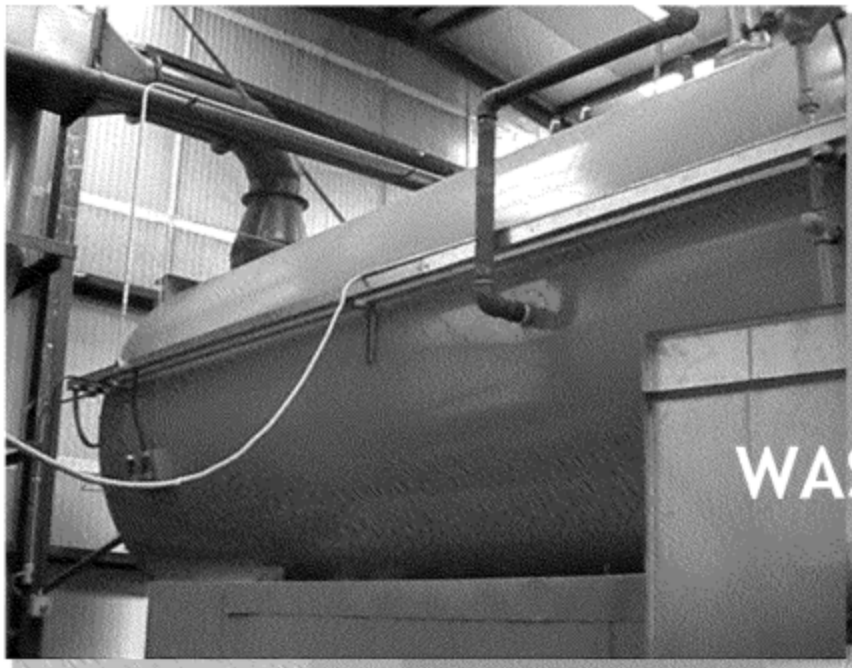


WASTE GASIFICATION

INNVIRON CORPORATION™

October 2009

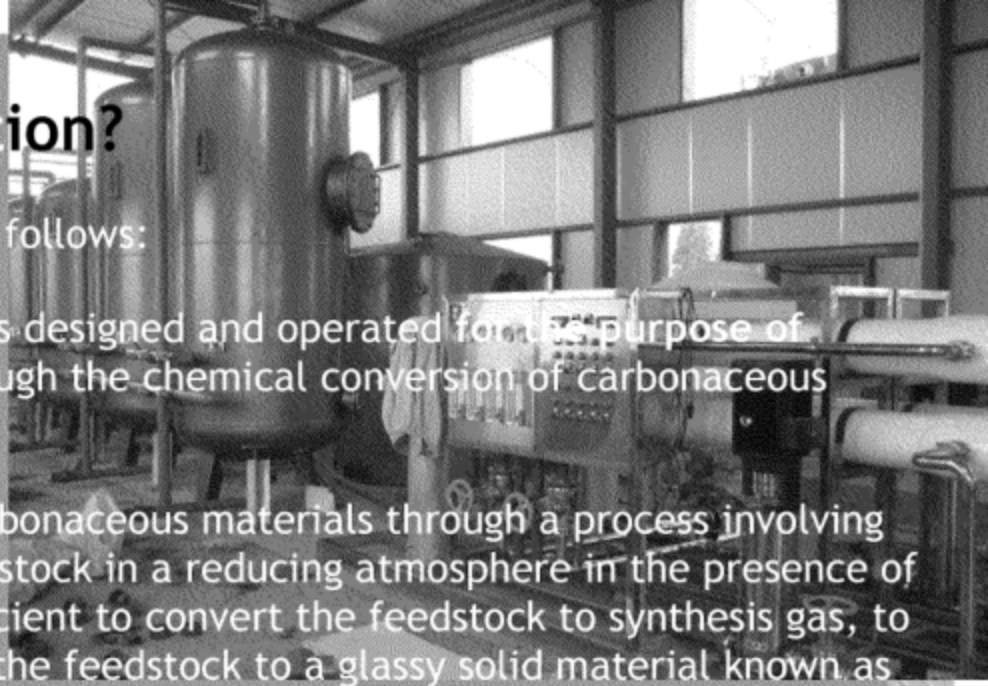
Why Contract with Innviron?

