-energy, biochar, and CO<sub>2</sub> removal 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.

