HTT ROTARY KILN SOLID WASTE DISPOSAL SYSTEM

We are happy to offer the following quotation. This package is for a turnkey installation of an **HTT ROTARY KILN SOLID WASTE DISPOSAL SYSTEM** in a Consolidated Incineration Facility (CIF). These systems will easily handle the customers disposal requirements and with the high efficiency Scrubber System, will be able to remove particulate and neutralize acids. The PLC control system and emissions monitors will assure environmental compliance. The components proposed can be built vertically to fit within the customers space requirements. For example the vertical afterburner and scrubber can be located on a platform above the rotary processing chamber and the feed system may be converted to a slurry pump system. This will leave an equipment footprint as small as 20m x 15m. All components will be Nema 4. A building structure should be provided for the worker environment.

Most of the fabricated components will be purchased from local sources when possible. Special items such as burners, pumps, blowers, control components, etc. will be purchased based on local availability or from US sources. HTT will engage a local Professional Engineer to undertake the submission to the relevant authority and certification of the steel structure.

HTT will provide recommendations for the plans of the grounds and/or building that is to be used for the project, to do a proper layout of the system in the customers plant location. This can be a cad file in .dwg or .dfx.

Thank you for the opportunity to present this information. Please feel free to call me at your convenience.

Very truly yours,

Stephen R. Parker
General Description – Turnkey Installation

Consolidated Incineration Facility (CIF)

The HTT website shows a facility being constructed in the Philippines that is similar in design and function to the one we are quoting. HTT will engage a local Professional Engineer to undertake the submission to the relevant authority and for certification of the steel structure. A complete turnkey system can have any of the components described below and illustrated in the pictures. The complete package bid can include:

- **The storage tanks for the liquid waste and related pipeworks**
  Package includes (2) 5,000 gals tanks for storage and mixing of waste liquids. Tanks shall be constructed of FRP, carbon or Stainless steel and shall include flanged connections, transfer pumps, integrated level indication controls, and support frame.

- **A Fuel storage tank**
  Package includes (2) 5000 gals tanks for storage of light fuel oil, and solvents. System shall include pumps for the mixing of liquid fuels for direct firing in the burners located in the system. When conditions permit, solvents will displace fuel thus reducing operating costs. Tanks shall be constructed of FRP, carbon or Stainless steel and shall include flanged connections, transfer pumps, integrated level indication controls, and support frame.

- **Solid Waste Container**
  Package shall include a 5m³ solid waste container, attached to a feed conveyor system for loading the materials into the screw hopper. Customer shall process this waste to allow for loading with a 16 in dia feed screw.

- **Continuous Monitoring of the Flue Gas** (referring to US Guidelines)
  Package includes a Constant Emissions Monitor System for O₂, CO, and HC. Guidelines and local requirements will vary as to what points will require monitoring. HTT will assist in the permitting and the equipment selection and integration. Other monitors could include: HCl, hydrogen fluoride, sulphur dioxide, NOₓ, and particulate.

- **Sorting area including the incinerator and scrubber treatment system**
  HTT will offer suggestions as to the area required and the equipment required for sorting of materials. Price does not include, sorting tables, work areas, fork truck and material handling equipment, lift chains or chain hoists.

- **Emissions Testing** (referring to US Guidelines)
  Pricing includes testing of the emissions. Guidelines and local requirements for testing will vary as to what points will require testing. HTT will take the stack samples, send samples to an approved lab for analysis, and make modifications to the system as necessary to assure compliance.
-Heat Recovery
Package includes a high efficiency steam generator for recovering heat from the resulting exhaust gases. The generator shall include sufficient heat exchange surface to remove 65-80% of the available heat. The steam produced can be used for process heat or generation of electricity.

-Electrical Generation
The steam produced in the system will be introduced into a steam turbine. The steam turbine will run a generator and switch gear assembly to produce power.

Typical Solid Waste Incineration Systems
HTT has more than 20 years of experience with the design, manufacture and installation of combustion, incineration, heat recovery and process heating systems. Our customers range from manufacturers that use solvents in their production processes, to SVE site remediation systems, to the disposal of solid waste to produce steam or electricity. Our systems are designed with special attention to ease of installation and maintenance, and long operating life. The basic components are selected for easy access anywhere in the world. Our control panels are designed to interface with all known PLC and Computer Controls.

Our standard unit for solid waste uses a conservatively designed afterburner to assure maximum oxidation and minimal particulate emissions. We can also offer various options for emissions control or heat recovery to steam, hot water, electricity, etc. Select a supplier of these components, we will be happy to work with them to provide a complete system. Read the section on "Solid Waste Systems Design Criteria".

