CONAMA 8

CongresoNacionaldelMedioAmbiente

CUMBRE DEL DESARROLLO SOSTENIBLE

Sala Dinámica 32

GRUPO HERA

Alisdair McLean

Director de Ingeniería

Plasco Energy Group - Canadá

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HERA Plasma

Plasma Gasification of MSW

Nov 28, 2006

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1. Introduction to PlascoEnergy Group
2. The path to the Ottawa Demonstration Plant:
   - R&D,
   - Process Simulator,
   - Process Optimization (Castellgali)
3. PlascoEnergy Gasification Process
4. Ottawa Demonstration Plant
   - Design
   - Environmental Performance

PlascoEnergy Group

- Formerly RCL Plasma, Inc.
- Headquarters in Ottawa, Canada
- 20 years experience in Research and Development
- Patents in ten countries
- 14 patents pending on current designs
- Energy from waste is primary focus
- Marketing Plants on a BOO (Build, Own, Operate) basis

Plasma Processing Experience

- Municipal Solid Waste*
- Biomedical Waste*
- Spent Potliner*
- Asbestos Containing Material
- Paper Mill Reject Waste
- Automobile Fluff
- Lead Contaminated Soils
  - Batteries
  - China
- Industrial Sludges
  - Sewage
  - Drum reconditioning
  - Paint
  - Petrochemical
- Biomass
- Rubber Tires
- Cocaine
- High Metal Content Waste
- Fluorescent Light Ballasts
- Explosives Industry Waste
- Industrial Hazardous Waste
  - PCBs
  - BHC
- Incinerator Ashes
  - Coal
  - Municipal Solid Waste
- Oil Shale

* - Extensive Experience

Plasma Processing Experience

cont'd

- **1988-1991: Municipal Solid Waste**
- **1994: Bio-medical and Hospital Waste**
- **1995: Spent Pot Liner (Al smelting waste)**
- **1997: Sewage Sludge**
- **1996-1999 Process Simulator**
- **2003-2006 Process Optimization (Castellgali, Spain)**

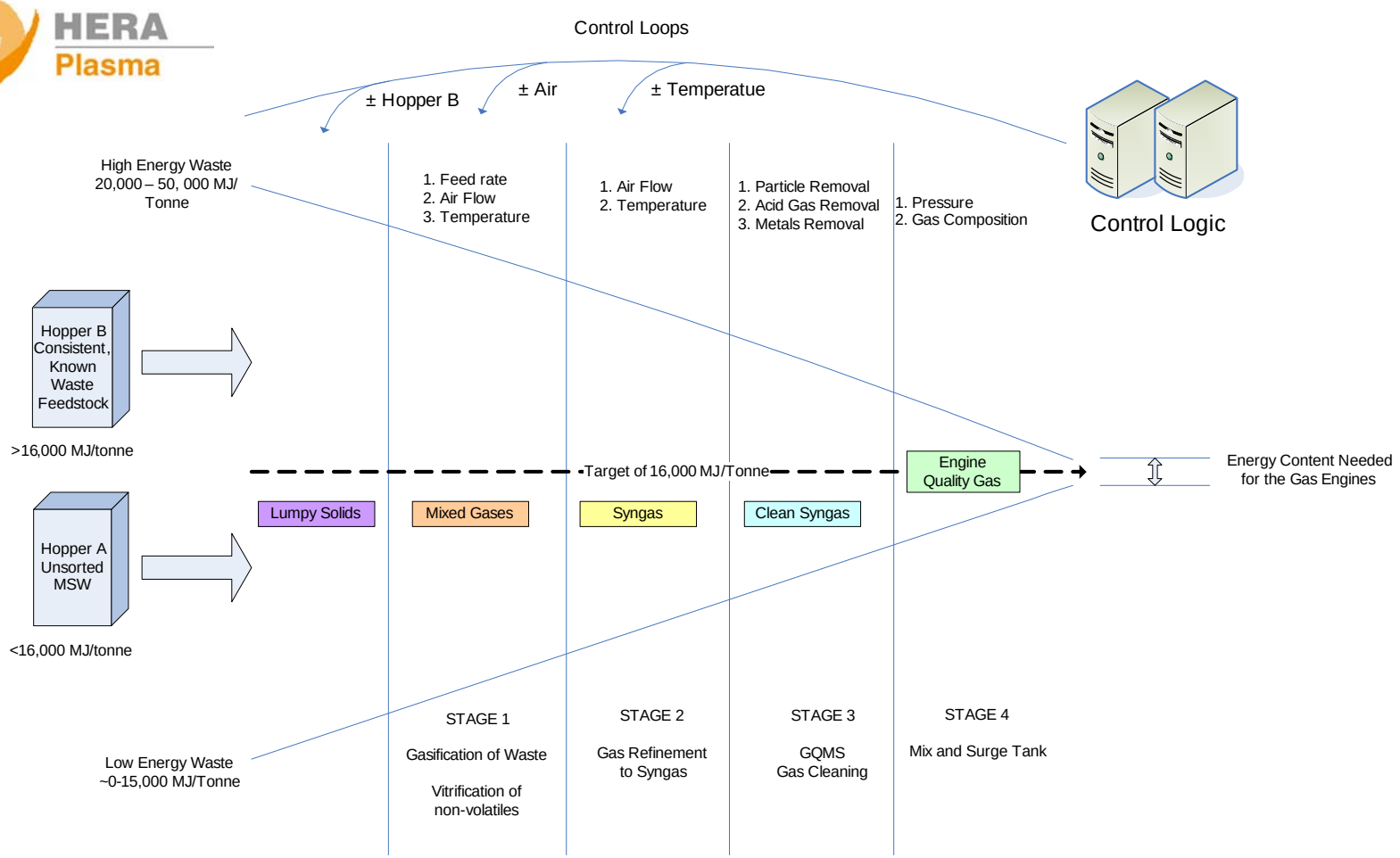
PlascoEnergy Plasma Gasification System

The Challenge:

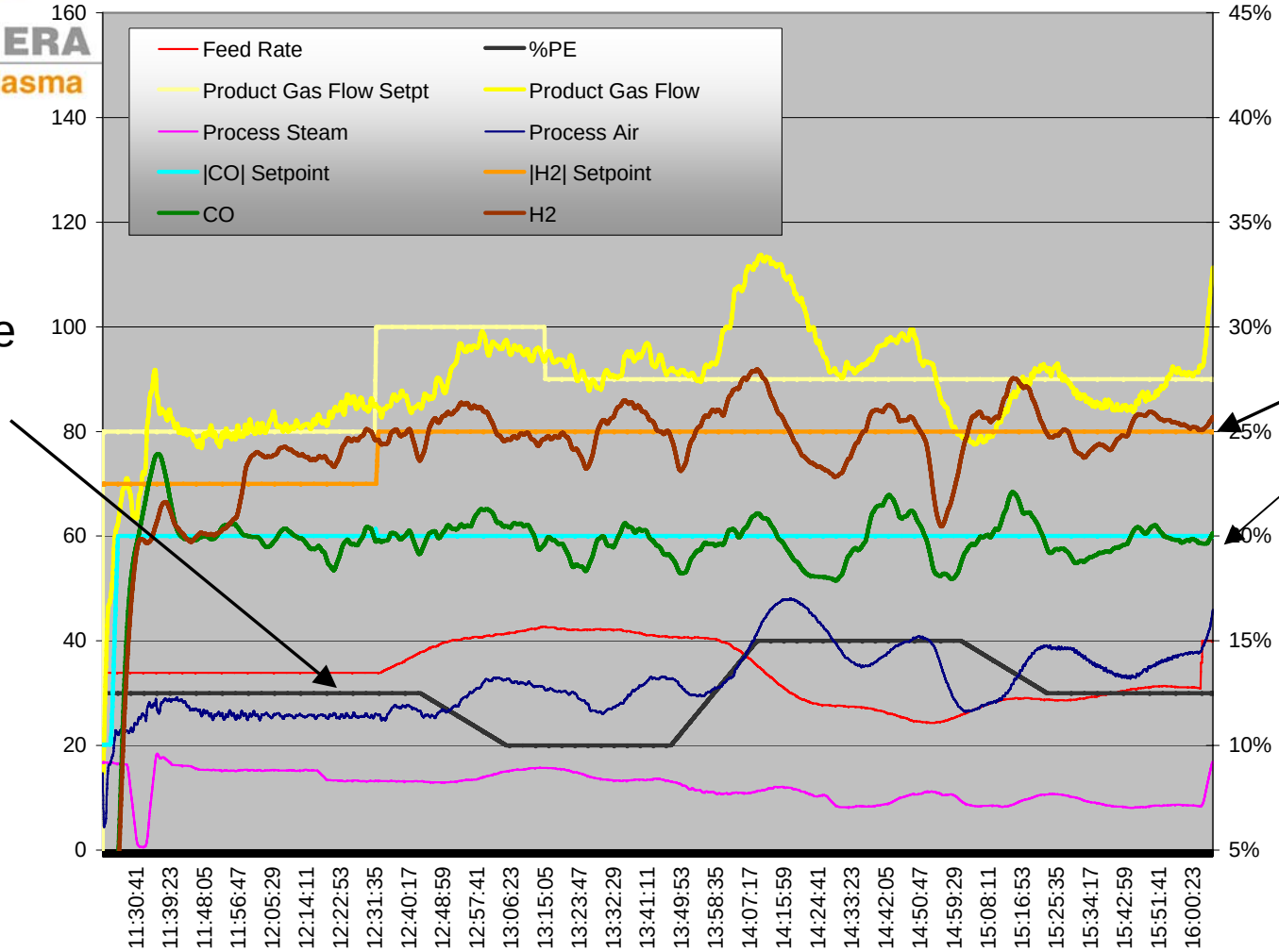
- **Waste feedstock is highly variable**

