WTE CAPITAL REFURBISHMENTS

Extending the Life of WTE Facilities Another 20 Years

HDR
OVERVIEW OF WTE FACILITIES IN US

- 73 Facilities Currently Operating in the US
  - 36 operating 30 years or less
  - 37 operating more than 30 years

- WTE - Major Benefits
  - Proven Technology
  - Can process 99%+ of waste stream
  - Direct Combustion Process
  - Volume Reduction of 90%+
  - Generate Electricity and/or Steam
  - Up to 650 kWh/ton net electric
  - Sell Recovered Metals
WTE FACILITY SHUTDOWNS

- Detroit RRF, Detroit, MI
- Warren RRF, Warren, NJ
- Wallingford RRF, Wallingford, CT
- WASTEC, Wilmington, NC
- Jackson County RRF, Jackson, MI
- Wheelabrator Claremont, Claremont, NH
- MERC, Biddeford, ME
- Harford WTEF, Joppa, MD
WTE PLANT MAINTENANCE PRACTICES

- Annual or bi-annual scheduled outages
- Unscheduled outages
- Extended cold iron outages
- Pressure part repairs and replacements
- During outages work is completed on:
  - Boilers, Scrubbers, Air Pollution Control (APC) Equipment, Power Generation Equipment, Electrical Systems, Pumps, Fans, Motors…..

DESPITE THE FACT THAT THESE FACILITIES PERFORM COMPREHENSIVE ROUTINE MAINTENANCE MANY WTE FACILITIES NEED TO INVEST SIGNIFICANT CAPITAL TO EXTEND FACILITY USEFUL LIFE ANOTHER 20YEARS
COSTAL PROJECT DRIVERS

- Components at End of Useful Life
- Improved Reliability
- Ensure Throughput Capacity is Sustained
- Stabilize or Reduce O&M Costs
- Increase Revenues/Gain Additional Revenue Streams
- Improve Aesthetics
- Comply with Future Emissions Requirements
CAPITAL REFURBISHMENT PROJECTS

- Cost of refurbishment projects highly variable
- Variables:
  - Maintenance History (Has it been maintained at “Industry Standard”)
  - Contract Terms (“Handback” provisions)
  - Plant Condition
- Some “typical” end of term projects:
  - New Cranes/Grapples
  - Ash Discharger Replacement
  - Boiler Waterwall Replacement
  - Generator Bank Replacement
  - Economizer Bank Replacement
  - Scrubber Rebuild/Replacement
  - APC Flue Gas Ductwork Replacement
  - Baghouse Rebuild/Replacement
  - Sootblower Rebuild
  - Cooling Tower Rebuild
**CAPITAL REFURBISHMENT PROJECTS**

- **MSW HANDLING**
  - Front End Processing Equipment (RDF plants)
  - Cranes
  - Grapples

- **LOWER FURNACE**
  - Feed Chute
  - Feed Table
  - Grates and Grate Support Structure
  - Ash Discharger

- **BOILER**
  - Waterwall Tube Panels
  - Boiler Screen Tubes
  - Generation Banks (Convective Zones)
  - Superheater Screen Tubes
  - Superheater Tube Bundles
  - Economizer Section
  - Air Preheater
  - Sootblowers
  - Auxiliary Burners
  - Insulation & Lagging

- **APC**
  - Flue Gas Ductwork
  - Scrubber Refurbishment
  - Baghouse Refurbishment
  - Carbon Injection System
  - Lime/Slurry Injection System
  - Ammonia Injection System (NOx)

- **ASH HANDLING**
  - Bottom Ash Conveyors
  - Ferrous Magnets
  - Non-Ferrous - Eddy Current Separators
  - Vibrating Pan Conveyors
  - Belt Conveyors
  - Screw Conveyors
  - Pugmills

- **SITE CIVIL/ARCHITECTURAL**
  - Receiving Floor Repairs
  - Receiving Pit Wall Repairs
  - Ash Building Floor Repairs
  - Ash Building Bunker Repairs
  - Landscaping/Repaving Work
  - General Building Repairs (roof/siding/painting)

- **BALANCE OF PLANT**
  - Turbine – Rotor/ Casing/Diaphragms
  - Generator
  - Boiler Feedwater Pumps
  - Condenser Retubing
  - High Pressure Feedwater/Steam Piping
  - Closed Loop Cooling Water
  - Cooling Tower/Air Cooled Condenser/Once Through
  - CEMS System Upgrades
  - DCS System Upgrades
  - Air Compressors
  - Stack
  - ID fans and motors
  - Other Fans and Pumps
  - Electrical Power Systems
  - UPS Systems
  - Rolling Stock
  - Truck Scales
  - Fire Protection
  - HVAC
TYPICAL SECTIONS OF COMBUSTION TRAIN
FEED TABLE & GRATES
BOILER WATERWALL TUBES
FIRST PASS
TILE/OVERLAY/REFRACTORY
SUPERHEATER TUBES
BOILER TUBE OVERLAYS

- Superheater and Waterwall Corrosion/Erosion Protection:
  - Inconel
  - Tube Shields
  - Colmonoy
  - Refractory/Backcast Tile

- Areas of Application
  - First Pass waterwalls
  - Superheater tubes
  - Convective zone evaporator
ECONOMIZER TUBES
SCRUBBER VESSEL
SCRUBBER VESSEL

- Traditional Material
  - Carbon Steel
  - 316L Stainless Steel

- Advanced Alloys to Consider
  - Inconel
  - Hastelloy C-22 “wall paper”

- Areas of Application
  - Scrubber vessel
  - Scrubber hoppers
BAGHOUSE

Roof Replacement

Tubesheet

Hopper Replacement
POWER GENERATION

- Turbine
  - Turbine Rotor, Diaphragms, Seals
  - Lube oil system
  - Bearings
  - Inlet Valves/Extraction Valves

- Generator
  - Rotor, Stator

- Controls

- Condenser

- Cooling Tower
FACILITY ENHANCEMENTS

• Metals Recovery
  • Cost/Benefit based on recovery rate and metals price:
    • Ferrous
    • Non-ferrous

• Variable Frequency Drives:
  • Cost/Benefit based on Electric Rates and operating characteristics
    • ACC fans, ID fans, FD Fans

• NOx Reduction
  • Enhanced SNCR
  • Staged Combustion for Nox
  • Flue Gas Recirculation

• Semi Dry Ash System
THANK YOU.

QUESTION & COMMENTS

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