



Thermal Conversion of Waste Materials Into High Value Energy Products



Liquid and Gaseous Fuels, Carbon Black, Activated Carbon, Agri-Char & Electricity

7/24/09

Remediation Earth, Inc.

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Remediation Earth, Inc. (“REI”)

- **Project Developer; 20 yrs modular systems approach**
 - Primary focus: convert medical & mixed plastics waste
 - Secondary focus: “green” waste (biomass) to bio-diesel
- **Proven commercial thermochemical conversion**
 - Pyrolysis and anaerobic gasification technologies
 - Meets current emission limits; CA, US, EU & Japan
- **Remediate wastes; higher value energy products**
 - Liquid/gaseous fuels, electricity, carbon black & agri-char
- **Cost effectively integrate water treatment & pyrolysis**
 - Proven chemical-free water technology; EPA registered

20 Years Modular System Experience



Skid Mounted: Intelligent Filtration System With Remote Monitoring



25 Ton per Day Continuous Pyrolysis I Unit

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“Higher Value from Pre-separated Materials”

- **Gasification of MSW to power- not cost effective**
 - At \$0.09/kWhr, \$90/ton + \$40 tipping = \$130/ton (2009)
 - Large 500 to 1000 ton/day systems problematic
- **Separated plastics- MRF; \$460/ton- 3.5X revenue**
 - 160 gallons/ton syn-diesel; \$320/ton @ \$2.00/gal (2009)
 - 200 lbs carbon black/ton (10%); \$100 @ \$0.50/lb (2009)
 - Tipping fee of \$40/ton
- **4 smaller 50 t/d units = 200 t/d; parallel processing**
 - Quickly change output products; chase market “highs”
 - Less impact from yearly scheduled maintenance

*Note: MRF = material recovery facility; MSW = municipal solid waste
t/d = tons per day*

REI Uses Thermal Conversion- Not Incineration

- **Incineration is combustion- by many “Aliases”**
 - Waste-to-energy (“WTE”), energy from waste (“EFW”)
 - Advanced thermal recovery (“ATR”), “mass burn”
- **The lines are “blurred”; people are confused**
 - WTE, EFW, ATR & mass burn all use stoichiometric O₂
 - Gasification/Pyrolysis uses little or no O₂- *not* combustion
- **Method of treating emissions is key**
 - Mass burn- can only treat *fully combusted exhaust*
 - Thermal Conversion: intermediate step for gas cleanup
 - REI’s emissions: meets both CA & worldwide standards

Our Technologies Convert All These Wastes . . .

Petroleum Product Waste



Pyrolysis I – SynDiesel

Organic Waste








Hybrid Pyrolysis II - "Green" Diesel

. . . Into High-Value Liquid/Gaseous Fuels and Electricity

Type & Amount; Value-Added Products

Pyrolysis I

(Per Ton of Feedstock Materials)

- Tires (100 per ton)  *80 gallons #2 fuel oil
640 lbs carbon black, 300 lbs scrap steel
- Mixed Plastics
(45%PP, 40%PE, 15%PS)  *160 gallons #2 fuel oil & synthetic diesel
160 lbs carbon black
- Medical Waste
(typical “red-bag”)  *110 gallons “black” #2 fuel oil, syn-diesel
120 lbs carbon black
- e-Waste
(Plastics with fire retardant)  *80 gallons “black” diesel
80 lbs carbon black
- MSW
(Municipal Solid Waste)  *60 to 80 gallons (see Note)
200 lbs char/ash, depending on content

