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August 8, 2013

E-MAIL & EXPRESS MAIL
FedEx No. 8029 9438 3821
Mr. Shailesh R. Patel, P.E.
Air Quality Program
Pennsylvania Department of Environmental Protection
2 Public Square
Wilkes Barre, PA 18711

Subject: Response to Technical Deficiency Letter
Delta Thermo Energy, A, LLC
Allentown Energy Production Facility
Plan Approval Application No. 39-00099A
APS ID# 808240, AUTH ID# 970243
IES Project No. EV130894.04

Dear Mr. Patel:

IES Engineers (IES), on behalf of Delta Thermo Energy A, LLC (Delta Thermo), is pleased to submit the updated response to our July 29, 2013, letter related to the Technical Deficiency Letter received from the Department on July 19, 2013. In addition, this updated response addresses the questions you raised during our meeting at the Northeast Regional Office on August 1, 2013. Specifically, we are providing the following:

- Calculations to determine the CCC combustion air requirements, as well as the flue gas flow rate from the CCC to the Waste Heat Boiler and the Air Pollution Control System.
- Changes have been made to Section B, page 3 of the Plan Approval Application form for the Shredder, related to fugitive emissions being treated in the CCC, and not the Air Pollution Control System.
- Figure 2-1 has been revised to incorporate the Quench Chamber before the Acid Gas Scrubber as well as the relocation of the flue gas recirculation to the CCC upstream of the cyclone, not the baghouse.
- We removed Page 9 of Section C of the Plan Approval Application form, as the original page in the March 29, 2013, submission remains valid.

As in our original July 29th response letter, we have restated each of your questions followed by our responses in **bold** text.

The Resource Recovery System (RSS) process is not explained in sufficient detail as a source of emissions. Since this is the principal component of the pulverized fuel production, further detail is necessary in explaining each unit and its design parameters by supplying the following:

a. Begin by revising the process flow diagram to include the tipping floor, shredder, feedstock pit, and recycled materials handling process.

Response: **The revised Process Flow Diagram showing the referenced components is presented in Attachment A. It is the same diagram which was reviewed with DEP during our meeting last Thursday, August 1st, 2013.**

b. Provide specific source details by completing the source information data form found in Section B on page 2 of the Processes Plan Approval Application. Complete a separate page for each component (shredder, feedstock pit, RRS unit, cyclone, dryer, boiler, and turbine).

Response: **The completed Section B forms for each system component listed above are presented in Attachment B. A detailed process description is presented in Attachment E.**

c. Discuss the potential fugitive emissions from the shredding operation, feed stock pit, and the recycled materials handling process.

Response: **The fugitive emissions from the shredder operations will be captured in a hood and treated in the Complete Combustion Chamber (CCC). The feedstock pit is enclosed within four walls in the plant to limit fugitives and odorous contaminants. The pit is separated from the Resource Recovery System (RRS), the other components, and the tipping areas. Fugitive emissions will be captured and treated in the CCC as combustion air. We do not expect any fugitive emissions from the sorting of the recyclable materials such as glass, metals, and non-combustible materials. Any large particulate matter generated by these operations will settle onto the building floor and other horizontal surfaces, which will periodically be cleaned.**

We would like to bring to the Department's attention that all of these operations are enclosed in the building, which will be maintained under negative pressure to prevent the escape of potential fugitive emissions to outdoor air. Automatic air curtains at the doors to the tipping area for the trucks to enter the building will assist in maintaining the negative pressure within the building and keep particulate from exiting outside the building.

d. Provide assurance that the steam exhausted from the dryer does not contain any odorous contaminants.

Response: **The pulverized fuel produced in the Resource Recovery System (RRS) contains approximately 50% moisture content, which is too high for self-sustaining combustion. The wet pulverized fuel will be dried in the Dryer using heat from the steam to reduce the moisture content to approximately 18%. The Dryer exhaust air containing moisture will be sent to the CCC.**

Please note that the feedstock in the RRS is subjected to approximately 300 psi of pressure and 290 °F for at least one hour, which kills all bacteria and removes odors through the Hydrothermal Decomposition process and produces clean pulverized fuel.