1. Design of More than 250 and construction management of more than 100 Solid Waste Management Facilities, including Landfills, Leachate and Gas Treatment Systems, Compost Plants, Transfer Stations, Sorting Facilities, Incinerators, Waste Gasification Facilities, Medical Waste Treatment Facilities, and Hazardous Waste Facilities

- Currently designing and permitting the first US commercial Waste Gasification Facility in Georgia, USA. Beginning construction on Gasification Facility in Trinidad in November 2009.

3. Innviron personnel assisted in development of RCRA regulations, developed the geosynthetic lining system technologies, and developed Sorting Facility and Compost System Technologies.
4. Development of Solid and Hazardous Waste Management Regulations for Many Countries and States
5. Design, Construction, and Operation of Solid Waste Facilities in the USA, Argentina, Ecuador, the Bahamas, Oman, Lebanon, Panama, Turkey, and the UAE.

- Published more than 100 papers on Solid and Hazardous Waste Management
- Permitted only Hazardous Waste / Transuranic Waste Repository in the USA



What is Gasification?

Gasification may be defined as follows:

- "A process technology that is designed and operated for the purpose of producing synthesis gas through the chemical conversion of carbonaceous materials."
- "A process that converts carbonaceous materials through a process involving partial oxidation of the feedstock in a reducing atmosphere in the presence of steam at temperatures sufficient to convert the feedstock to synthesis gas, to convert inorganic matter in the feedstock to a glassy solid material known as vitreous frit or slag, and to convert halogens into the corresponding acid halides."
- "A process that incorporates a modern, high-temperature pressurized gasifier with auxiliary gas and water treatment systems to produce refined product synthesis gas, which when combusted, produces emissions in full compliance with the Clean Air Act."

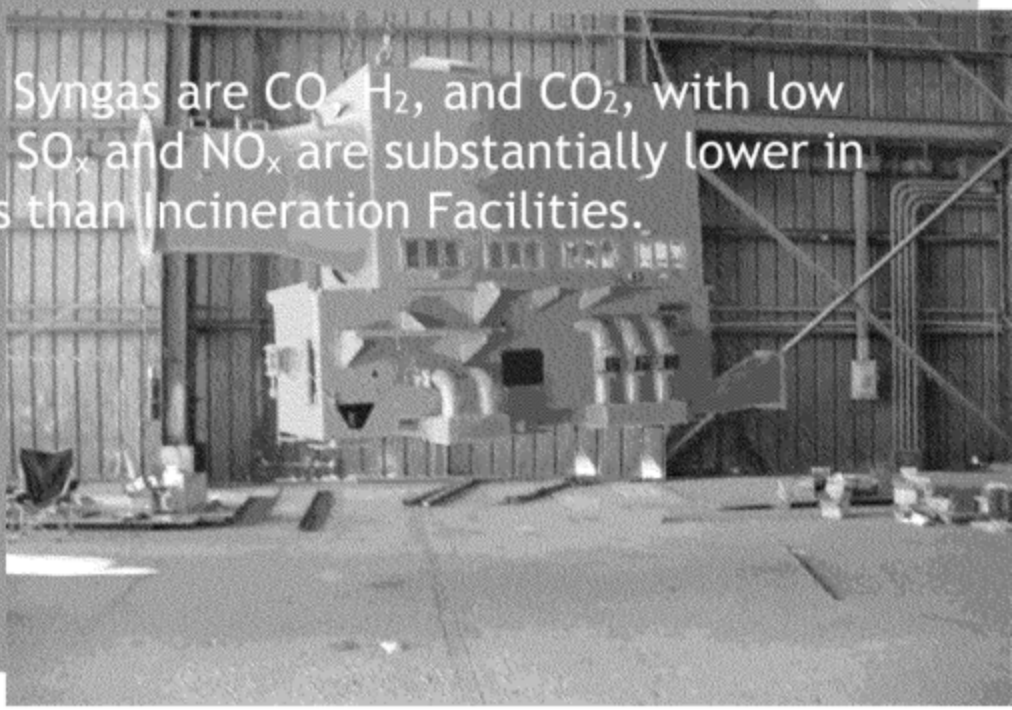
Wetherhold, B., Orr, D., and Maxwell, D., "A Comparison of Gasification and Incineration of Hazardous Wastes",prepared for US Department of Energy by Radian International LLC, 30 Mar. 2000

History of Gasification

- Coal Gasification used to produce medium quality gas since middle 1800s. Coal heated in low oxygen environment to produce synthesis gas, that was burned for heating and lighting in the 1800s, and burned for electricity in the 1900s.
- Gasification used for the past 50 years in the production of fuels and chemicals.
- Waste Gasification used in treatment of hazardous wastes, and in conversion of MSW to Medium Calorific Value (MCV) fuel.

