

Advanced Hybrid Gasification System

Our Advanced Hybrid gasification system technology is particularly indicated for medium/small and distributed electric power generation, from 500KWe up to 5MWe electric output. More higher electric power can be obtained pairing modules in a parallel way although basic unit is designed now for 500KWe from viewpoint of easy transportability.

The whole process is able to improve the value of locally produced biomass or biomass bi-products/waste products through generation of both electric and thermal power either grid connected or stand alone for particular energy consumer facilities. The system requires regular and any biomass feeding and it can be designed to be fully automatic or manual operated according to economic evaluation.

The clean produced gas(Producer gas or Syngas) fuel can be used many industrial applications, but typically used in syngas mode of gas engine fuel with power generator, or alternatively in co-combustion (with natural gas) in gas power plants, or also in dual fuel mode with standard diesel fuel for specific applications where diesel fuel can be replaced in part. However, applications in Japan mostly now aims to for biomass power generation and it will be sold to FIT(feed-in Tariffs) as renewable electricity.

Our highly efficient gasification process is an advanced hybrid pyrolysis-gasification process coupled with efficient gas engine generator and ORC(Organic Rankine Cycle) / waste heat recovery combined power cycle technology. Using both pyrolysis and gasification hybrid technology the process combines the advantages of both an higher calorific value of the producer gas (Syngas) and a lower consumption of valuable and cost intensive feedstocks material for gasification.

• Reaction

	ΔH (cal)
$C+O_2=CO_2$	-97000
$CO_2+C=2CO$	38200
$2C+O_2=2CO$	-58800
$C+H_2O=CO+H_2$	28400
$C+2H_2=CH_4$	-17900
$CO+H_2O=CO_2+H_2$	-9800
$C+2H_2O=CO+2H_2$	18600

The particular circulation of gases through the system (see last pictures) contributes to get a clean produced gas ready for use without any further pre treatment(Patented).

The waste products are not dangerous char(ash) wastes, but can be used effectively as agricultural fertilizer. Thanks to high yield of potassium, especially rich in Bamboo char. Our Advanced Hybrid gasifier is designed especially for treating efficiently of any lower temperature melting point feed stocks(richer potassium/sodium).

Gas analysis

Tables shown bellow is comparison table of typical Down Draft gasifier process and our Advanced Hybrid process. As you see,our gasifier is remarkably richer/higher energy syngas produced with higher feedstocks to syngas conversion efficiency(Cold Gas Efficiency). In addition,feedstocks in use is almost no limitations.

Comparison Table Gasifier Type		
Process Type	Typical Down Draft	Advanced Hybrid
Feedstock	Woody Biomass only (Wood Chips)	Any Biomass Used (Multi-feedstocks)
: Size	Pellet only in size (2-5cm)	Any small to large size(0.2-10cm)
Oxidant	Air	Air
Pressure	Atmospheric	Atmospheric
Gas Composition(v%/v)		
Hydrogen:H2	12.0	33.4
Carbon Monoxide:CO	12.6	47.2
Methane:CH4	3.9	3.6
Carbon Dioxide:CO2	15.3	0.1
Nitrogen:N2	51.0	15.7
Others	5.2	0.0
Total	100.0	100.0

Syngas/Feedstock Cold Gas	50.0	75.0
Efficiency(%)		
Gas Energy LHV(MJ/NM3)	4.3	11.5
: LHV(Kcal/NM3)	1027.7	2748.5

The process is performed with a single machine under multiple/parallel configurations, in a cost effective way which enable to get an higher number of working hours per years.

Almost every kinds of biomass can be gasified including such as bamboo, and rice husk, regardless of the content of the moisture, sizing and compositions. About 0.8 Kg of wood chips(10% moisture) can generate for 1KWh electric power. Produced syngas can be used either in reciprocating (gas or dual fuel) engines or turbines according to specific necessity.

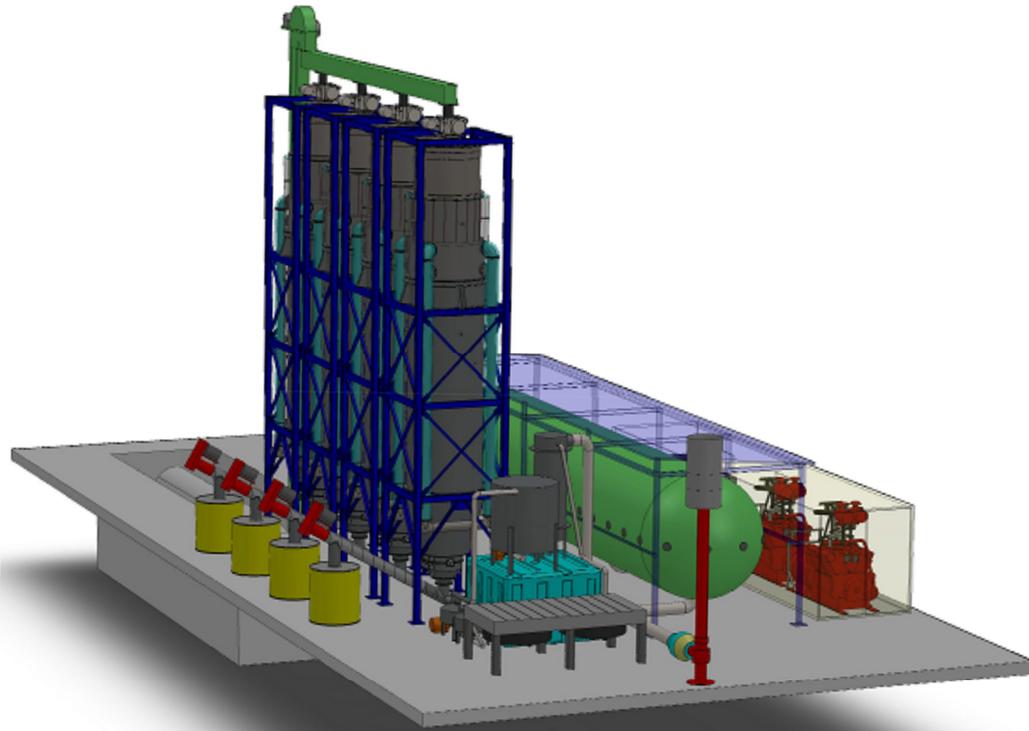
Further developments foresee the use of pure oxygen instead of air and employ of catalysts for the synthesis of liquid fuels (second generation bio fuels) as well as bio-methane (SNG, Substitute of Natural Gas) or pure hydrogen generation instead of power generation.

