



# Old PP20 vs New PP30 Cogen-CS

## Technical Specifications & Comparisons



PP30 COGEN-CS USE CASE EXAMPLES	
INDUSTRY	USE
Residential / Commercial	Radiant hydronic heating Water-to-air heating Pool and spa heating Snow melt Adsorptive chilling
Animal Husbandry	Barn and enclosure heating Sterilization and cleaning
Agriculture	Greenhouse heating Food/Seed drying Process heat
Forestry	Kiln-drying lumber Pulp drying Space heating
Manufacturing	Heat for chemical processes Food processing Fluid transport, Textiles, Minerals

## CORE PERFORMANCE SPECS

	PP20	PP30 Cogen-CS
Continuous Electrical Power Rating	18 kW @ 60Hz 15 kW @ 50Hz	60Hz Markets 27 kW (on-grid with CHP) 25 kW (off-grid)  50Hz Markets 24 kW (on-grid with CHP) 22 kW (off-grid)
Biomass Consumption	1.2 kg/kWh (dry basis)	1.0 kg/kWh (dry basis)
Runtime per hopper fill: Approximate feedstock density 250 kg/m <sup>3</sup>	5 kW: 10 hours 10 kW: 5 hours 15 kW: 3 hours	5 kW: 12 hours 10 kW: 6 hours 15 kW: 4 hours 25 kW: 2.4 hours
Max. continuous operation before ash vessels need emptying	12 hours	16 hours
Start up time:	10-20 minutes	10-15 minutes
Sound Level @ 7 meters	85 dB	75 dB

## COGEN HEAT AND EFFICIENCY RATINGS

	PP20	PP30 Cogen-CS
Electrical Efficiency	~20% (woody biomass, LHV) ~25% (syngas)	~23% (woody biomass, LHV) ~28% (syngas)
3 stage Electrical + thermal efficiency (Gasifier Hx + engine cooling water Hx + engine exhaust Hx)	Not offered	>65% (biomass), >80% (syngas)
3 stage CHP system heat output	Not offered	2.0 kW thermal per 1 kW electrical generated
1 stage Electrical + thermal efficiency (Engine cooling water Hx)	>40% (biomass), >55% (syngas)	Not Offered
1 stage CHP system heat output	1.0 kW thermal per 1 kW electrical generated	Not Offered
Engine coolant working fluid Engine water pump rate (free flow) Engine coolant temperature range	Coolant: Up to 50% PEG 4 m <sup>3</sup> /hr (17.6 GPM) 70-80°C (158-195°F)	Coolant: Up to 50% PEG 6 m <sup>3</sup> /hr (26.4 GPM) 80-95°C (175-205°F)

Customer side CHP loop temp Customer side minimum flow rate Minimum customer heat delivery	~70-75°C (158-168°F) 0.7 m3/hr (3.2 GPM) @ 18 kWt 0 kWt (native radiator backup)	~80-85°C (175-185°F) 2.2 m3/hr (9.5 GPM) @ 50 kWt 0 kWt (native radiator backup)
Plumbing connection for customer side CHP loop	1" NPT plumbing	1.5" Sanitary Fitting

GAS MAKING SYSTEM		
	PP20	PP30 Cogen-CS
Type	APL v5.x Patented Multistage heat recycling downdraft gasifier	APL v5.x Patented Multistage heat recycling downdraft gasifier
Materials	304 Stainless, 310 Stainless, 321 Stainless, Mild Steel	304 Stainless, 310 Stainless, 321 Stainless, 316 Stainless, Mild Steel
Hearth	Coated Ceramic	Coated Ceramic
Char-Ash Removal	Automated auger removal from reactor to 12-hour batch vessel.	Automated auger removal from reactor to 16-hour batch vessel.
Fuel Feed	Automated from hopper to reactor	Automated from hopper to reactor
Hopper Capacity	333 liters / 88 gallons	333 liters / 88 gallons
Hopper Filling	Batch—manual refilling while operating. Optional airlock lid and level sensing for automated filling.	Batch—manual refilling while operating. Optional airlock lid and level sensing for automated filling.
Filtration	Dry Filtration: Cyclone. Packed charcoal candle filter, run in condensing mode.	Dry Filtration: Cyclone. Packed charcoal candle filter, run at controlled temperature for tar and water dew point management. No condensate produced.
Gas cooling pre-filtration	Gas flow direct heat exchange with drying stage. Variable output temp	Gas flow heat exchange with engine cooling water, using in situ cleanable Hx. Gas output temperature controlled to 60-80°C. Second indirect heat exchange loop to drying prevents soot fouling.
Flare	Clean burning premixed swirl combustor. Manual mixing. Automated ignitor.	Clean burning premixed swirl combustor. Manual mixing. Automated ignitor.
Control system	On-board automation	On-board automation