Note: Minimum of 15% to 20% plastics (by wt) in MSW for oil production

*** Deductions already made for 12% -14% oil used for parasitic needs**

REI's "Green" Diesel vs. "Black" Diesel

Green diesel properties

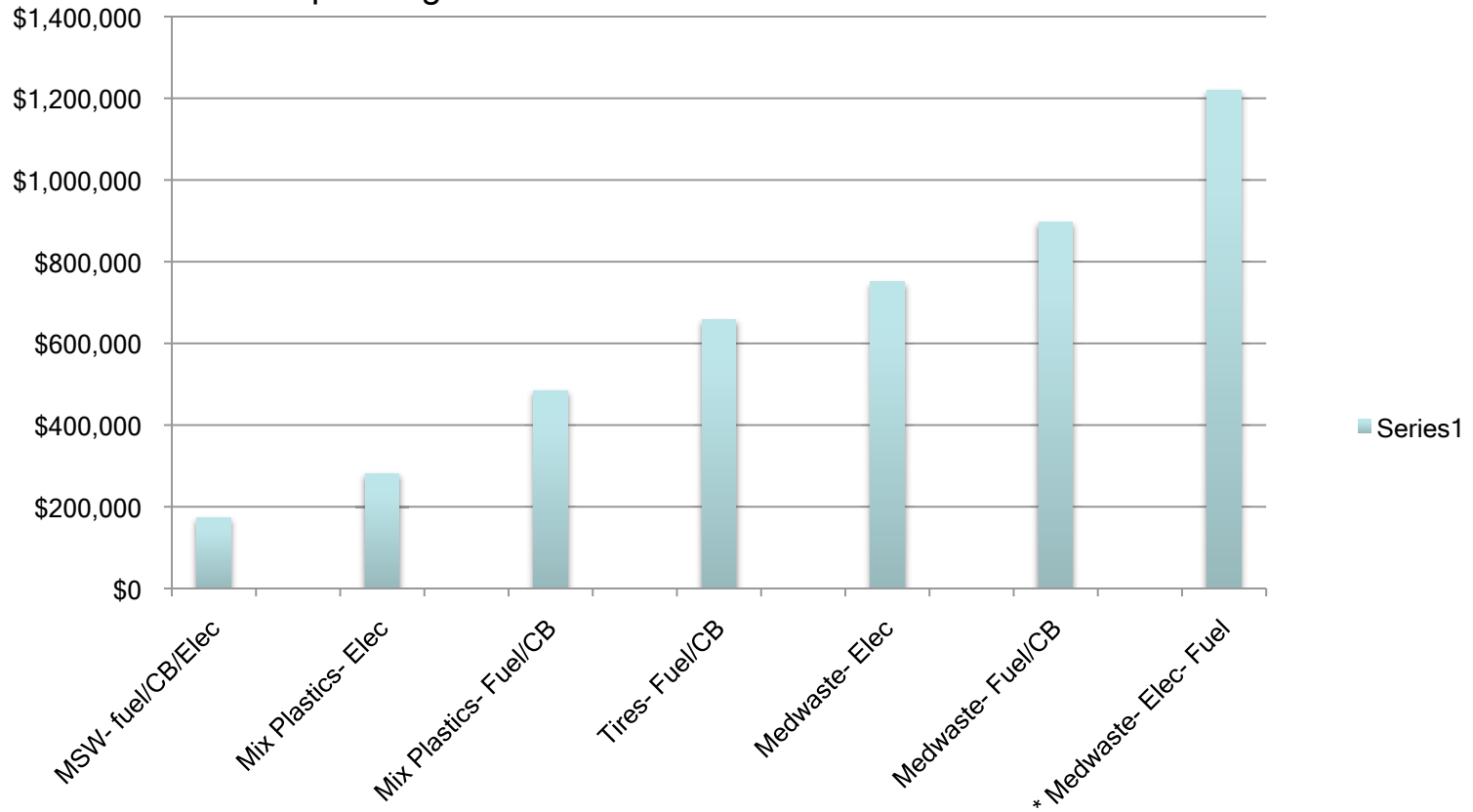
Compared with a commercial diesel, green diesel has higher cetane value, lower density, and narrower boiling temperature range with lower high-boiling point. In addition, green diesel has no aromatic content that is believed to be the cause of particulate matters (PM) in exhaust. Furthermore, green diesel excels in NO_x reduction and contains no sulphur and thereby expedites the PM reduction effect of oxidation catalyst.

