



SUSTAINABLE **GLOBAL** SOLUTIONS

Waste to Energy



SGS, LLC's mission is to market, build, implement, and operate or sell waste-to-energy systems in the USA and other worldwide locations based on proven, proprietary, and efficient solid waste gasification and renewable energy generation technology while supporting a sustainable environment.

What-If?

- ▶ Small communities could completely eliminate 100% of their solid wastes through recycling/reuse of all these materials for energy or remanufacturing, without transporting the waste out of the community?
- ▶ Affordable, small, modular systems which require minimal manpower and material handling or processing, could do so in an environmentally sound way?
- ▶ This process could eliminate hauling of wastes for final disposal, eliminate material handling and processing, eliminate the need for landfills or any other final waste disposal of any kind, and during the process receive virtually free energy?

Unique Solution

- ▶ SGS,LLC has developed, evolved, and proven a unique and elegantly simple, cost effective waste gasification to energy system.
- ▶ High calorific value synthetic gas (syngas) is produced from various solid waste, within environmental regulations.
- ▶ Syngas is used to produce base load electrical energy using engine generators and thermal energy for a variety of local uses.
- ▶ Waste reduced about 95% in volume, 82% in weight, 100% recycled.
- ▶ Focus is distributed, decentralized, “green” systems supporting 5,000 to 500,000 population areas to process 10-500 tons per day.
- ▶ Build-Own-Operate and Build-Sell options with economic and environment benefits.

Loading

- ▶ Municipal, industrial, medical, agricultural, or other solid wastes are delivered to the gasification facility.
- ▶ Pre-sorting or pre-processing of the waste material is not required.
- ▶ Aluminum, other metals, glass, and ceramic are recoverable in their near original form post-processing.
- ▶ Waste is loaded into the system's syngas generator/primary vessel via direct dump, conveyor, grapple, or end loader.
- ▶ When the loading of that vessel is completed, the vessel is sealed and the batch process is ready to start.

Starting

- ▶ Environment temperature is elevated in the syngas generator by energizing its electric heating array.
- ▶ Internal temperature of vessel reaches 800-1200°F., depending on waste, in approximately 1-2 hours.
- ▶ Air supply to the vessel is modulated to maintain an optimum oxygen concentration to sustain a substoichiometric environment within the vessel.
- ▶ Temperature, pressure, and oxygen concentration is monitored and maintained for maximum efficacy and efficiency.

Gasification

- ▶ Under these conditions the gasification event begins producing a flow of combustible gas vapor.
- ▶ Carbon in the waste feedstock converts in large part in this atmosphere to combustible gases – CH₄ (methane), CO, Hydrogen, other gases (“syngas”).
- ▶ The syngas is vented out of the syngas generator, condensed, minimally processed, and sent to heavy dual fuel engine generating sets.
- ▶ Engines are computerized to compensate for the flow of gas as it fluctuates in calorific value, with either biodiesel or regular diesel.
- ▶ The engine heat and exhaust and excess syngas flows to the secondary gas processor to recover thermal energy.

Generation

- ▶ The engine generating sets produce electrical energy for local consumption or sent to the power grid.
- ▶ Exhaust heat and excess syngas flows to the secondary gas processor, raised to 1600° F to insure complete combustion.
- ▶ Thermal energy can produce hot water, distilled water, low/high-pressure steam, absorption chiller refrigeration, product drying heat, and other products for communities, greenhouses, fish farms, and other agricultural and industry applications.
- ▶ The syngas can be used to produce bio-fuels, bio-chemicals, other bio-products, and CO₂ for greenhouses.
- ▶ The amount of products produced is dependent on the type and throughput of feedstock and volume of syngas produced.

Configuration

- ▶ Systems can be made to adapt to almost any location, requires minimal land, and avoids extensive site work.
- ▶ Systems are modular and designed for a 20+ year useful life, vessels are based on containers or custom designed.
- ▶ Manufacturing of systems, delivery, and installation are uncomplicated and require no special equipment.
- ▶ Engine(s) and generator(s) should be enclosed, the syngas generating vessels can be designed to operate outside.
- ▶ Systems can process 10-500 tons per day, multiple primary vessels provide continuous operation, distributed systems avoid transportation costs and environmental issues.

Eight Module System



Energy Recovery

TPD	#s/Hr	Steam #s/Hr	Hot Water Gal/Day	Electric kW/Hr
<i>MSW</i>				
5	417	790	32,000	94
10	833	1,580	64,000	188
100	8,333	15,700	648,000	1,800
<i>Medical</i>				
5	417	1,580	64,000	188
10	833	3,160	128,000	375
100	8,333	31,570	1,290,000	3,750
<i>Tires</i>				
5	417	3,160	129,000	375
10	833	6,300	258,000	750
100	8,333	63,000	2,580,000	7,500

Features

- ▶ Batch process reduces total day's feedstock in multiple primary vessels for continuous/24 hour supply.
- ▶ 24 hour cycle for loading, cool-down, and ready for reload.
- ▶ Advanced engine technology.
- ▶ Unsorted and unprocessed MSW is reduced about 95% in volume and about 82% in weight, 100% recycled.
- ▶ Materials left (fine and inert ash, glass, ceramics, aluminum, and metals) are recovered, processed, and sold.
- ▶ Over 20 years, no occurrence of air emissions or ash quality not meeting the regulatory requirements.

