



raiseRECLAIM



Municipal Waste Gasification



RAISE RECLAIM™ INCINERATOR & GASIFICATION - POWER GENERATION SYSTEM

RAISE RECLAIM™ converts existing waste streams into sustainable renewable energy in the form of electricity and heat. It uses a carefully integrated series of pyrolysis, gasification and incineration processes to vaporise any and all types of waste into clean gas – glass and metal is removed from the waste stream and recycled. This gas is then fed into a turbine system or gas engine, or alternatively used to produce steam, that will then produce electrical and heat energy. The system has two different set-ups - one for dry and consistent feedstock materials and one for wet/combination of materials. The system has a small footprint for the output it delivers, and is easily integrated into a building/site architecture, to consume, incinerate, vaporise and “clean” the waste streams into sustainable renewable energy (Electricity and Heat). The systems are implemented modularly, which makes it easily scalable. Sizes vary from small systems in multiples of 250 kW to modular blocks of 5MW (5,10,15,20 MW etc.)

RAISE RECLAIM™ process will incorporate and adhere to international best practice and global standard engineering practice, and will be completed by a senior engineering team with global gasification experience and training - including extensive experience in the United States. Our entire technical team is highly qualified, and have served many years in senior positions within large corporate organizations such as SIEMENS, GE (General Electric), Efficient Power & Engineering, Alan-Bradley, Royal Huskoning DHV, Synthesis Consulting, Ahlstrom and ABB.

Table 1A: Comparative Table on RAISE Energy Technology:

	A	B	C
Comparative Table - Tech A,B and C	RAISE RECLAIM™ Tech	Magnetic Induction Tech	Plasma Arc Tech
Waste Into Plant	100 Tonnes	100 Tonnes	100 Tonnes
Killowatt Hours Generated Electrical	100 000	8500	25000
Killowatt Hours Generated Thermal	200 000	16500	50 000
Total Energy Produces both e + t	300 000	25 000	75 000
Maxium Efficiency	54-88%	13-18%	24-32%
External Energy Source Required	NO	YES - Electrical	YES - Electrical
Parrasitic Load of External Source	0%	20-80%	4-60%
Current Largest Plant Size in Operation	45 Megawatt	16 kW	4 MW
Current Smallest Plant Size in Operation	250 kW	16 kW	70 kW
Capex Cost per Killowatt	US\$ 1000	US\$ 3500	US\$7000
Capex Cost per Megawatt	US\$ 1 Mill	US\$ 3.5 Mill	US\$ 7 Mill
Ave Cost of Power per Killowatt Hour	US\$ 3 cents	US\$ 12 cents	US\$ 20 cents
Saving on Nearest Competitor	300% Saving	0 Saving	40% More expensive

As per Table 1A above, RAISE Energy’s gasification technology is much more efficient in generating energy than other comparative technologies. Additional to this the CAPEX and production cost is significantly cheaper than the nearest competitor. Since the RAISE RECLAIM™ System does not require any additional and external sources of energy, there is no parasitic load on the system. RAISE Energy also has running plants with a large plant, proven track record.



Pictures Below: European WTE Plant in Operation with almost 0% Emission



Gasification is Not Incineration

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The gasification process represents significant advances over incineration. In order to understand the advantages of gasification when compared to incineration, it's important to understand the differences between the two processes. Incineration literally means to render to ash. Incineration uses MSW as a fuel, burning it with high volumes of air to form carbon dioxide and heat. In a waste-to-energy plant that uses incineration, these hot gases are used to make steam, which is then used to generate electricity. Gasification converts MSW to a usable synthesis gas, or syngas. It is the production of this syngas that makes gasification so different from incineration. In the gasification process, the MSW is not a fuel, but a feedstock for a high temperature chemical conversion process. Instead of producing just heat and electricity, as is done in a waste-to-energy plant using incineration, the syngas produced by gasification can be turned into higher value commercial products such as transportation fuels, chemicals, fertilizers, and even substitute natural gas.

Incineration cannot achieve this. One of the concerns with incineration of MSW is the formation and reformation of toxic dioxins and furans, especially from PVC-containing plastics. These toxins end up in exhaust streams by three pathways:

List:

- By decomposition, as smaller parts of larger molecules
- By "re-forming" when smaller molecules combine together; and/or
- By simply passing through the incinerator without change



Picture Below: **RAISE Energy Biomass Gasification System**



POWER PRODUCTION FACILITY

On the power production line the synthesis gas is passed through an HRSG

On the power production line the synthesis gas is passed through an HRSG boiler to produce high temperature and pressure steam. The steam is fed to a high efficiency steam turbine to generate clean, green, renewable electric energy. The flue gas is processed through a Cyclone to remove particulate matter, an acid Gas Removal Unit to remove HCl, H₂S, and HNO₃, an Electrostatic Precipitator to remove sub 2.5 micron particulate matter, a bag house with carbon injection to remove particulate matter, heavy metals, and organics, and is then discharged out the stack at a temperature of 140 to 200 deg C, which prevents condensation. The power production line produces parasitic loading for the electricity needed for the facility of clean, green, electrical power 24 hours per day, 365 days per year.



RAISE Energy has the most efficient, lowest cost gasification technology in the world that will produce the best commercial business case to any customer.

RAISE Energy will utilise a technology agnostic approach to arrive at the lowest possible cost, most appropriate and proven technology, which will most efficiently address that specific client's requirement. This solution will be delivered by a team of highly skilled professionals, who have previously delivered similar solutions to high end clients, and this approach would guarantee the most effective results for the client.

RAISE Energy has developed its own gasification technologies. **RAISE Energy** owns all of the IP and have done all of the development in house. Ranging from biomass all the way to MSW, sewage and "Process All" solutions, our team can provide an end to end solution that can satisfy all of the client requirements.

The outcome of developing our own technologies as well as our manufacturing capabilities, have allowed us to provide high efficiency solutions – up to 88% efficient - at a significantly reduced cost of 30-40% lower than market competitors. Combining our technologies with components and processes that are already implemented elsewhere in the world, allows us to craft unique solutions, fitting to new and previously unaddressed requirements from clients.

Today **RAISE Energy** has access to a diverse range of gasification options and technologies to suit different applications. With a proven track record of successfully running world class installations, we can offer our partners the most appropriate and fitting solution for their waste disposal problems.

Our team has a proven and successful track record of large, completed and current projects. They have been involved in the design, feasibility, construction, and/or commissioning of various waste to energy plants, as partly listed below. For more detail, please also refer to our attached 2017 Project Portfolio.

Gas to Power:

Initial Prototype Gasifier: 1 MW Biomass Johannesburg, South Africa

1. 1 500MW ArcelorMittal South Africa (Saldanha Bay)
2. 500MW Swaziland
3. 800MW Gas power Bagamoyo, Tanzania
4. 850MW Gas power Maputo, Mozambique
5. 992MW Distributed power Angola
6. 1.4 Million ton LNG Supply to South Africa
7. 20 Mill MMBTU containerized LNG solution for West Africa

Waste to Energy:

1. 15MW WTE, Mbeya, Tanzania
2. 15MW WTE Zanzibar, Tanzania
3. 15MW WTE Pilane, Botswana, project awaiting Cabinet approval
4. 45MW WTE Ekurhuleni, South Africa
5. 52MW WTE Johannesburg, South Africa
6. 17MW WTE Lusaka, Zambia
7. 12MW WTE Gweru, Zimbabwe
8. 15MW WTE New Delhi, India
9. 2,1 MW + 15MW WTE, Slovenia
10. 18 MW WTE Munich, Germany