- **Product syngas must be consistent in quality and flow**

PlascoEnergy Plasma Gasification System



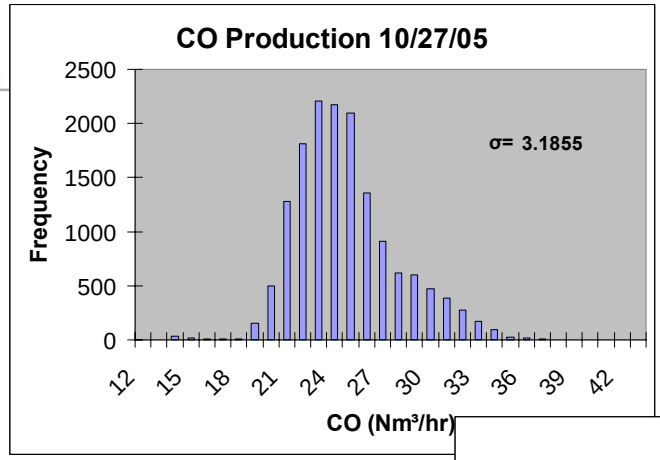
Syngas Control Optimization

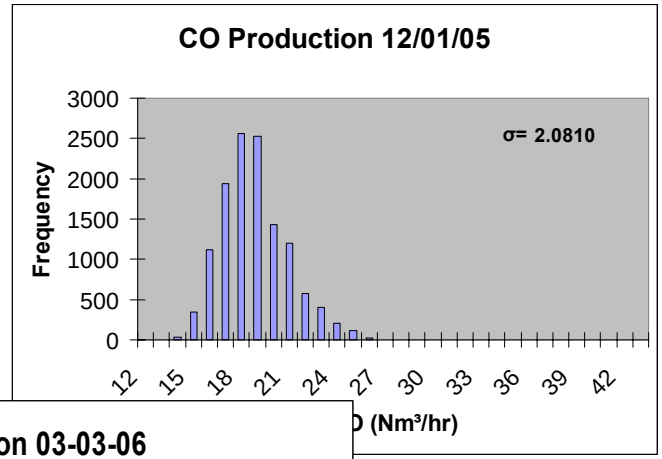


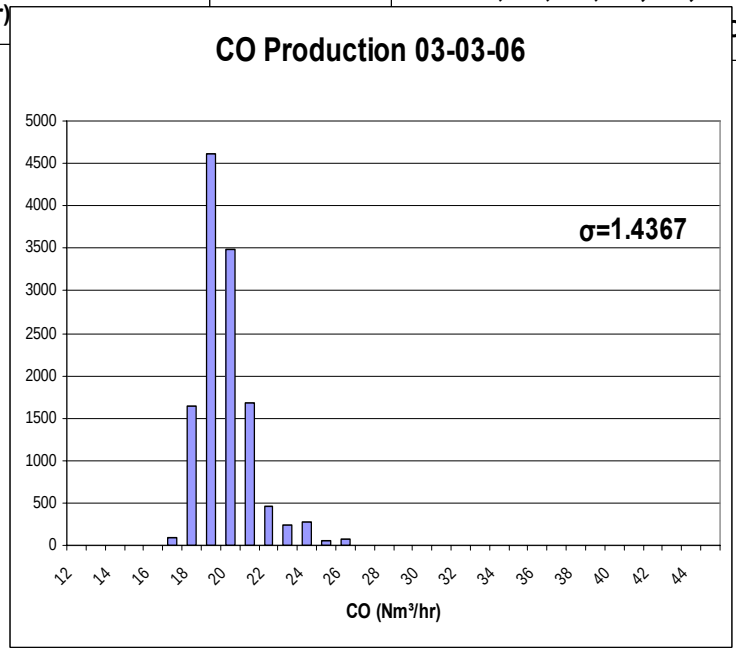
Vary waste input

Consistent gas quality

CO Control Improvements







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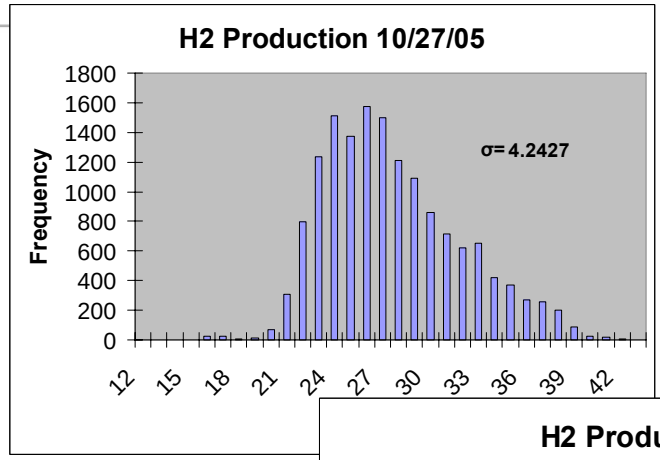
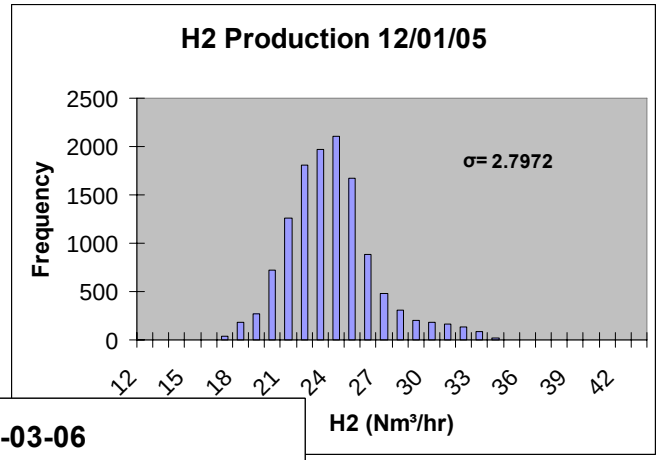
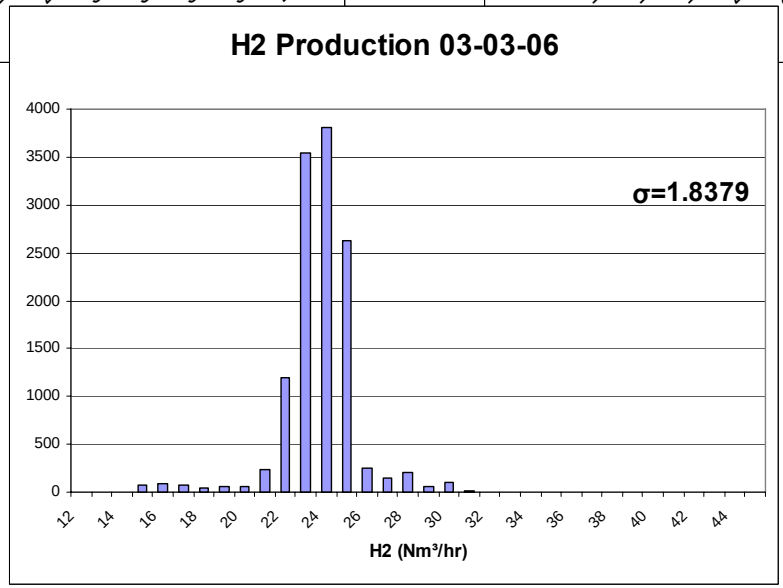
H_2 Control Improvements