In addition to the RSS, additional information on the remaining process is required as listed below:

1. The project description states the produced fuel will generate 3 to 4 MW of electricity. Please provide a specific design capacity based upon the maximum design pulverized fuel firing rate.

Response: **The proposed steam turbine will be supplied by Dresser Rand (Model U) and have a nominal rating of 4 MW at 5,350 RPM with steam inlet conditions of 580 psig and 752 °F. This unit is a condensing-type steam turbine. The plant will produce an average of 3.7 MW and consume approximately 1.4 MW. It will provide 2.3 MW to the grid for sale.**

2. Please explain in detail how the fuel will be burned in the Complete Combustion Chamber (CCC). Section B – Part 1 of the application is missing this information.

Response: **The CCC will be designed by Jasper GmbH of Germany. One CCC will be installed in the Allentown facility. It will be designed to burn the pulverized fuel produced by the RSS process and dried in the steam Dryer. The dried pulverized fuel will be fed into the CCC by a controlled fuel charging system and burned at approximately 1,860 °F. Ash from the combustion process will be removed by a chain conveyor for disposal. Flue gas from the combustor will be transported to a post-combustion chamber where the temperature will be kept above 1,650 °F, with a residence time of 2 seconds for complete combustion. The CCC will be complete with a natural gas burner that will only be used during startup. The flue gases from the CCC will be directed to the heat recovery boiler for the production of high-pressure super-heated steam to power the turbine to produce electricity.**

The CCC is essentially a stoker-type combustor with special Jasper features incorporated into its design, including a rotary paddle system to gently agitate the fuel to the combustion grid. This agitation system helps to ensure complete combustion without the use of a large amount of underfire air, to improve combustion efficiency, and to lower emissions.

3. Maximum heat input as stated in the application is 76.28MM Btu/hr. Based on the maximum firing rate of 4.954 ton/hr of pulverized fuel and its heat value of 9,038.0 Btu/lb, the maximum heat input calculates to 89.476 MMBtu/hr. Please explain this difference.

Response: **The maximum heat input rate of 76.28 MMBtu/hr, as stated in the Plan Approval application, is correct. The maximum firing rate of the solid fuel to the CCC is 4.78 tons/hour (wet), which contains 18% moisture. The higher heating value of this wet pulverized fuel is 7,980 Btu/lb or 9,730 Btu/lb on a dry basis.**

4. Within Section B under the Maximum Operating schedule, the listed fuel usage of 38.047 ton/yr is incorrect. Provide the correct annual fuel usage here.

Response: **The fuel usage will be 36,710 tons/year of pulverized fuel (4.78 tons/hour x 7,680 hours/year). Accordingly, we have revised the maximum operating schedule in Section B – Combustion Unit Information, a copy of which is presented in Attachment B.**

5. Please explain how the bottom ash from the CCC will be handled. Are any fugitive emission control techniques or measures to be provided?

Response: **The ash will be removed from the CCC by a chain conveyor and cooled using water from the Water Treatment System (WTS). Vapors generated from this cooling process will be collected by an ID fan, hoods, and duct work to exhaust the vapors to the CCC and the WTS.**

6. Please update Figure 2-1, the emissions control flow diagram, to include the gas conditioning equipment explained in Section C, item 2.

Response: **We have revised Figure 2-1, a copy of which is presented in Attachment B, to incorporate the quench chamber gas-conditioning equipment to cool the baghouse gas stream from 320 °F to approximately 135 °F. In addition, we relocated the flue gas recirculation upstream of the cyclone. We have also included the quench chamber exhaust gas flow rate calculations in Attachment C.**

7. Please provide the exhaust flue gas calculation from the CCC unit that will feed the boiler.

Response: **Attachment C presents the simplified calculations for the CCC combustion air requirements as well as the exhaust flue gas flow rate from the CCC unit to the boiler and air pollution control system (APCS). Detailed process mass and energy balance calculations were performed by Jasper GmbH using a computerized combustion engineering model.**

8. Within Section C, page 9 of your application, the scrubber inlet volume and outlet volume are listed with the same temperature. Please justify these entries.