Primary Advantages of Gasification

- Ability to produce consistent, high-quality Synthesis Gas (Syngas) that can be used for energy production;
- Ability to accommodate a wide variety of gaseous, liquid, and solid feedstocks;
- Major components of Syngas are CO, H_2, and CO_2, with low levels of N_2 and CH_4. SO_x and NO_x are substantially lower in Gasification Facilities than Incineration Facilities.



Major Subsystems in Gasification and Incineration Facilities

1. Waste Preparation and Feeding
2. Combustion and Gasification
3. Combustion Gas Cleanup versus Syngas Cleanup
4. Residue and Ash/Slag Handling

Key Differences Between Gasification and Incineration

2. Combustion versus Gasification

Incineration	Gasification
Designed to maximize the conversion of feedstock to CO_2 and H_2O	Designed to maximize the conversion of feedstock to CO and H_2
Large quantities of excess air	Limited quantities of oxygen
Highly oxidizing environment	Highly reducing environment
Operated at temperatures below the ash melting point. Mineral matter converted to bottom ash and fly ash.	Operated at temperatures above the ash melting point. Mineral matter converted to glassy slag and fine particulate matter (char).

Wetherhold, B., Orr, D., and Maxwell, D., "A Comparison of Gasification and Incineration of Hazardous Wastes",prepared for US Department of Energy by Radian International LLC, 30 Mar. 2000

Key Differences Between Gasification and Incineration

3. Gas Cleanup

Incineration	Gasification
Flue Gas cleanup at atmospheric pressure	Syngas cleanup at high pressure
Treated Flue Gas discharged to atmosphere	Treated Syngas used for Power Production with subsequent Flue Gas discharge
Fuel sulfur converted to SO_x and discharged with Flue Gas	Recovery of reduced sulfur species in the form of high purity elemental sulfur or sulfuric acid byproduct

Wetherhold, B., Orr, D., and Maxwell, D., "A Comparison of Gasification and Incineration of Hazardous Wastes", prepared for US Department of Energy by Radian International LLC, 30 Mar. 2000

Key Differences Between Gasification and Incineration

4. Residue and Ash/Slag Handling

Incineration	Gasification
Bottom ash and fly ash collected, treated, and disposed as a hazardous waste.	Slag is non-leachable, non-hazardous and suitable for use in construction materials. Fine particulate matter recycled to gasifier or processed for metals reclamation.

Wetherhold, B., Orr, D., and Maxwell, D., "A Comparison of Gasification and Incineration of Hazardous Wastes", prepared for US Department of Energy by Radian International LLC, 30 Mar. 2000

Gasification System Design

1. Gasification System operate by feeding carbon-containing waste materials into a heated chamber, with a limited and controlled amount of oxygen. This creates reducing conditions in the Gasification Reactor.

2. At high operating temperatures in the Gasification Reactor, chemical bonds are broken by oxidation and steam reforming at temperatures sufficiently high to promote rapid reactions. Gasification Reactor temperatures in range of 1,550 to 3,500 °F.

   Primary components of Syngas created in Gasification Reactor are CO and H_2, with lesser amounts of H_2O, CO_2, N_2, CH_4, H_2S, and HCl.