HTT custom designs Rotary Kiln Systems that will operate at 500-4000#/hr. The best way to think of a solid waste incinerator is as a BTU machine. Each system is designed to process a specific BTU/hr. And the higher the BTU value, the less you can feed it per hour. Because the heat content of some material is higher, the units will be de-rated. For example: If your material has twice the heat content of typical municipal waste (4-5,000 BTU/lb), a 2,000 lb/hr unit would only handle 1,000 lb/hr.

The HTT rotary system is sized based on operating with materials that require constant mixing, drying, and agitation. Depending on the operating period (8-24 hrs) your plant will be able to handle amounts as indicated in the attached quotation. The price includes the the standard screw feed mechanism. We also offer feed systems such as those manufactured by KOMAR Industries at http://komarindustries.com/. We can also offer various options for emissions control or heat recovery to steam, hot water, electricity, etc. Select a supplier of these components; we will be happy to work with them to provide a complete system.
1.1 Dual Waste Feed System

1.1A Screw Feed System - Waste will be fed to the Ignition chamber through a round access door. Shredded material shall be loaded into a screw feed hopper with water cooled nose piece. The feed hopper shall be complete with heavy duty shaft and screw, housing, and reduced motor drive. Temperature sensors will limit the feed system thus maintaining a constant burn rate. Thermocouples interlocked to the control panel and the feeder will prevent operation except at set temperatures on the control panel.

1.1B Liquid Waste Injection Option – Liquid wastes with a high BTU value such as solvents, may be injected into the chamber with an air atomizing spray nozzle. When using a nozzle with mechanical atomization, the orifice is small. This can cause nozzle plugging when the liquids are not properly heated and filtered. The HTT air atomizing nozzle has a larger orifice that minimizes plugging. The nozzle system also is designed for ease of removal and cleaning. Some systems also include a secondary injection nozzle as a backup. The secondary injection unit can be used when the first is being maintained.
1.2 Primary Ignition Chamber - The rotating chamber is proven to be one of the best available technology to burn solid materials and sludges. Contaminated materials such as sludges and soil can be heated to drive off the contaminants and the chemical vapors produced are destroyed in the afterburner chamber. The hard refractory used in the Rotary Kiln typically would be field installed due to the weight problems of shipping. The weight of hard refractory is 160 pounds per cubic foot. The complete lined chamber can be over 50 tons.

The refractory is installed using refractory needles that assure maximum structural integrity. A high alumina material is used with minimal binders. This assures minimum shrinkage and maximum operating life, even when processing materials with a high acid content.

Connected to the primary chamber shall be a stationary mating section. This section contains the inspection door, blast gate peep sight, burner, and connecting duct to the secondary chamber. Both the burning chamber and a stationary chamber shall be mounted on a single trailer. At the chamber to the outlet connection shall be air nozzles connected to a high-pressure blower with actuated damper. As the combustion rate of the material increases, the damper is opened thus maintaining a proper air ratio for complete combustion of the smoke and particulate.
The materials to be consumed are charged into the rotating refractory lined cylindrical chamber, which has been pre-heated to normal operating temperature. The burner ignites the material and the combustible components producing smoke and volatilized gases. The action of the burner and use of fuel is normally intermittent, but depends upon the materials to be consumed. Materials with a high heating value will require little if any auxiliary fuel. The Primary Ignition Chambers consume the material thermally and as a result of the rotation action, continuously delivers the non-combustibles (including ash) to an exterior receptacle. The smoke and volatile vapors and gases are drawn into the second, but stationary chamber, air is added and the secondary burner begins the final thermal oxidation.

The ash remains in the primary chamber and settles to the bottom. As the chamber slowly rotates, the rotary action transports the ash and other non-combustibles to the opposite end where they exit through a slot at the edge of the kiln and into an ash receptacle. A man sized access door is provided.

Rotating this chamber during the burning process exposes new surfaces to be burned while breaking up the insulating ash layer. The thick refractory lining retains the desired pre-set temperature and continually moves under the burning material while over-fire air supports the combustion from the other side.
A controlled air condition is maintained and the reduction of the waste product is semi-pyrolytic. Non-combustible materials and ash are continuously discharged and collected from the system. During normal operation no ash will have to be handled, preventing a potential health hazard.

1.3 Secondary Combustion Chamber - The secondary chamber or afterburner will be mounted on a second trailer. A suitable refractory lined transition section shall be provided. The Secondary combustion chamber shall be constructed of rolled carbon steel plate. The chamber shall be complete with the required structural supports, and flanged connections. The chamber shall be lined with a combination of both insulating and hard faced refractory materials. The refractory shall be suitably supported with stainless steel anchors for long life. The chamber shall be complete with access doors for inspection and maintenance.