Parameter	Green diesel	Commercial diesel*
LHV [MJ/kg]	43.5	43.5
Air-oil ratio [kg/kg]	14.9	14.6
Density [kg/m ³]	763	802
Cetane number	78.4	59.9
Kinematic viscosity (at 30 C)	4.44	2.20
High-frequency reciprocating rig HFRR (μ m)	580	440
Oxygen content (mass %)	< 0.1	0
Carbon content (mass %)	84.9	87.5
Hydrogen content (mass %)	15.1	12.5
Sulphur content (mass %)	~ 0	< 0.005

*Sample parameters can fluctuate

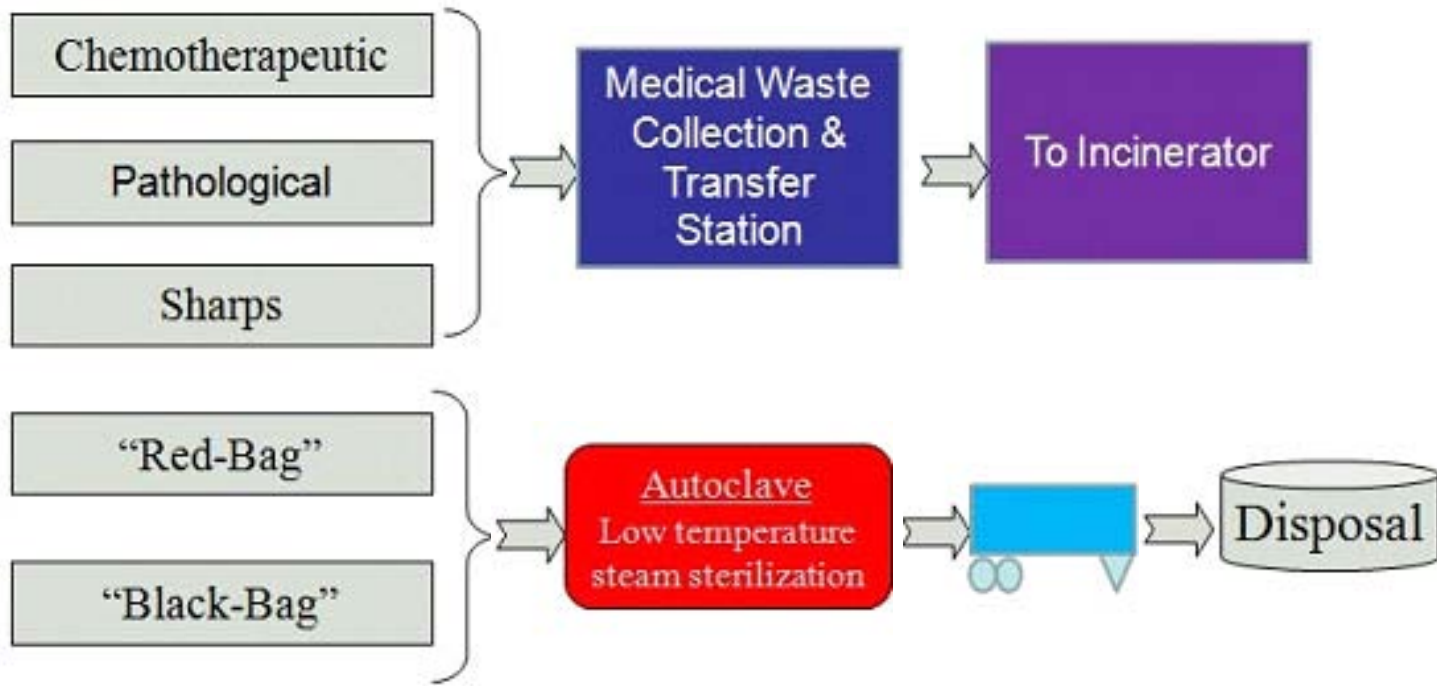
Yearly Gross profit per \$million capital invested (with tax credits)

“Product line Addition” to an existing functioning facility which is already operating and HAS EXISTING INFRASTRUCTURE



* Note: Initially, medical waste to electric with 30% grant. Switch to fuel 5 years later