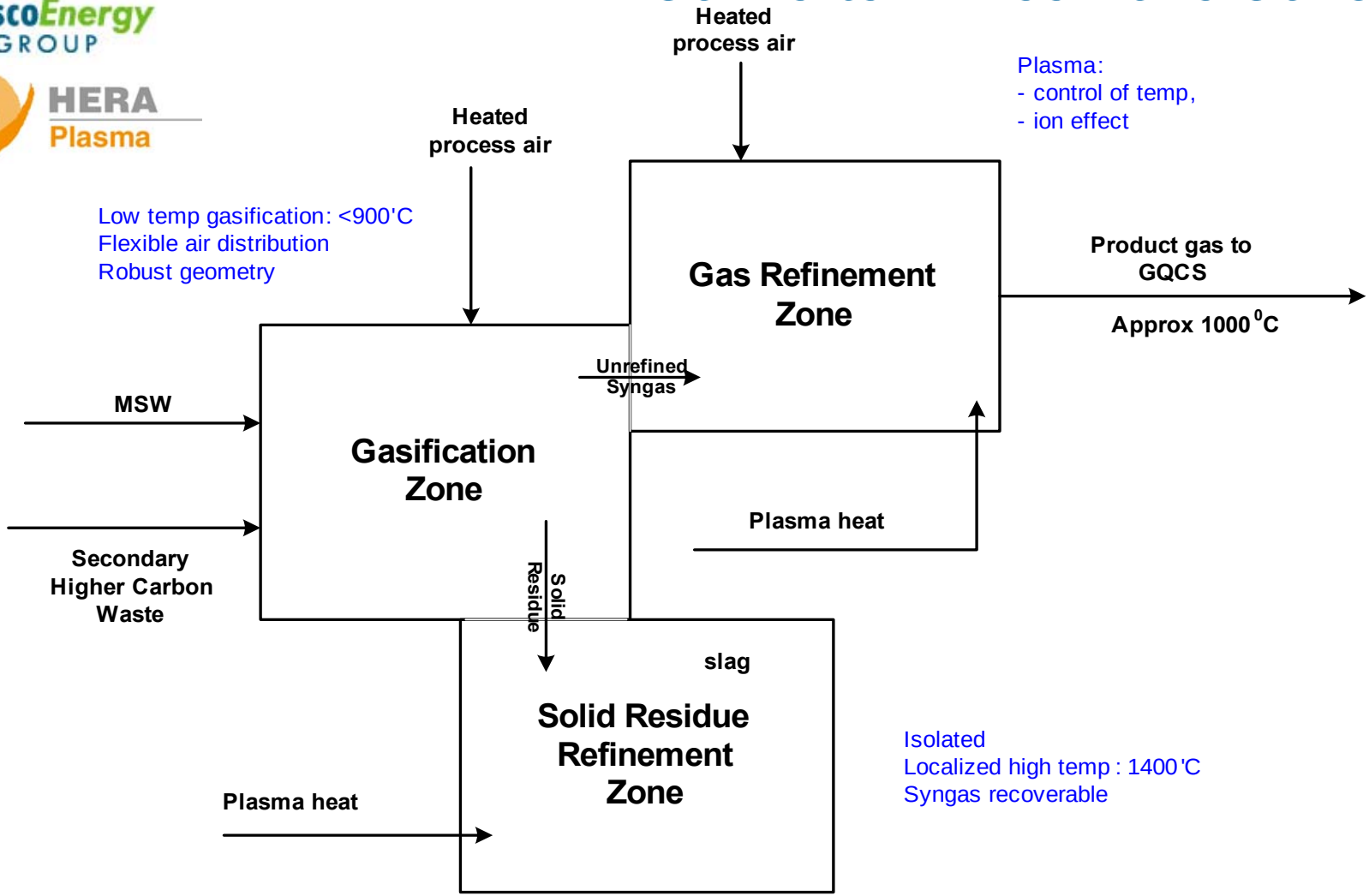




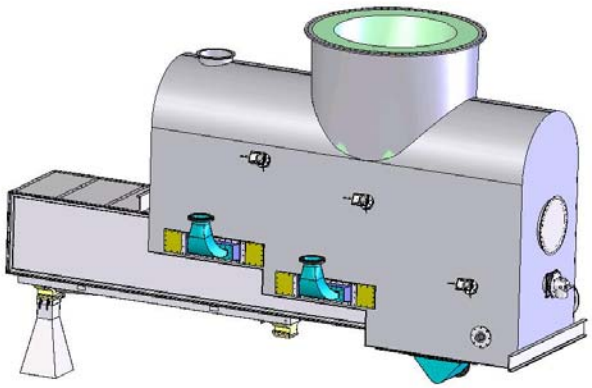
PlascoEnergy Plasma Gasification Process

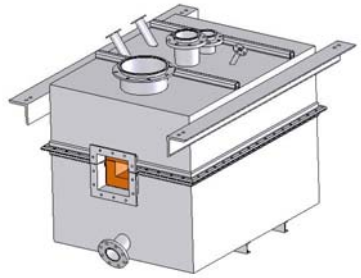
- Unique in using plasma in an economical fashion
- Keep the environmental superiority
- Three zone concept:
  - enables optimal selection of operating parameters for each "sub-process" (technically and economically)

Converter Three-Zone Concept



Converter Three Zone Concept





Ottawa Demonstration Project

Scott Basham, PM Plasco

Ken Campbell, VP Ops Plasco

Mayor of Ottawa, Bob Chiarelli

Jordi Gallego, General Manager Hera Holding

Rod Bryden, CEO Plasco

Jan Harding, Ottawa City Councillor

Gary Lunn, Minister Natural Resources

Maria J. Aubry, Senior VP Operations SDTC

PlascoEnergy Business Model (Municipalities)

PlascoEnergy:

- Has the responsibility for all capital requirements,
- Will build own and operate the PGP Plant and Power Plant.
- Will manage the sale of power and industrial products while retaining the resultant income

The Municipality

- Has no financial or environmental risk.
- Will provide a location for the facility
- Will pay a waste disposal fee only (less than current fees).
- May negotiate sharing of revenues

Ottawa Demonstration Project: Overview

- $27 million CAD investment
- 75 tonnes per day Municipal Solid Waste
- 1.15 MWh of energy produced per tonne of waste

- December 2006: Construction and Integration
- January 2007: Commissioning
- February 2007: Gas production
- March 2007: Power production

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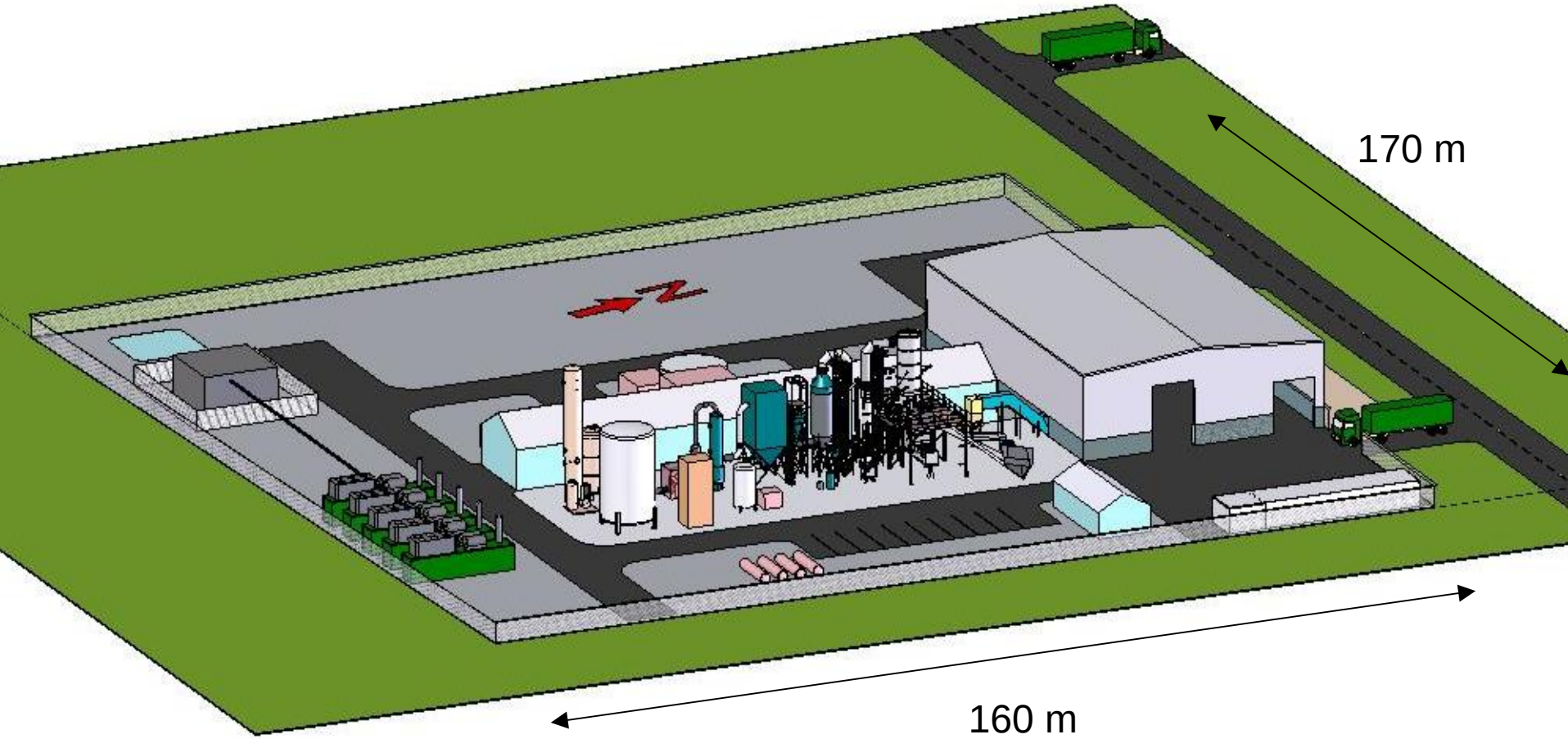
Ottawa Demonstration Project