The Secondary Combustion Chamber operates at a higher temperature (1400-1800 F) than the Primary Chamber and consumes the gases, smoke, and particulate. The volatile products resulting from the thermal reduction process are drawn into the secondary combustion chamber to be further oxidized. The burner is positioned below HiTemp time still air so that the incoming gases and particulate pass through the flame and are ignited. The direction of the flame assures a swirling, vortex action providing maximum turbulence and residence time to the burning mass.
A 304 stainless steel air dilution type stack shall be mounted to the discharge connection of the secondary chamber. The stack shall be designed intersections for ease of assembly and storage during equipment transport.

1.4 Burners - The Rotary Kiln System will be equipped with modulating Natural Gas or light oil burners with flame safety. The burners will be mounted to the outer shells of both chambers and are directed to assure maximum turbulence. Also included will be complete fuel trains. Note: HTT burner systems come standard with dual UV scanners and constant gas pilots for ignition. This approach assures constant dependable operation.
1.5 Controls - The system shall monitor and record temperatures, feed rates and cycles, external equipment conditions, and safeties. System modifications may require only simple program changes rather than extensive field modifications during system upgrades.

The controls are designed to permit the proper and safe operation of the unit and to provide the operator with various options to broaden the versatility of the unit. The control panel includes the various electrical controls to assure a safe start-up and pre-heat of the chambers and operation of the Kiln.
Both under and over temperature limit set point circuits are interlocked with the feeding mechanism to assure control in feeding waste materials. The Rotary Chamber may be operated in a fixed mode, or rotated at various speeds, depending upon the materials being fed.

The controls are designed to interlock feeding of charges until the conditions of both chambers are brought up to pre-defined temperature levels. The feeding process will also stop if, during operation, conditions in the combustion chambers deviate from these pre-established conditions.

Operating temperatures controlled by adjusting the fuel-to-air ratio according to temperature monitors in the designated flue gas flow areas. Temperature is sensed by Chromel Alumel Type K thermocouples, which are connected to the system temperature controls, which regulate the auxiliary fuel.

The Rotary Kiln Incinerator shall be equipped with a temperature controller, which will shut off the feed when present operating conditions are not met. Feeding will not resume until conditions have been corrected. For the purpose of control consideration, the Rotary Kiln Incinerator is a "constant flow" system.
1.6 Automatic Ash Removal - The ash shall drop out of the primary chamber once the proper burn time has elapsed. Directly below the opening shall be a collection container or an optional ash conveyor to an ash container. The ash shall be cooled with water spray prior to removal for emptying. Customer is responsible for the furnishing of this container. We suggest using a stainless container or drum with a palette-jack.

As the container shall be located below the primary chamber, the kiln would be raised or the ash receiver placed in a pit, or a conveyor system may be used. The orientation is optional and the foundations shall be part of the customer-supplied footings.

1.7 Quencher Scrubber System - The scrubber shall include a quenching section constructed of FRP or 316L SS, venturi, circulation pump, filler valve, level sensor, liquid storage, packed tower, and demister pad. All components shall be skid mounted for ease of assembly.

The Scrubber will clean the gases of fumes before being discharged into the atmosphere. The gases contact the scrubber water to condense the fumes and wet the particles while cleaning the interior walls of the housing. A mixing section or packed tower accelerates the gas flow and maximizes the collection of the pollutants. The demister separation section removes ultra fine droplets and particles prior to being drawn to the atmosphere.

1.8 CONSTANT EMISSION MONITORS (CEM)

Each application is different. Because of this, the types of monitors that may be require will change depending on the application. HTT will provide a CEM including a draw sample system that will monitor O2, CO, HCl, hydrogen fluoride, sulphur dioxide, NOx, particulate, and HC.

1.9 TRIAL BURN AND EMISSIONS TESTS

HTT shall take samples during trial burns. These samples will be taken to an approved lab for analysis.
Terms and Conditions

DELIVERY: Shall be 16-20 weeks after the receipt of a valid purchase order, progress payments, and all required approvals.

PAYMENT TERMS: Shall be 35% with order, 35% at midpoint of delivery period, and 30% when fabrication is completed prior to shipment. Export projects will require a LOC.

NOTE: Costs of any and all emissions testing are extra. Any additional equipment or controls required above those stated herein shall be provided at extra charge.

Thank you for the opportunity to present this quotation. Should you have any questions or require any additional information, please feel free to call or write me at your convenience.