<b>ENGINE</b>		
	<b>PP20</b>	<b>PP30 Cogen-CS</b>
Type	GM Vortec	Ashok Leyland (Hino-Toyota design)
Cylinder count	4 cylinder	4 cylinder
Displacement	3.0 liter	4.0 liter
Compression Ratio	8.2:1, 10.5:1	12:1
RPM	1500 @ 50 Hz, 1800 @ 60 Hz	1500 @ 50 Hz, 1800 @ 60 Hz
Engine block	Cast Iron. Automotive gasoline engine based block. No cylinder liners. Machine shop based rebuild.	Cast Iron. Industrial diesel engine based block. Replaceable cylinder liners. In frame rebuild enabled.
Pistons	Aluminum alloy. Flat top.	Aluminum alloy with steel inserts for ring trenches (prevents ring sticking). Center combustion cup.
Cylinder head	Interlaced Intake and exhaust. Cast Iron w/ hardened exhaust valve inserts. Wedge squish combustion. Offset spark plug.	Crossflow head. Cast Iron w/ hardened exhaust valve inserts. Circumference squish combustion. Center spark plug.
Valve Configuration	Overhead valves, Pushrods	Overhead valves, Pushrods
Ignition	Mechanical distributor	ECU Controlled Electronic
Oil capacity	5 L, 1.2 gallon	8 L, 2 gallon
Oil Cooling	None	Integrated in block to water coolant loop
Oil Maintenance Interval	250 hrs	500 hrs
Coolant capacity	11.4 liter	15 liter
Auto-shutdown	Low oil pressure, high coolant temperature	Low oil pressure, high coolant temperature
Engine auxiliary components type/power	Belt driven cooling fan, water pump and 12V DC alternator	Electrical DC cooling fans, DC water pump, and battery charger. Controlled to maximize efficiency.
Auxiliary parasitic load on engine	~2.5 kW mechanical	850 watts with radiator on. 300W without radiator.
Starter	12V Automotive Starter	12V Industrial Starter
Charging system	Delco-Remy 7-SI (70A)	Switch Mode AC Charger from genhead
System voltage	12V DC	12V DC

Recommended battery	75Ah, 880 CCA Marine	75Ah, 880 CCA Marine
Battery tray dimensions	20 × 30 cm / 10 × 12 inches	20 × 30 cm / 10 × 12 inches
Speed control	Electronic governor Woodward L-series	Electronic governor Woodward L-series
Mixture control	Automated with Bosch Wide Band Oxygen Sensor	Automated with Bosch Wide Band Oxygen Sensor

## AC GENERATOR

	<b>PP20</b>	<b>PP30 Cogen-CS</b>
Type	Mecc Alte NPE32-E/4, 12 wire reconfigurable	Marathon 284CSL1542, 12 wire reconfigurable
AVR	Mecc Alte DSR	DSE A106 MK II
Efficiency	83%	92%
Available Voltages	120-277, 240-480 V AC	120-277, 240-480V AC
Available Topologies	3 phase: Series Star, Parallel Star, Series Delta, Parallel Delta, 1 phase: Double Delta	3 phase: Series Star, Parallel Star, Series Delta, Parallel Delta
Total Harmonic Distortion	<5%	<5%
Motor Surge Starting Capacity	>300%	>300%
Genset Starting	Manual Handover	Manual Handover
Maximum step-load	50% of rated power	50% of rated power

## GRID-TIE / PARALLELING

	<b>PP20</b>	<b>PP30 Cogen-CS</b>
Controller	Deep Sea DSE8610	Deep Sea DSE8610 MKII

PP30 EMISSIONS WITH EXHAUST CATALYST*				
vs US EPA, Landfill Gas, SI Engine <500 HP, 2011				
Emission	Units	Ref. O2 %	Standard	Status
NOx	ppm	15%	150	Pass
CO	ppm	15%	610	Pass
VOC	ppm	15%	80	Pass
vs California, San Joaquin Valley APCD				
Emission	Units	Ref. O2 %	Standard	Status
NOx	ppm	15%	9	Pass
CO	ppm	15%	75	Pass
PM	g/bhp		0.05	Pass
VOC	ppm	15%	25	Pass
vs Lazio Region, Italy				
Emission	Units	Ref. O2 %	Standard	Status
NOx	mg/m3	5%	320	Pass
NOx	mg/m3	11%	200	Pass
CO	mg/m3	5%	160	Pass
CO	mg/m3	11%	100	Pass
PM	mg/m3	5%	50	Pass
PM	mg/m3	11%	80	Pass

\* Emissions numbers and pass status use both in house and certified third party testing.  
More detailed information available on request.

FUEL COST COMPARISON (Varies by Region)	
FUEL	PRICE RANGE
Diesel / LPG	\$0.25-\$0.75/kWh
Gasoline	\$0.25-\$0.75/kWh
Biomass	<b>\$0.00-\$0.06/kWh</b>

**OPERATING CONDITIONS**

	<b>PP20</b>	<b>PP30 Cogen-CS</b>
Site Requirements	Ideally outdoor covered patio. Well ventilated, level floor, protected from rain and direct sun, 1.75m overhead clearance. If poor ventilation, a fireproof hood over the flare is required.	Ideally outdoor covered patio. Well ventilated, level floor, protected from rain and direct sun, 1.75m overhead clearance. If poor ventilation, a fireproof hood over the flare is required.
Ambient Temperature	5-40°C, 40-100°F	5-40°C, 40-100°F
Ambient Relative Humidity	5-95%	5-95%
Installed Footprint L x W x H	1.36 × 1.35m 53.5 × 53.5 x 88in	1.778 × 1.42 × 2.24m 72 × 56 × 88 in

**SHIPPING**

	<b>PP20</b>	<b>PP30 Cogen-CS</b>
Dimensions: Main crate	1.45 × 1.45 × 1.40 m 57 × 57 × 54 inches	1.85 x 1.44 x 1.40 m 73 × 57 × 55 inches
Dimensions: Hopper crate	83 × 83 × 114 cm 33 × 33 × 45 inches	83 × 83 × 114 cm 33 × 33 × 45 inches
Weight: Main crate	700kg 1,750 lbs	1,130 kg 2,500 lbs
Weight: Hopper crate	91kg 200lbs	91kg 200lbs