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Erection of Buildings

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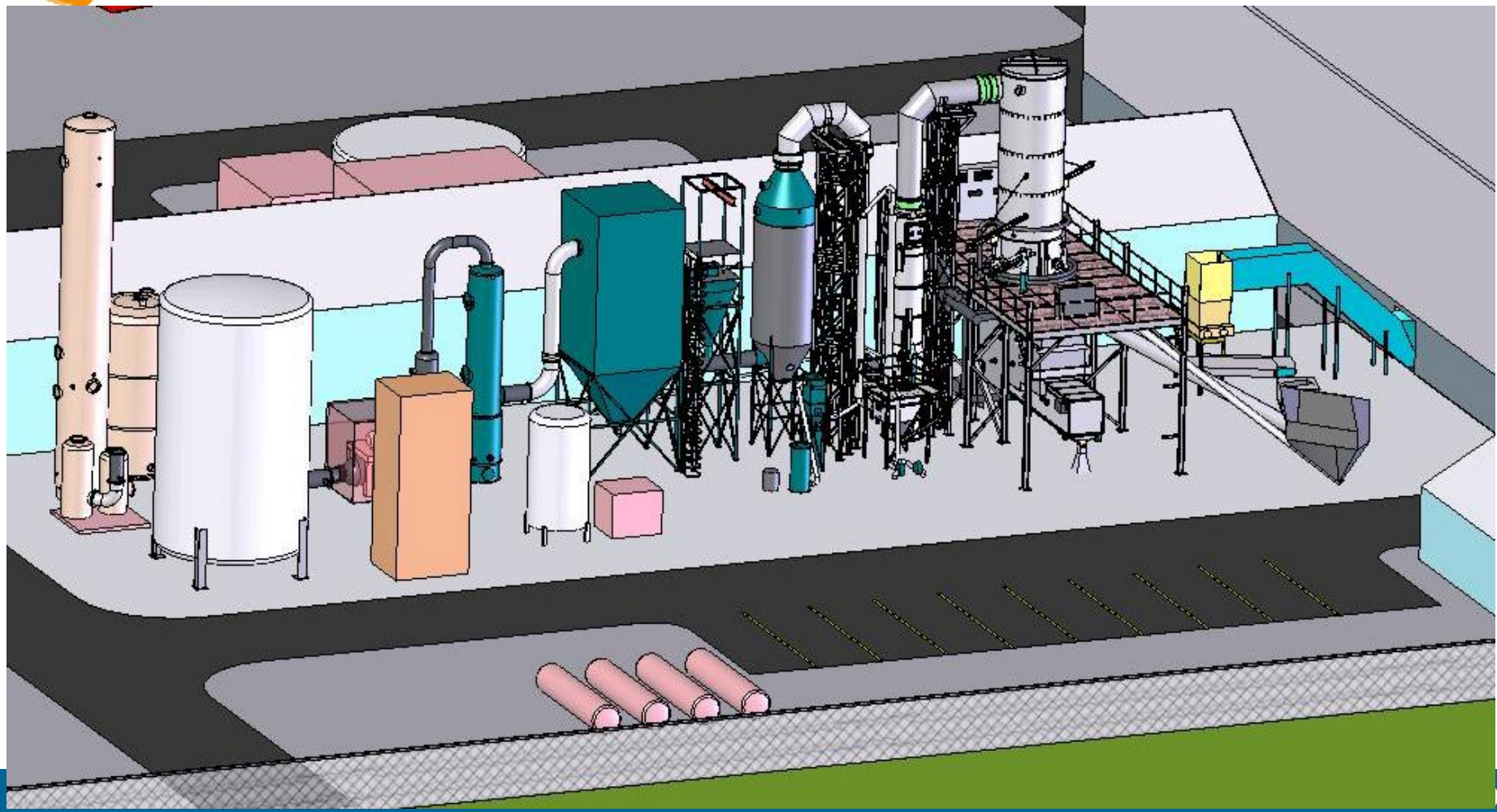
Ottawa Demonstration Project
Modular Design – 100 tpd