Response: **The process gas stream from the baghouse is cooled from 320 °F to 135 °F (saturation) in the quench chamber before it enters the scrubber. Therefore, the inlet and outlet temperature will be the same.**

9. According to our technical support section in Harrisburg, the facility is subject to NSPS Subpart AAAA – Standards of Performance for Small Municipal Waste Combustion Units. Please update page 14 of the application identifying this subpart and provide a narrative discussing the applicability of NSPS subpart AAAA to this project.

Response: **We submitted a letter to Mr. Krishnan Ramamurthy on July 25, 2013, detailing our analysis of the non-applicability of Subpart AAAA to this project. A copy of that letter is presented in Attachment D. We expect to hear from Mr. Krishnan Ramamurthy in the near future.**

We would like to bring to the Department's attention that the design of the Allentown Energy Production Facility is subject to refinements that may result in minor changes as we proceed.

Should you have any questions or comments relating to this response package, please feel free to contact me or Rob Van Naarden of Delta Thermo at (215) 809-1139. We look forward to meeting with you to review these responses so that the Department can issue the Plan Approval.

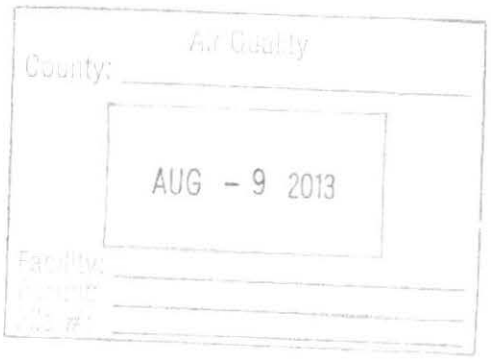
Sincerely,

Robert W. Schlosser /c/
Robert W. Schlosser, P.E.
Principal Project Manager

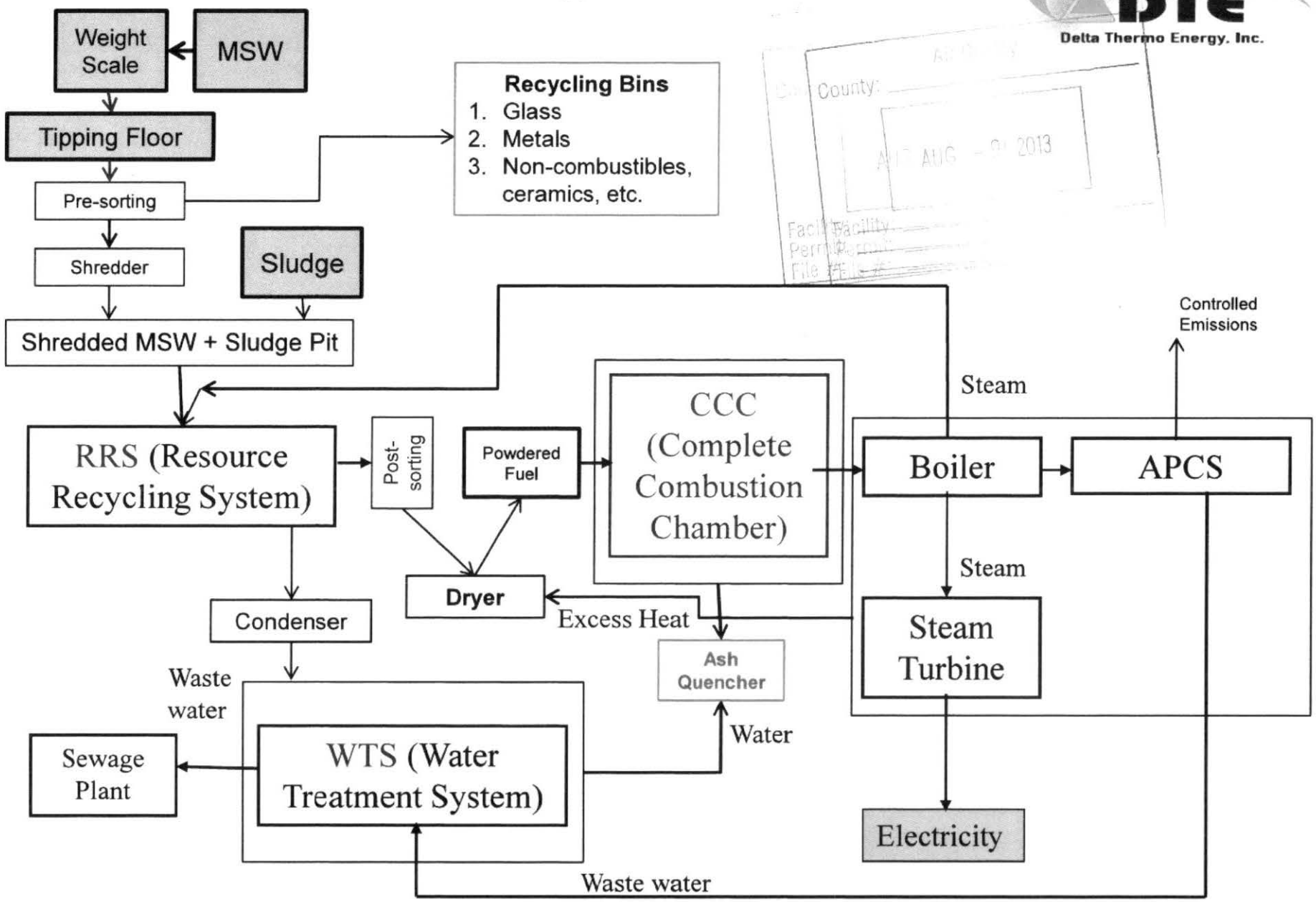
Enclosures
cc: R. Kempa, DEP
R. Van Naarden, Delta Thermo
M. Bonilla, Delta Thermo
A. Soni, IES