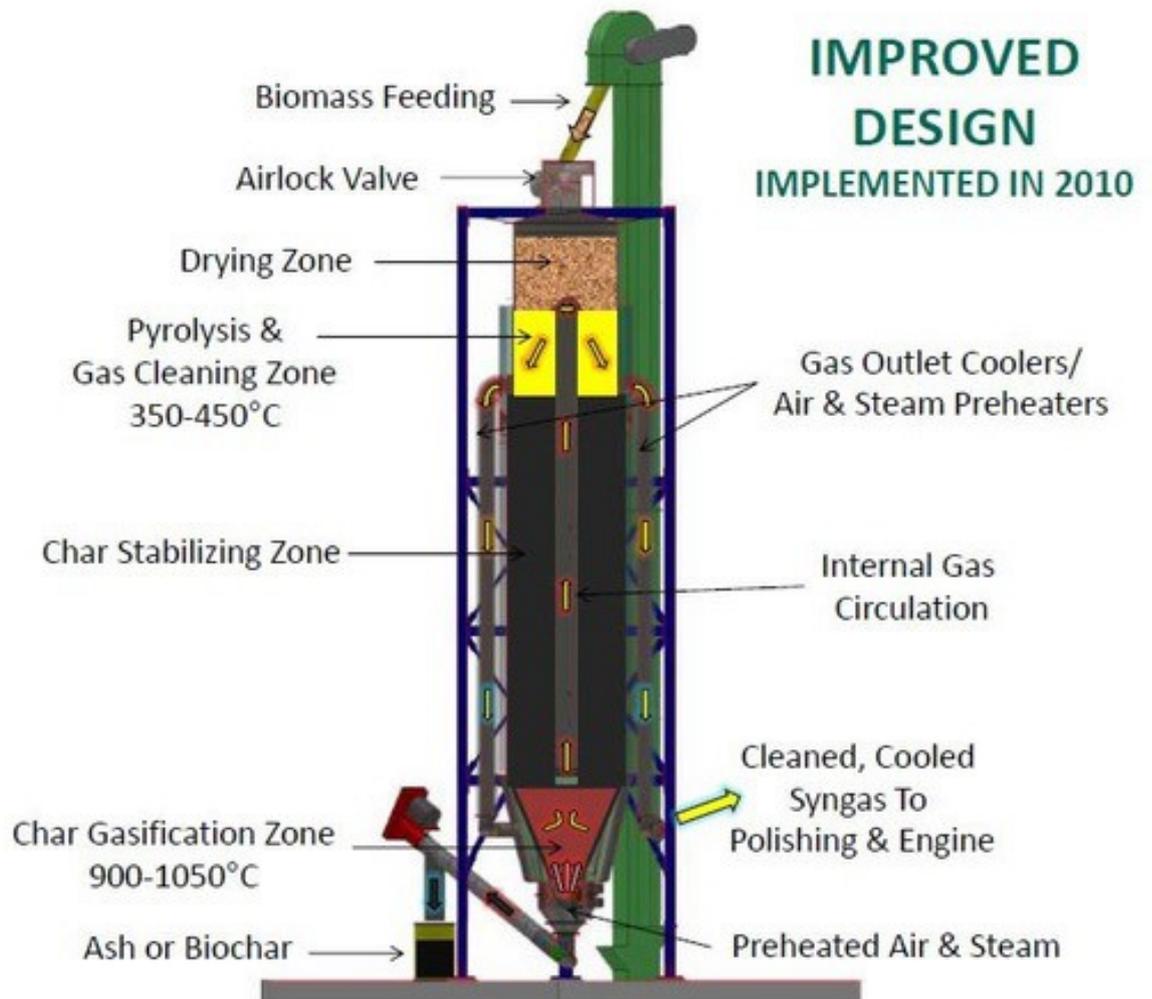
Attached Pictures:

1) **First one** is our planned Advanced Hybrid Gasifier (2MWe gasifier consists of 4 sets of 500KWe combining) with NO-Tar formation and clean producer gas(syngas) can be supplied to gas engine generators.

2) **Second one** is 500KWe of our Advanced Hybrid Gasifier recently commitioned in USA jointly with University California, San Diego/Davis/Berkley, Caterpillar and our business partner in US and EU with biomass subsidy of US/State of California(2M\$).

3) **Third one** is interior and gas flow diagram of a advanced hybrid gasifier of 500KWe unit and the design sizing is exactly as same as 40 feet sea container sizes(2.4mx2.4mx12.0m). Then, it is easy to moving to anywhere of installation site and then, it will complete all of installation works within just for short times at on-site, since the most of manufacturing work and testing shall be done at factory.





More detailed reference: <http://blogs.yahoo.co.jp/hirai476/20525160.html> (only in Japanese)

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