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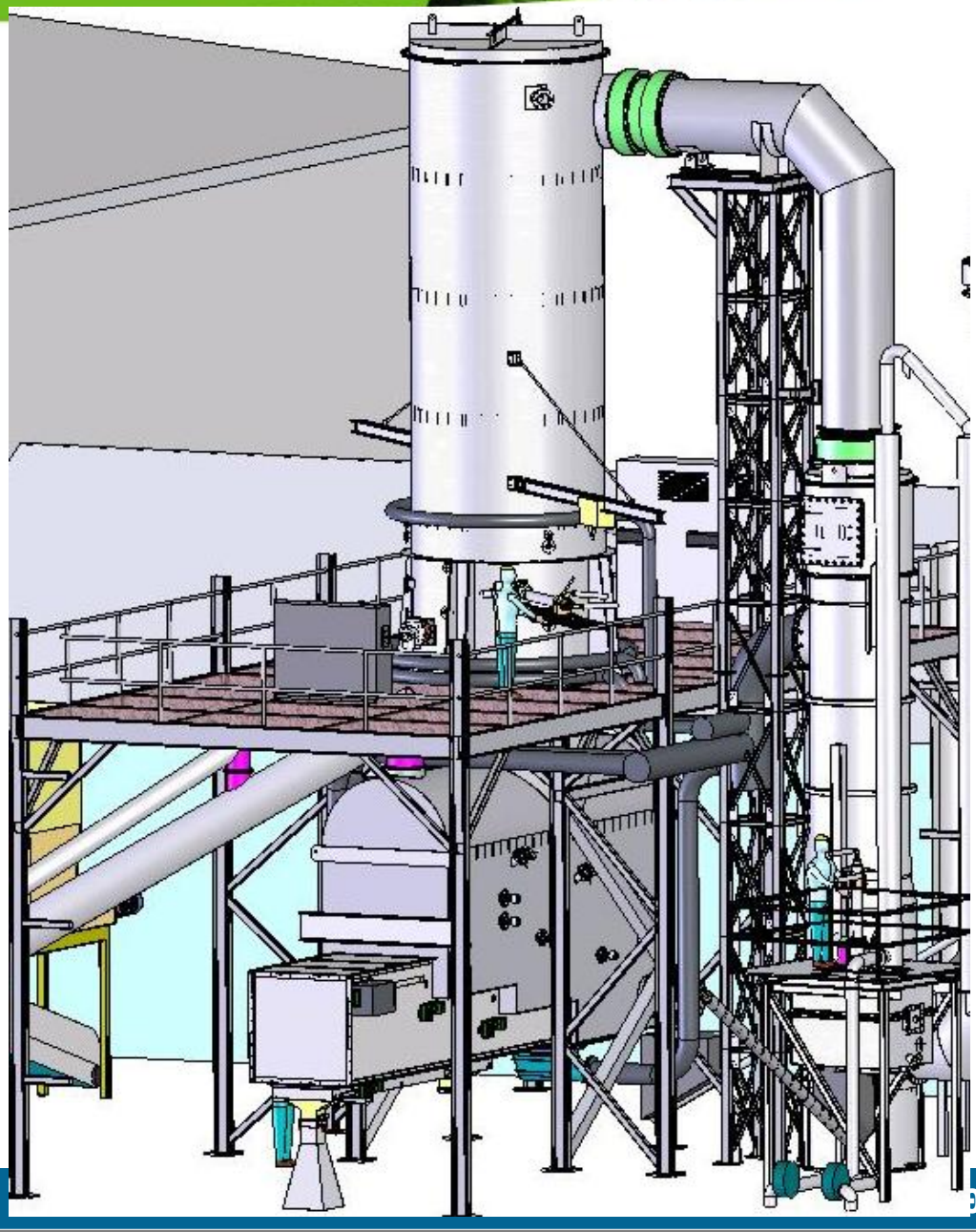
Gasification