Advantages

Batch processing advantages over conventional continuous feed:

- ▶ All incoming feedstock is directly loaded, no shredding, pre-processing, or pre-sorting required.
- ▶ Vessels are air tight; no smell; no insect, rodent, or bird activity.
- ▶ Capital cost and high operating and maintenance expense for shredders, continuous flow equipment, tip floor, and emissions control are eliminated.
- ▶ Bulky items, furniture, tires, and big items load as delivered.

Qualifying Projects

- ▶ Profile – waste disposal, electrical and thermal energy, site, and public issues and requirements.
- ▶ Procurement/decision process/criteria?
- ▶ Timeframes?
- ▶ Funding requirements?
- ▶ Strategy and analysis (feasibility analysis level I & II) to determine unit and operating costs and economic and operational feasibility.
- ▶ Full presentation/proposal and demonstration/site visit
- ▶ Signed Agreements

Project Plan

- ▶ Design and engineer the system for specific wastes, energy usage, the site, and operating hours.
- ▶ Obtain approvals and permits.
- ▶ Manufacture, assemble, and test the system.
- ▶ Install and test the system at the host site.
- ▶ Train operators and maintenance personnel and provide manuals.
- ▶ Provide limited warranty on parts and labor and follow-up for 1 year.
- ▶ Offer service/maintenance agreements for separate fee.

Market Concepts

- ▶ Waste-to-energy alternative must be competitive with landfills (most alternatives are grossly more expensive) while significantly reducing greenhouse gases (GHG).
- ▶ Decentralizing/distributing the final processing reduces the costs and overall carbon footprint, while generating abundant, very low cost energy.
- ▶ Power companies get 24x365 base load power, do not need to duplicate energy available by conventional means nor upgrade the high voltage transmission lines, and avoid distribution losses.

Market Focus

- ▶ Communities of 5,000 to 500,000 to process out daily waste and recover energy and recyclables.
 - ▶ Significantly reduce time and labor and transportation costs of multiple handling of waste.
 - ▶ Provide 100% recycling/recovery of all usable materials.
 - ▶ Reduce the combustible fraction of the waste to readily usable energy within environmental guidelines.
 - ▶ Do this at costs which are equal to or sometimes less than the current landfill tipping fee.
 - ▶ Provide system installations in very short delivery and commissioning windows.

Competition

- ▶ Economically, the SGS,LLC process offers a very favorable return over almost any other (continuous flow) process:
 - ▶ New gasification
 - ▶ Pyrolysis
 - ▶ Plasma-arc
 - ▶ Vitrification
 - ▶ Fluidized bed
 - ▶ Molten emersion
- ▶ Only SGS,LLC can cost compete with most landfills on a tip fee basis, without considering energy and recyclable sales.

Evolution

- ▶ Since 1989, SGS, LLC have worked on a number of facilities at private industries and communities.
- ▶ Each successive facility has been an evolution to:
 - ▶ Reduce system complexity and costs.
 - ▶ Eliminate “smoke stacks”.
 - ▶ Use new construction and insulation materials to reduce weight.
 - ▶ Increase process efficiency and reduce energy loss.
 - ▶ Improve process steps to provide cleaner emissions.
- ▶ Combine electrical & thermal energy components (CHP/CCHP) to increase application and technology options and benefits.

Market Opportunities

- ▶ Research, Development, and Demonstration (RD&D) facility, with performance & emissions data, processing 10 tpd. Huge demand for Non-Recyclable Plastics to Fuels platform.
- ▶ Commercial facilities, worldwide, with waste disposal fees and energy and recyclable sales processing 10-500 tpd.
- ▶ Waste management companies/recyclers/municipalities/counties/businesses – support environment, economically.
- ▶ Large energy users – community/education/business/industry complexes, greenhouses, etc. – renewable energy at a discount.
- ▶ Key to success = available waste + disposal costs + energy generated + energy & recyclable sales + support + approvals.
- ▶ Funding – private, government, lenders, partners, equity.

Market Options

▶ **Build-Own-Operate (USA):**

- ▶ Designs, builds, and implements systems at host sites.
- ▶ Maintains 100% ownership or a percent in a joint venture.
- ▶ Contracts for operation and maintenance.
- ▶ Benefits from a continuing revenue stream.
- ▶ Loans paid in 5-10 years or pays percent of annual returns.

▶ **Build-Sell (Worldwide):**

- ▶ Sells system to a purchaser with progressive payments.
- ▶ Designs, builds, and implements system at host site.
- ▶ Trains purchaser or others to operate and maintain system.

Summary

- ▶ SGS,LLC has developed, evolved, and proven a unique and elegantly simple, cost effective waste to energy gasification system.
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Austrian demonstration plant video, mixed waste was put in thru maintenance door on vessel to show various waste types



After 18 hour gasification process, a benign ash is vacuumed up, cans, bottles and metals are recycled. Notice the steel tire rims with steel belting...the tires are gone!



Thanks

- ▶ Questions?
- ▶ Next Steps?
- ▶ Contact us for more information and to conference call or meet with SGS, LLC
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