ALL Power Labs

personal scale power

POWERTAINER - PT150 Beta 2

RENEWABLE AFFORDABLE ON-DEMAND POWER

The **ALL Power Labs Powertainer (PT150)** is a compact and cost-optimized biomass power generation system, enclosed within a standard 20' shipping container. The system is fully automated and complete – from biomass hopper, gasifier and gas filtering, to engine, generator and electrical output control – all within the shipping container envelope. The goal is a total-system-in-a box, drop it off the truck and run.

The Powertainer uses a scale-up of the TOTTI gasifier system architecture previously designed, refined and proven in PP20 and PC20 Power Pallets. The Powertainer Alpha Protoype was initially developed in partnership with the US Dept of Energy, and APL is now developing a Beta 2 design with support from a grant from the Califonia Energy Commission. The project is aimed at incentivizing forest-fire mitigation by demonstrating the potential of waste-to-power enterprises based on gasifying the logging waste that results from this thinning, and which is too often disposed of by open burning. This will be supported by the 50 MW biomass feed-in tariff set asides in the ReMAT program established by SB1122.

The technical specifications are derived from initial testing at APL in Berkeley, CA and during more extensive data-logged runs and analysis done in Morris, Minnesota through the end of 2012. We are currently developing the PT150 with the intent of commerical production which could result in Beta 2 units being available as early as late 2016.

In the interim, the numbers to the right are working specifications. We can offer these with reasonable confidence given our Powertainer tests to date, as well as long running data acquisition on the related Power Pallet gasifier-genset systems.

POWERTAINER SPECIFICATIONS

PRELIMINARY SPECIFICATIONS	
Maximum Continuous Power Output [1]	150 kW @ 60Hz
Sound Insulation	Container Interior
Sound Level @ 10 meters	65 db(A)
Emissions	Meets CA targets
Full Enclosure - ISO Container	Corrugated Steel
Site Requirements	Well-Ventilated
Operating Footprint 20 ft. ISO container plus 8 ft. access clearance	24' x 36'
Shipping Dimensions Standard ISO container	8' x 8' x 20'
Shipping Weight TBD	Not to exceed 30,000 lbs.

[1] Actual power will vary depending on fuel type, shape, energy density and moisture content.

BIOMASS FEEDSTOCK

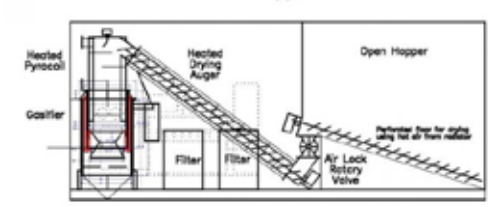
Size	12-40 mm (1/2 inch - 1 1/2 inch)
Moisture Content	10-30% dry basis
Planned Primary Feedstock[3] expected normal operating procedures	Nut Shells (e.g. Walnut, Hazelnut) Softwood Chips (e.g. Fir, Pine) Hardwood Chips (e.g. Oak, Ash)
Targeted for additional Testing [3] possible increased operating effort	Corn Cobs Coconut Shells Palm Kernel Shells
Not Approved Dangerous & Will Void Warranty	Coal Tires Medical Waste Plastic Municipal Solid Waste

[3] Warranty coverage for use with any particular species of feedstock requires specific testing and approval. Visit ***http://www.allpowerlabs.com/fuels*** for the most current information on feedstock suitability.

FUEL COST COMPARISON

FUEL		PRICE
Diesel	@$3.00/gal, 0.1 gal/kWh	$0.30/kWh
Gasoline	@$3.20/gal, 0.12 gal/kWh	$0.38/kWh
LPG	@$2.50/gal, 0.17 gal/kWh	$0.42/kWh
Gasified Woodchips	***@$20/ton***	***$0.04/kWh***

All specifications are subject to change without notice



Side View
Powertainer Alpha

3D CAD Powertainer Alpha

APL Custom Process Control

Deep Sea Grid Tie Control for Synchronous Generator

GASIFIER SYSTEM

FEATURES	
GEK TOTTI Gasifier - Multi-stage, Zone-separated Heat-regenerating, High-efficiency Architecture	✔
Fuel Moisture Tolerance	<30%
Biomass to Power Conversion[4] - Dry Basis	1.0 kg = 1 kWh
High Performance Neutral-Vane Multi-Cyclone	✔
Multi-stage Solid Particulate Filters	✔
Active Mist and Tar Filtration	✔
Continuous Char/ash Removal from Gasifier [5] 12-24 hr. service period	✔
Continuous Cyclone Particulate Removal [5] 12-24 hr. service period	✔
Continuous Fuel Feed via Airlock Including hopper, air lock, level sensing & ECU	✔

[4] Energy density of any given feedstock varies depending on various factors such as fixed carbon content.
[5] Char/ash & particulate byproducts vary depending on fuel type, shape, energy density & moisture content.

ENGINE & GENERATOR

FEATURES	
Spark Ignition IC Engine - TBD > 6.0 liter displacement	✔
Electronic Governor	✔
Automated Syngas/Air Mixture Control	✔
Exhaust Cleanup - Catalytic Converter	CA Compliant
Synchronous or Induction Alternator	UL/NEMA Compliant
Field Configurable - All common phase & Voltage	✔
Grid Tie System - including controls & contactor	✔
Paralleling Capable	✔

AUTOMATION SYSTEM

FEATURES	
Full Temperature & Pressure Instrumentation	✔
Smart Grate, Fuel & Charash Auger Control	✔
Diagnostic Messages for Error Recovery	✔
User-Configurable Setpoints For all critical systems	✔
Datalogging for Gasifier	✔
Datalogging for Power Generation	✔
Remote Monitoring	✔

All specifications are subject to change without notice