ATTACHMENT A

REVISED PROCESS FLOW DIAGRAM



Waste-to-Energy Process Flow Overview



ATTACHMENT B

PLAN APPROVAL APPLICATION SECTION B FORMS
AND
REVISED FIGURE 2-1

Section B - Combustion Unit Information

1. Combustion Units: ☐ Coal ☐ Oil ☒ Natural Gas (Startup Only) Other: **Pulverized Fuel Product produced from municipal solid waste and sewage sludge**

Description: **Complete Combustion Chamber (CCC)**

Manufacturer	Model No.	Number of units	
Jasper (or equal)	**Jasper (or equal)**	**1**	
Maximum heat input (Btu/hr)	Rated heat input (Btu/hr)	Typical heat input (Btu/hr)	Furnace Volume
76,280,000	**76,280,000**	**76,280,000**	
Grate Area (if applicable)		Method of firing	

Indicate how combustion air is supplied to boiler

Indicate the Steam Usage:

Mark and describe soot Cleaning Method: - **N/A**

i. Air Blown
ii. Steam Blown
iii. Brushed and Vacuumed
iv. Other _____
v. Frequency of Cleaning _____

Maximum Operating schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Operational restrictions taken or requested, if any (e.g., bottlenecks or voluntary restrictions to limit potential to emit)

Capacity (specify units)

Per hour	Per day	Per week	Per year
4.78 ton/hr PF	**114.72 ton/day PF**	**803.0 ton/wk PF**	**36,710 ton/yr PF**

Typical Operating schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Seasonal variations (Months): If variations exist, describe them.

Operating using primary fuel: _____ From _____ to _____
Operating using secondary fuel: _____ Form _____ to _____
Non-operating: From _____ to _____

2. Specify the primary, secondary, and startup fuel. Furnish the details in item 3.

Pulverized fuel produced from municipal solid waste and sewage sludge in the RRS is burned in the CCC. The CCC is equipped with a 1.1 MMBTU/hr natural gas-fired burner for startup. Startup time is estimated to require 8 hours and occur 3 times per year.

