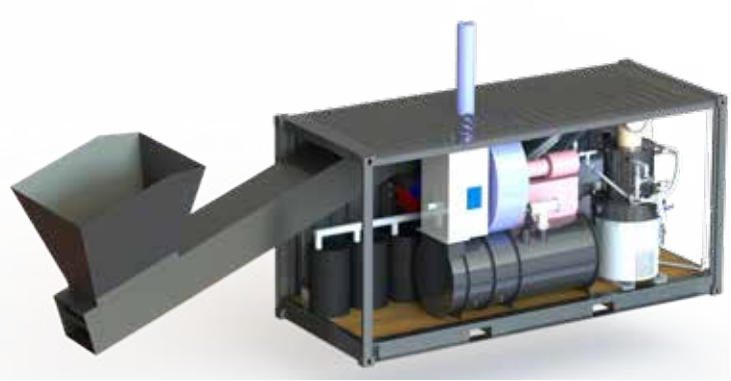
ALL POWER LABS

Carbon Negative Power & Products

CHARTAINER PILOT UNIT

GASIFIER PYROLIZER FOR TAR-FREE GEO-CONDUCTOR BIOCHAR



Chartainer 3D Rendering

The ALL Power Labs CharTainer is a compact, high-volume, Combined Heat and Biochar (CHAB) pyrolizer system enclosed within a standard 20-foot shipping container. The system is fully automated and complete–from biomass hopper, gasifier-retort, and clean-burning flare with heat exchangers to biochar takeoff–all integrated within the shipping container envelope. The CharTainer uses a scaled-up version of APL's newest Swirl Hearth architecture previously refined and proven in our PT150 Powertainer.

The CharTainer is being developed to meet the ever-increasing demand for high-quality, high-temperature, electrically active biochar in the agronomy and climate/carbon mitigation sectors. Partnering with our carbon-drawdown initiative, The Local Carbon Network, APL's engineers have been working with biologists, agronomists, farmers, and climate researchers to perfect biochar-retort technology and biochar application techniques. One result of this work is the design of the CharTainer, capable of a one quarter tonne of biomass per hour throughput delivering up to 40 kilograms per hour of the highest quality, tar-free, geo-conducting biochar available.

We are currently developing a pilot unit with CEC funding with the intent of commercial Production units being available as early as Q3 2021. 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

PRELIMINARY VALUES	
Biomass Consumption Rate	250 kg/hr
High Temperature Biochar Yield (>600°C)	40 kg/hr
Heat Output	500 kWth
Hot Water Flowrate min@ 20°C customer side	100 gpm
Hot Water Temperature Range	80° - 90° C
Interface Plumbing Size/type	3 in. NPT
Internal Operating Pressure (Relief Pressure)	15 psi

GAS MAKING SYSTEM

ESTIMATED VALUES	
Swirl Hearth with Augmented Pyrolysis Auger	<50 mg/m^3 Tar

CHAR OUTPUT TEST RESULTS

LABORATORY VALUES	
Post-Combustion High-Temp Char (>600°C)	<0.2 mg/kg PAH

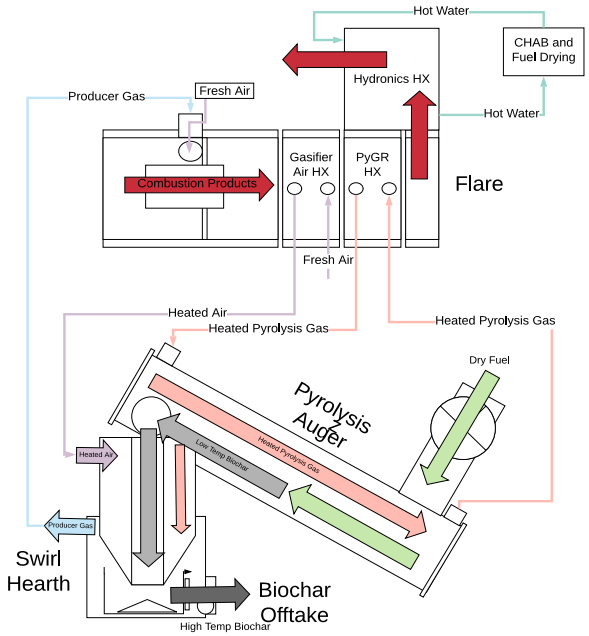
FLARE SPECS

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

BIOMASS FEEDSTOCK

SPECIFICATIONS	
Particle Size	1/8 in. - 2.5 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 2.5 inches and all must be less than 5 inches	<3% by weight
Moisture Content (Dry Basis)	<15% External Drying Required

The numbers provided herein are working specifications which are subject to change without notice



CHARTAINER Flow Diagram

SUPPORTING INFRASTRUCTURE REQUIREMENTS

SPECIFICATIONS	
Form Factor	20 foot Shipping Container
Footprint	28 feet x 40 feet (8.5 meters x 12.2 meters)
Clearance: for external components and material loading/unloading	10 feet all sides (3 meters)
Shore Power	3 phase 240 V AC with 200 amp breaker
Fuel Drying	15% ± 3% moisture (dry weight) may require External Drying Module
Fuel Loading	Conveyor or Manually
Biochar Handling	Manual or Conveyor
Instrumentaion and Controls	Wifi Access to onboard remote monitoring system

AUTOMATION SYSTEM

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

Woodchips into Biochar

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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