- Patented Converter
- Separates fuel from inert materials



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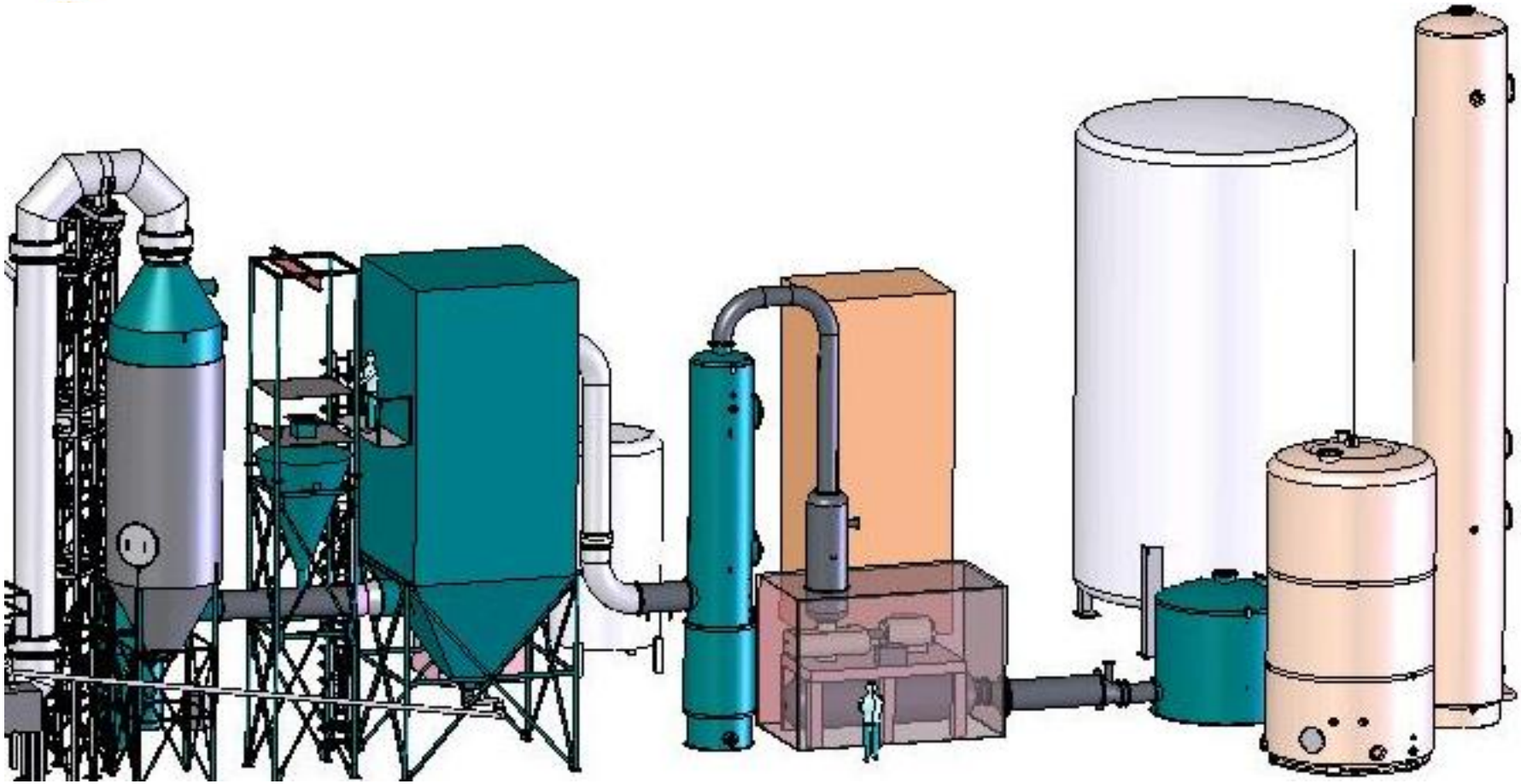
Syngas Cleaning



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Delivery of Syngas Cleaning Equipment

Ottawa Demonstration Project: Environmental Performance

- **Production per tonne of waste processed:**
  - **Product quality syngas: fuel for power generators**
  - **0 air emissions**
  - **150 Kg inert solids saleable as aggregate**
  - **5 Kg powder Sulphur, useful for agriculture application**
  - **300 g heavy metals and PM**
  - **Sewer grade water**

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Inert Solids - Building Products

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Inert Solids: Leachate Data

Parameter	Units	M.D.L.*	MSW Sample 22 Dec 2005	Soda Bottle July 1991
Arsenic	mg/L	0.03	<0.03	<0.03
Barium	mg/L	0.001	0.060	0.12
Boron	mg/L	0.005	0.018	0.43
Cadmium	mg/L	0.005	<0.005	0.47
Chromium	mg/L	0.002	0.005	<0.01
Lead	mg/L	0.02	<0.02	12.2
Mercury	mg/L	0.00006	<0.00006	<0.0001
Selenium	mg/L	0.001	<0.001	0.002
Silver	mg/L	0.005	<0.005	<0.02

*Minimum Detection Limit

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Energy Production

- Gas engines
- Exhaust to atmosphere
- Emissions cleaner than Government of Ontario Regulations

Air Emissions (Parameters to monitor after combustion engine	Tightened Requirements Issued in 2004 by MOE (A-7)	European Standard	PlascoEnergy Performance for Ottawa Facility
HCl	18 ppmv	7 ppmv* (10 mg/Rm^3)	5 ppmv
SO_2	21 ppmv	19 ppmv* (50 mg/Rm^3)	13 ppmv
NOx	110 ppmv	159 ppmv* (200 mg/Rm^3)	<110 ppmv
Organic Matter	100 ppmv	10 mg/Rm^3	20 ppmv (See note 1)
Particulate Matter	17 mg/Rm^3	10 mg/Rm^3	10 mg/ Rm^3
Dioxins and Furans	80 pg/Rm^3	100 pg/Nm^3	0-30 pg/ Rm^3 (See note 2)

Note 1 – Conversion to 10 mg/Rm3 is not possible since Organic Matter is made up of different compounds with different molecular weights. The Plasco process is in fact designed to perform better than the limits in Ontario and the EU with regards to Organic Matter.
Note 2 – In normal operation, the Plasco process dissociates waste to the atomic level – dioxins and furans are absent at the exit from the converter. During equipment or process malfunctions, dioxins may be formed (mainly in the gas quality control suite) until the equipment is shutdown, or until the process is re-stabilized. During these short and infrequent transition periods, the facility may produce 0-30 picogram/Nm3 of dioxins and furans.
* Converted from the format originally quoted by the specification or engine. The original format is found in parentheses.

In Conclusion:

PlascoEnergy Plasma Gasification Process

- Ottawa Demonstration: the result of >20 years of research and engineering
- Use plasma in an economical fashion
- No risk to municipalities
- Modular design for rapid, low cost construction
- Keep the environmental superiority

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Thank You!