Revised 7/29/13

Section B - Processes Information

1. Source Information

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

Municipal Solid Waste (MSW) arriving at the site will be shredded to a size of about two inches. The shredder will be low speed, shear-type.

Manufacturer	Model No.	Number of Sources
UNTHA, or equal	**RS 40 4S, or equal**	**1**
Source Designation	Maximum Capacity	Rated Capacity
MSW – Electric Shredder	**5.0 tons/hour**	**5.0 tons/hour**

Type of Material Processed
MSW

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)
None

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – Uses electricity – 30 KW

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

CONFIDENTIAL VERSION SHREDDER

Section B - Processes Information (Continued)

3. Burner N/A

Manufacturer	Type and Model No.	Number of Burners
Description:		
Rated Capacity	Maximum Capacity	

4. Process Storage Vessels N/A

A. For Liquids:

Name of material stored		
Tank I.D. No.	Manufacturer	Date Installed
Maximum Pressure	Capacity (gallons/Meter^3)	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)		
Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)	
Type of Roof: Describe:		
Total Throughput Per Year	Number of fills per day (fill/day): Filling Rate (gal./min.): Duration of fill hr./fill):	

B. For Solids

Type: ☐ Silo ☐ Storage Bin ☐Other, Describe	Name of Material Stored	
Silo/Storage Bin I.D. No.	Manufacturer	Date Installed
State whether the material will be stored in loose or bags in silos	Capacity (Tons)	
Turn over per year in tons	Turn over per day in tons	
Describe fugitive dust control system for loading and handling operations		
Describe material handling system		

5. Request for Confidentiality

Do you request any information on this application to be treated as "Confidential"? ☒ Yes ☐ No
If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

Shredder processes 4.73 tons/hour (113.6 tons/day) of Municipal Solid Waste. Shredder funnel volume is 424 cubic feet. The shredder's electrical power requirement is 30 KW.

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

Delta Thermo Energy will keep records of the quantities of MSW and Sewage Sludge processed.

Describe each proposed modification to an existing source.

None

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

Fugitive emissions from the shredder will be captured in a hood and treated in the CCC. This source will be located inside the building, which will be kept under negative pressure to prevent the escape of fugitives to outdoor air.

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

The capture and treatment systems will be operated to minimize emissions.

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: _____

ii. Expected completion date of construction/reconstruction/installation: _____

iii. Anticipated date of start-up: _____

Section B - Processes Information

1. Source Information

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

The pit is used to store shredded MSW on one side and sewer sludge received from delivery trucks on the other side.

Manufacturer	Model No.	Number of Sources
N/A	**N/A**	**1**
Source Designation	Maximum Capacity	Rated Capacity
Shredded MSW/Sludge Pit	**22,320 cu ft**	**22,320 cu ft**

Type of Material Processed
Shredded MSW and sewer sludge

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – N/A

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information (Continued)

3. Burner - N/A

Manufacturer	Type and Model No.	Number of Burners
Description:		
Rated Capacity	Maximum Capacity	

4. Process Storage Vessels – N/A

A. For Liquids:

Name of material stored		
Tank I.D. No.	Manufacturer	Date Installed
Maximum Pressure	Capacity (gallons/Meter^3)	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)		
Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)	
Type of Roof: Describe:		
Total Throughput Per Year	Number of fills per day (fill/day): Filling Rate (gal./min.): Duration of fill hr./fill):	

B. For Solids

Type: ☐ Silo ☐ Storage Bin ☐Other, Describe	Name of Material Stored	
Silo/Storage Bin I.D. No.	Manufacturer	Date Installed
State whether the material will be stored in loose or bags in silos	Capacity (Tons)	
Turn over per year in tons	Turn over per day in tons	
Describe fugitive dust control system for loading and handling operations		
Describe material handling system		

5. Request for Confidentiality

Do you request any information on this application to be treated as "Confidential"? ☒ Yes ☐ No
If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

The pit is bunker type – approximately 69' long, 23' wide, and 14' deep. The pit will have two compartments – one for holding MSW and the other for holding sewer sludge. The pit will be contained within 4 walls inside the building.