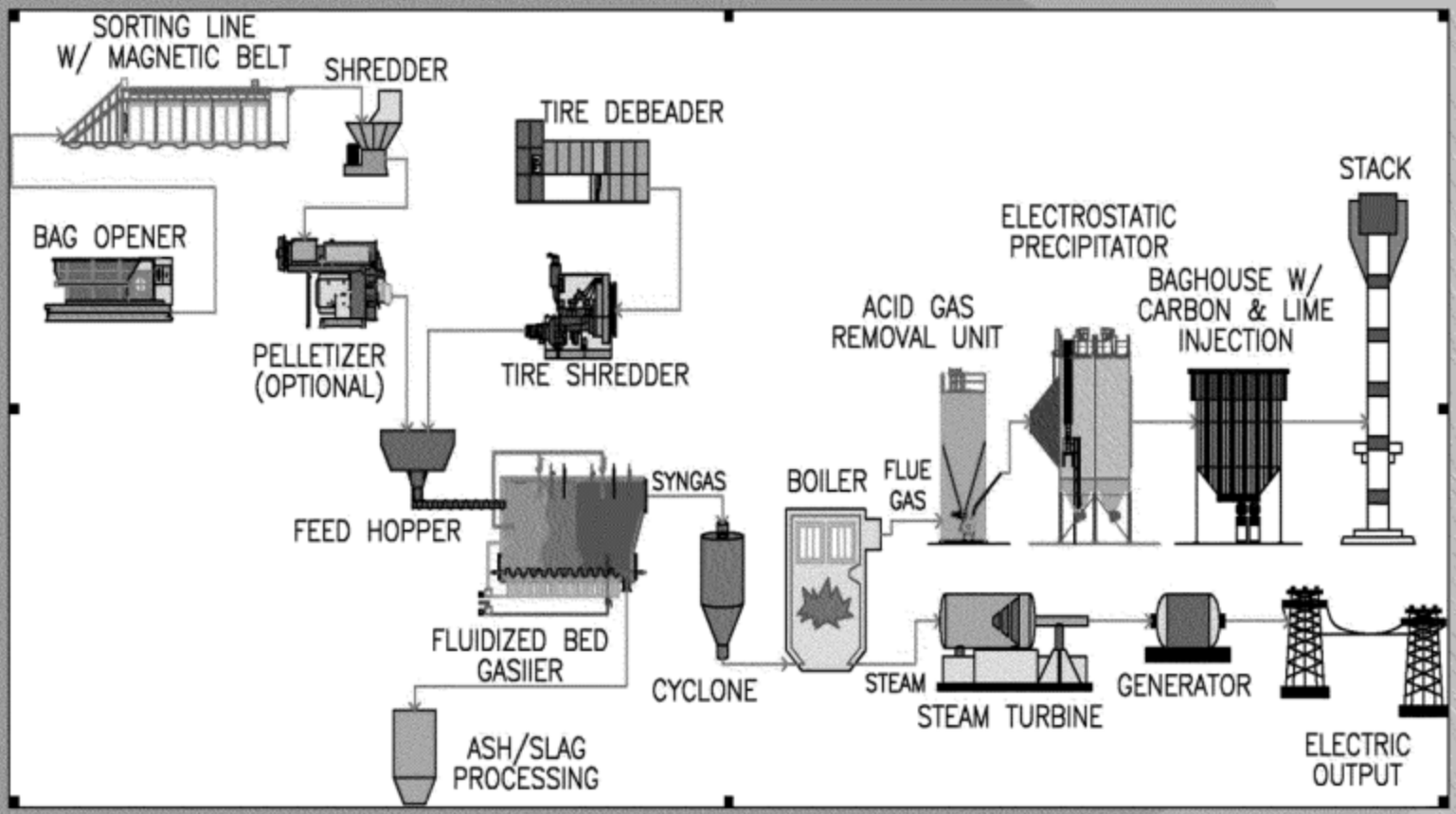
   Waste materials are converted from solids to gases, they are not burned. Therefore, Flue Gas is much cleaner for Gasification Process.

   Slag has the consistency of glass, and Sulfur may be recovered in elemental form, which may be sold.

Key Elements to a Successful Gasification Facility

- Sorting Line required to remove high ash content materials such as metals, glass, concrete, brick, rock, and soil;
- C&D materials should be diverted. Plastics and wood can be separated from C&D and transported to Gasifier;
- Shredder and pelletizer required to produce good quality, more uniform pellets, and to reduce moisture content of waste to about 20%;
- Two stage Gasification required, (1) Conventional Gasification to convert solids to syngas; and (2) Ash slagging unit required to convert carbon in ash to syngas, increase BTUs of syngas, and convert ash to slag;
- Cyclone required after Gasifier to remove particulate matter from syngas prior to combustion in Boiler;
- Boiler with Steam Turbine more efficient than Gas Turbine; and
- Air Quality Treatment system typically consists of Acid Gas Removal Unit, Electrostatic Precipitator, Bag House with Carbon Injection, and Stack.