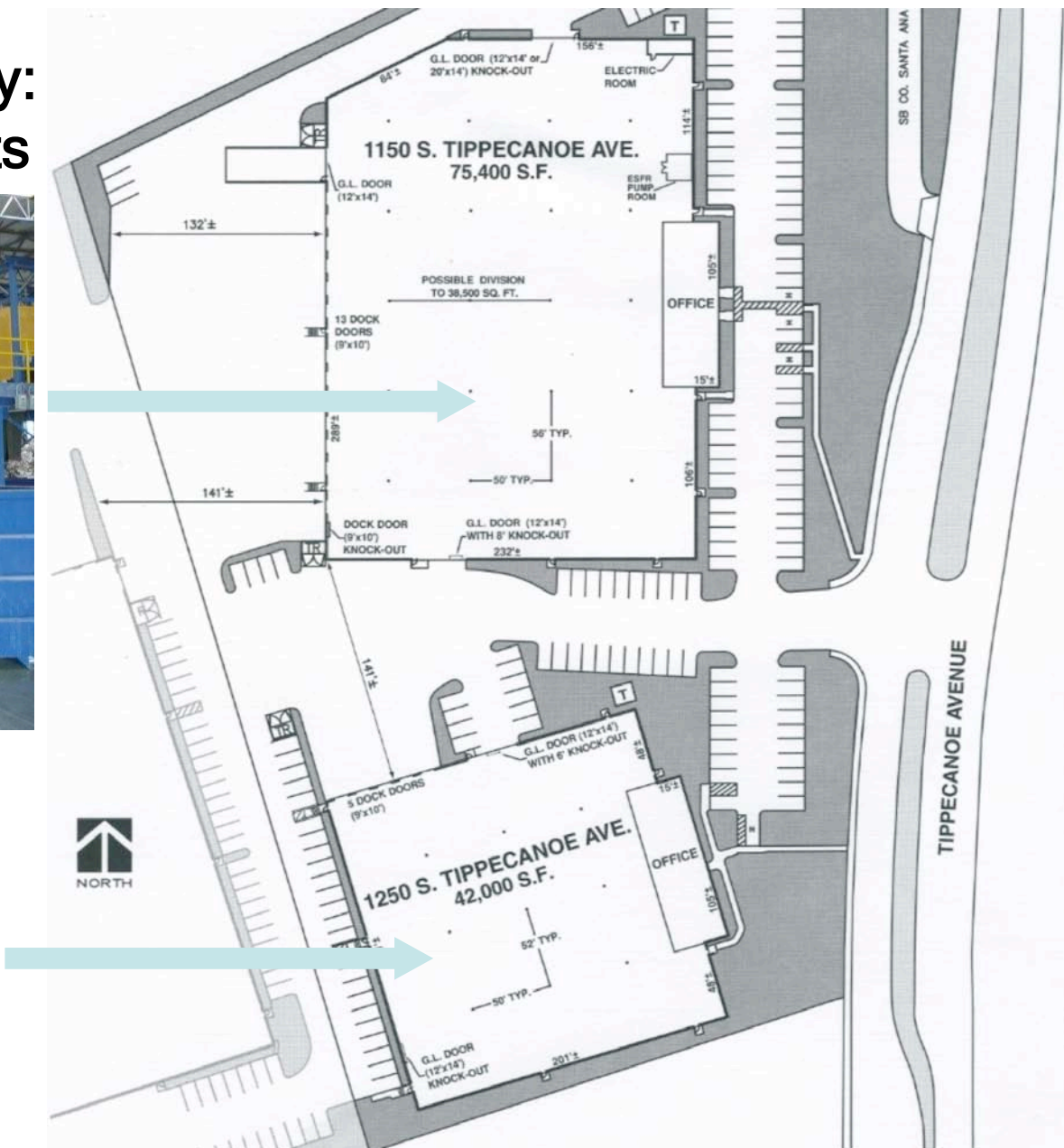
Basic Flow Diagram of Hospital/Medical Waste Process (How most medical waste processors operate)



\$\$ Profit: Medical Waste to Energy (100 tons/day facility)

Medical W-T-E (numbers in 000's)	Autoclave Only Facility (Estimate)	Add Pyrolysis Systems to Autoclave Facility	Pyrolysis Only Systems
Total Revenue	17,500	35,350	35,350
Operating Expenses	10,770	12,000	9,745
Gross Profit	7,030	23,350	25,605
Gross Profit (%)	40.1%	66.0%	72.4%
SG&A Expenses	3,375	3,375	3,375
EBITDA	3,655	19,975	22,230
Operating Profit (%)	20.9%	56.5%	62.9%

REI's San Bernardino Facility: 4- 50 ton/day Pyrolysis Plants



Thank You
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Future Site: 1250 Tippecanoe Avenue, San Bernardino, California