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

Delta Thermo Energy will monitor the amounts of MSW and sewer sludge processed in the Energy Production Facility.

Describe each proposed modification to an existing source.

N/A

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

Fugitive emissions from the pit will be captured and treated in the CCC as combustion air.

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

During startup, the pit's emissions will be treated in the CCC.

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: _____
ii. Expected completion date of construction/reconstruction/installation: _____
iii. Anticipated date of start-up: _____

Section B - Processes Information

1. Source Information

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

The Resource Recovery System (RRS) utilizes the high pressure and high temperature HydroThermal Decomposition process to produce clean pulverized fuel (PF) containing approximately 50% moisture content. There are 5 RRS units, which are operated in the batch mode. The batch time is approximately 2.5 hours.

Manufacturer	Model No.	Number of Sources
Hokuto	**To be determined**	**5**
Source Designation	Maximum Capacity	Rated Capacity
RRS	**353 cu ft / each**	**353 cu ft / each**

Type of Material Processed
Combination of MSW and sewer sludge (2:1 ratio)

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	7,680

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – None – Steam is used in the RRS Chamber.

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information (Continued)

3. Burner – N/A

Manufacturer	Type and Model No.	Number of Burners
Description:		
Rated Capacity	Maximum Capacity	

4. Process Storage Vessels - N/A

A. For Liquids:

Name of material stored		
Tank I.D. No.	Manufacturer	Date Installed
Maximum Pressure	Capacity (gallons/Meter^3)	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)		
Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)	
Type of Roof: Describe:		
Total Throughput Per Year	Number of fills per day (fill/day): Filling Rate (gal./min.): Duration of fill hr./fill):	

B. For Solids

Type: ☐ Silo ☐ Storage Bin ☐Other, Describe	Name of Material Stored	
Silo/Storage Bin I.D. No.	Manufacturer	Date Installed
State whether the material will be stored in loose or bags in silos	Capacity (Tons)	
Turn over per year in tons	Turn over per day in tons	
Describe fugitive dust control system for loading and handling operations		
Describe material handling system		

5. Request for Confidentiality

Do you request any information on this application to be treated as "Confidential"? ☒ Yes ☐ No
If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

Process Flow Diagram is presented in Attachment A.

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

Delta Thermo Energy will monitor the steam pressure and temperature in each RRS unit as well as the number of batches performed.

Describe each proposed modification to an existing source.

N/A

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

During operation, the RRS chamber is totally closed and operated under high pressure and high temperature steam. The chamber is cooled before being opened. Fugitive emissions will be captured and treated in the CCC.

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

The RRS units are enclosed in the building. The RRS chambers are cooled before being opened. Fugitive emissions will be captured and treated in the CCC.

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: _____
ii. Expected completion date of construction/reconstruction/installation: _____
iii. Anticipated date of start-up: _____

Section B - Processes Information

1. Source Information

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

During its depressurization time, the RRS unit releases steam that flows through a cyclone for solids separation and then it enters a condenser, where the water is pumped to the WTS.

Manufacturer	Model No.	Number of Sources
Jasper GmbH, or equal	**N/A**	**1**
Source Designation	Maximum Capacity	Rated Capacity
RRS Cyclone	**Average Steam input 2.0 tons/hr.**	**Peak Steam input 4.0 tons/hr.**

Type of Material Processed
Steam

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – N/A

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information (Continued)

3. Burner – N/A

Manufacturer	Type and Model No.	Number of Burners
Description:		
Rated Capacity	Maximum Capacity	

4. Process Storage Vessels - N/A

A. For Liquids:

Name of material stored		
Tank I.D. No.	Manufacturer	Date Installed
Maximum Pressure	Capacity (gallons/Meter^3)	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)		
Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)	
Type of Roof: Describe:		
Total Throughput Per Year	Number of fills per day (fill/day): Filling Rate (gal./min.): Duration of fill hr./fill):	

B. For Solids

Type: ☐ Silo ☐ Storage Bin ☐Other, Describe	Name of Material Stored	
Silo/Storage Bin I.D. No.	Manufacturer	Date Installed
State whether the material will be stored in loose or bags in silos	Capacity (Tons)	
Turn over per year in tons	Turn over per day in tons	
Describe fugitive dust control system for loading and handling operations		
Describe material handling system		

5. Request for Confidentiality

Do you request any information on this application to be treated as "Confidential"? ☒ Yes ☐ No
If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

The Process flow Diagram is presented in Attachment A.