INNVIRON GASIFICATION SYSTEM SCHEMATIC



Comparison of Waste to Energy Technologies

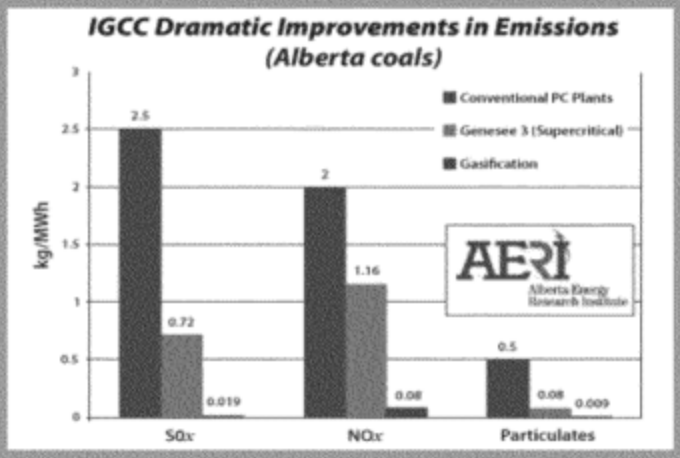
Description of Technology	Total Waste Quantity (tons/day)	Electricity per ton of Prepared Waste (MW-hr/ton)	Cost of Contstruciton (Millons US$)	Electricity produced per day (MW-hrs/day)	Unit cost per KW-hr per day (US$/kW-hr/dia)
Innviron Gasifier	250	1.12	$25	192	$130.21
Incinerator	250	0.4	$75	69	$1,086.96
Plasma Arc	250	0.5	$125	108	$1,157.41

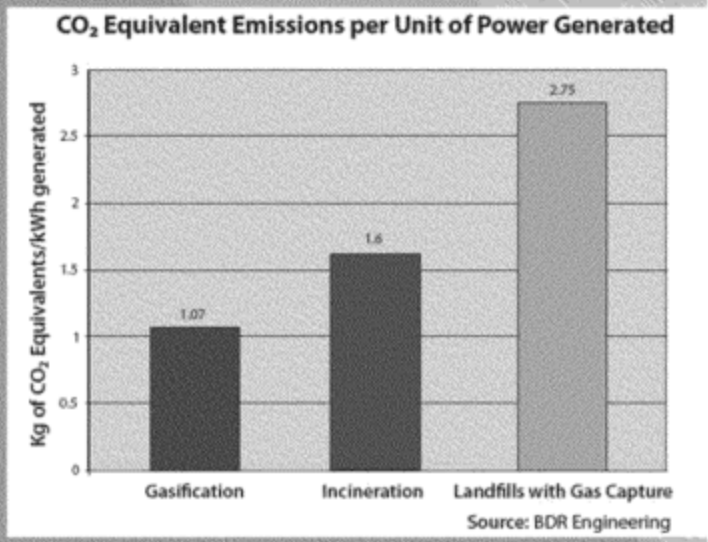
Technical Parameters

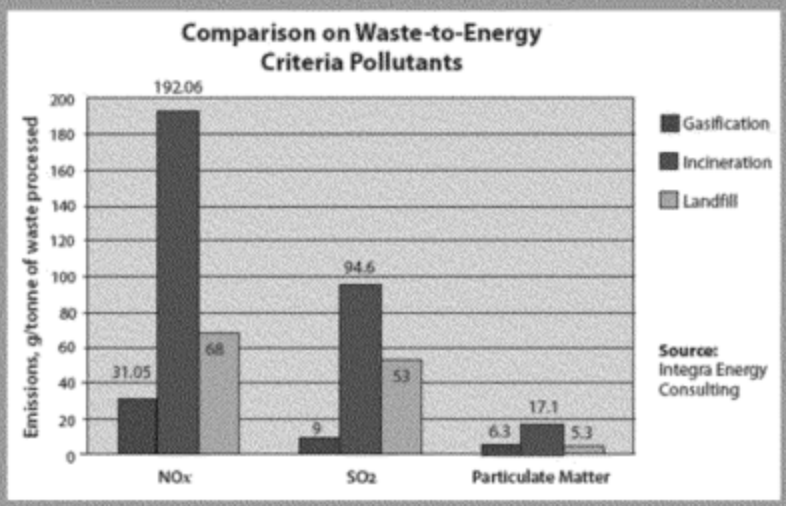
Description	NO_x	CO	VOC	NH_3	SOx	PM
Concentration ppm of Pollutants @ 15%O_2	2	3	2	5	N/A	N/A
Daily Emissions lbs/day	37	34	36	34	2.6	22
Annual Emissions tons/year	6.8	6.2	6.5	6.3	0.5	4.0
Exhaust temperature 26°C						

NO_x and SO_x concentrations are significantly less than air quality standards, and much lower than flue gas concentrations from incinerators.

Flue Gas Emissions Substantially Lower for Waste Gasification Facilities





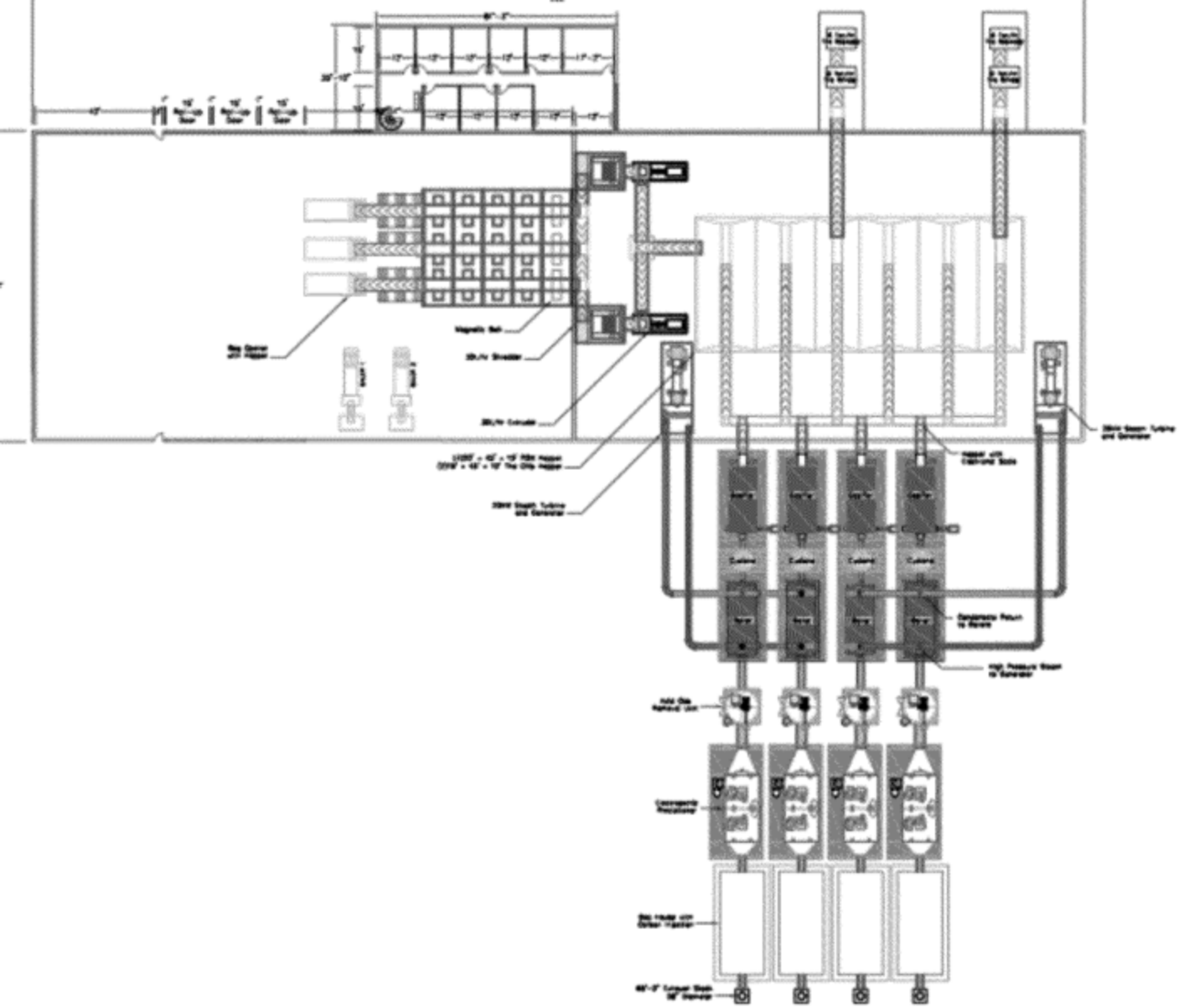


"Coal gasification is "the only coal-based energy technology that could result in near zero emissions." Pembina Institute

"Gasification is by far the cleanest coal/coke conversion technology." Alberta Energy Research Institute (AERI)

Integrated Solid Waste Management Plan

Typical Sorting Facility



CHICLAYO (40MW) SOLID WASTE AND GASIFICATION MANAGEMENT FACILITY

SORTING/GASIFICATION FACILITY LAYOUT

INNVIRON

1

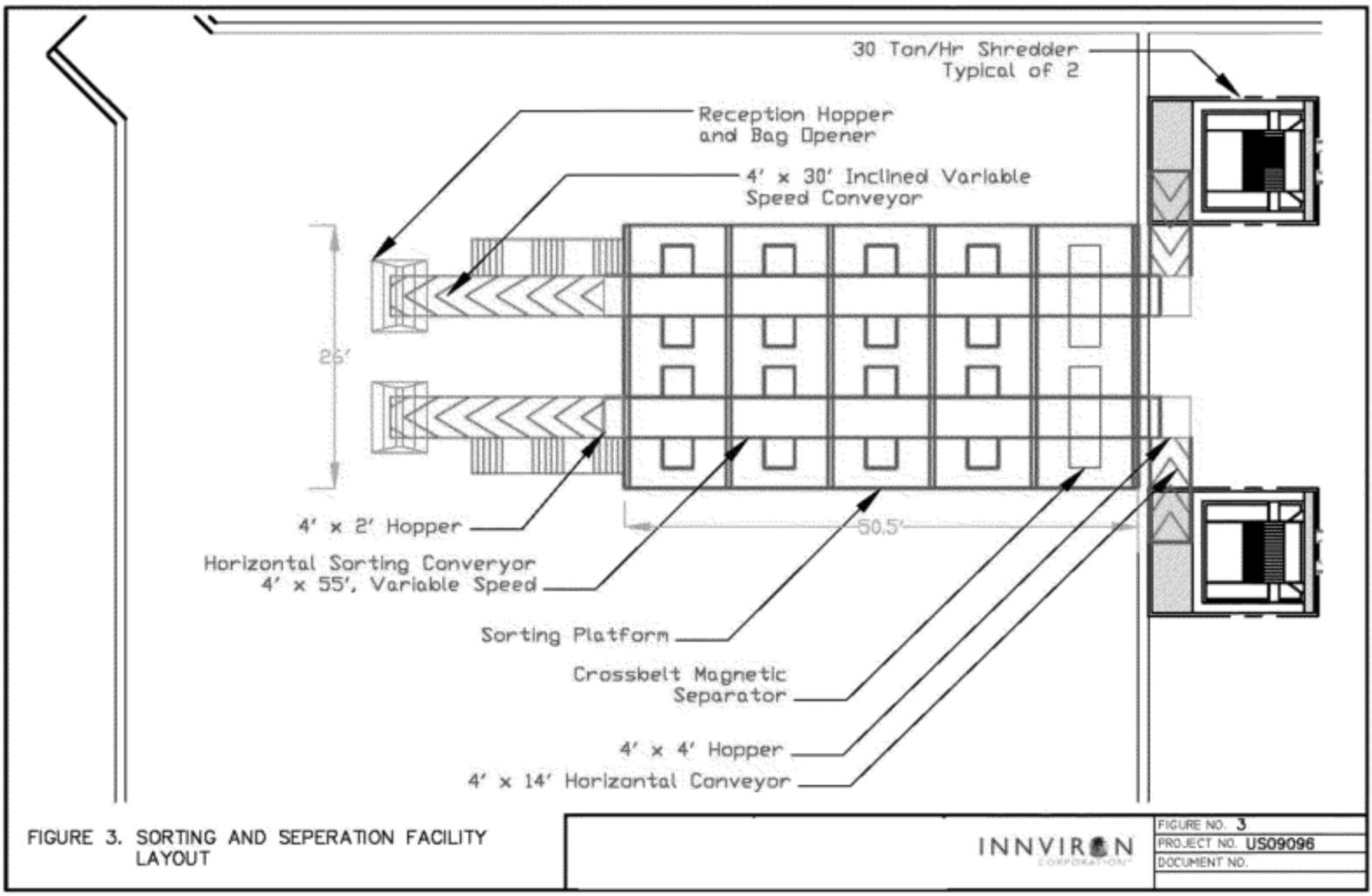
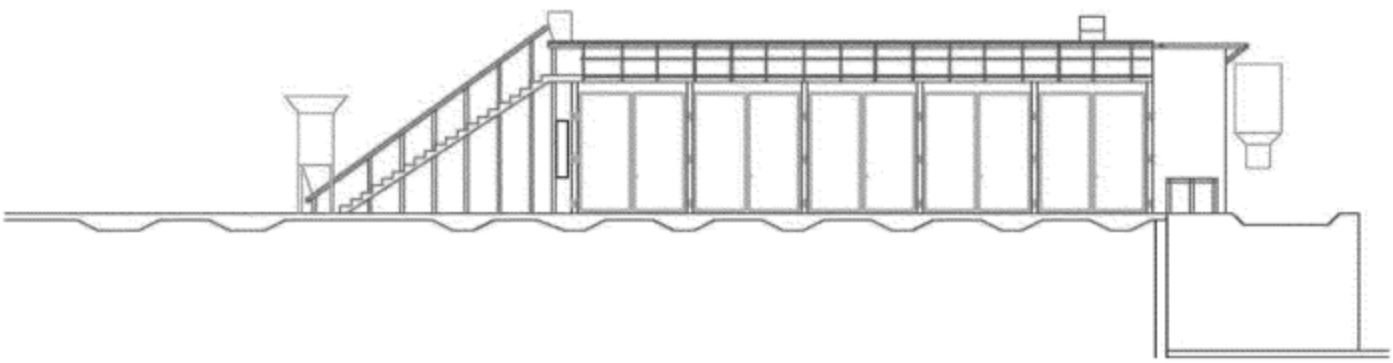


FIGURE 3. SORTING AND SEPERATION FACILITY LAYOUT

INNVIRON CORPORATION

FIGURE NO.	3
PROJECT NO.	US09096
DOCUMENT NO.	



	INNVIRON CORPORATION	FIGURE NO. 4 PROJECT NO. US09096 DOCUMENT NO.

WASTE GASIFIER DESIGN
Income from Sale of Power

Income from 10 MW Gasifier (8.0 MW of Power to Grid):

- qwaste = 250 tons/day
- qp = 171.5 tons/day
- E = (171.5 tons/day)(1.12 MW-hrs/ton)(365 days/yr)(1,000 KW-hrs/MW-hrs)($0.10/KW-hr)
- E = $7,010,920 per year

PRELIMINARY COST ESTIMATE

Description	10 MW System	30 MW System
Design and Permitting	$1,000,000	$1,000,000
Construction Management	$350,000	$450,000
Modification of Building	$3,000,000	$5,000,000
Scales and Scalehouse	$165,000	$165,000
Site Improvements	$500,000	$500,000
Access Road, Fence, and Guardhouse	$293,000	$293,000
10 MW Gasification System	$15,000,000	$45,000,000
Mobile Plant Equipment	$450,000	$650,000
Tire Shredder and Oversize Shredder	$625,000	$900,000
Extend Grid 400 ft	$500,000	$500,000
Offices (3000 ft2)	$450,000	$450,000
Equipment Materials and Supplies	$100,000	$100,000
Total Construction Cost	**$22,433,000**	**$55,008,000**

Assumes that connection to Grid is at the building, no additional cost to extend power lines to the Building

TYPICAL COMPONENTS OF REVENUE

Description	10 MW System	30 MW System
Tipping Fee to Process Waste:		
- $40 per ton	$3,942,000	$11,826,000
Sale of Recyclables:		
- Ferrous Metals: ($60/ton)	$280,977	$842,931
- Aluminum: ($750/ton)	$183,413	$550,239
Processing Fee:		
- Tires: (1 ton/day)	$36,500	$109,500
- Telephone Poles and RR Ties (1 ton/day)	$36,500	$109,500
Sale of Power:	$7,010,920	$21,032,760
TOTAL PROJECTED REVENUE	**$11,490,310**	**$34,470,930**
TOTAL PROJECTED OPERATING COST	**$6,894,186**	**$17,235,465**
TOTAL PROJECTED EBITDA	**$4,596,124**	**$17,235,465**

Conclusions

1. Need Tire Shredder and Debeader to process tires
2. Need Oversize Shredder to process Telephone Poles and Railroad Ties
3. Sorting Line needed to process waste, remove metals and HHW, protect Shredder, Pelletizer, and Gasifier, and provide more uniform pellets
4. Facility would create a minimum of 21 to 50 new jobs
5. Potential Additional Sources of Income:
   - Tires ($2/tire)
   - Telephone Poles and Railroad Ties
   - Carbon Credits
   - Government Stimulus Money and Subsidies

MINIMUM REQUIREMENTS

- Long-Term Contract: Minimum Term = 20 years
- Availability of waste (250 tons/day, 365 days/yr, for each 10 MW Gasification Line)
- 8.0 MW/hr to Grid for each 10 MW Gasification Line
- Support in Permitting the Facility
- Assistance to Obtain Power Buy Back Agreement with the Local Utility Company or Base