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

N/A

Describe each proposed modification to an existing source.

None

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

N/A

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

N/A

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: _____
ii. Expected completion date of construction/reconstruction/installation: _____
iii. Anticipated date of start-up: _____

CONFIDENTIAL VERSION DRYER

Section B - Processes Information

1. Source Information

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

The Dryer is used to reduce the moisture content of the pulverized fuel from approximately 50% to approximately 18% after it leaves the RSS.

Manufacturer	Model No.	Number of Sources
Jasper GmbH	**N/A**	1
Source Designation PF Dryer	Maximum Capacity **8.5 tons/hr (feed in)**	Rated Capacity **8.5 tons/hr (feed in)**

Type of Material Processed
Wet PF (approximately 50% moisture content)

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – N/A – PF Dryer uses steam

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

CONFIDENTIAL VERSION DRYER

Section B - Processes Information (Continued)

3. Burner - N/A

Manufacturer	Type and Model No.	Number of Burners
Description:		
Rated Capacity	Maximum Capacity	

4. Process Storage Vessels – N/A

A. For Liquids:

Name of material stored		
Tank I.D. No.	Manufacturer	Date Installed
Maximum Pressure	Capacity (gallons/Meter^3)	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)		
Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)	
Type of Roof: Describe:		
Total Throughput Per Year	Number of fills per day (fill/day): Filling Rate (gal./min.): Duration of fill hr./fill):	

B. For Solids

Type: ☐ Silo ☐ Storage Bin ☐Other, Describe	Name of Material Stored	
Silo/Storage Bin I.D. No.	Manufacturer	Date Installed
State whether the material will be stored in loose or bags in silos	Capacity (Tons)	
Turn over per year in tons	Turn over per day in tons	
Describe fugitive dust control system for loading and handling operations		
Describe material handling system		

5. Request for Confidentiality

Do you request any information on this application to be treated as "Confidential"? ☒ Yes ☐ No
If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

The Process Flow Diagram is presented in Attachment A.

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

Delta Thermo Energy will monitor the steam pressure and temperature in the Dryer.

Describe each proposed modification to an existing source.

None

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

N/A

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

N/A

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: _____
ii. Expected completion date of construction/reconstruction/installation: _____
iii. Anticipated date of start-up: _____

Section B - Combustion Unit Information

1. Combustion Units: ☐ Coal ☐ Oil ☐ Natural Gas Other: **Pulverized Fuel**

Description: **Pulverized fuel is burned in the CCC unit. The hot gases flow to the boiler for steam production.**

Manufacturer	Model No.	Number of units	
Hwa Seong Boiler Co., Ltd.	**N/A**	**1**	
Maximum heat input (Btu/hr)	Rated heat input (Btu/hr)	Typical heat input (Btu/hr)	Furnace Volume
70.4 MMBTU/hr	**70.4 MMBTU/hr**	**70.4 MMBTU/hr**	
Grate Area (if applicable)		Method of firing **Energy is recovered from the CCC's hot gases to produce steam at 580 psig and 752 °F.**	

Indicate how combustion air is supplied to boiler

Indicate the Steam Usage:

Mark and describe soot Cleaning Method:

i. Air Blown
ii. Steam Blown
iii. Brushed and Vacuumed
iv. Other _____
v. Frequency of Cleaning _____

Maximum Operating schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Operational restrictions taken or requested, if any (e.g., bottlenecks or voluntary restrictions to limit potential to emit)

Capacity (specify units)

Per hour	Per day	Per week	Per year

Typical Operating schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Seasonal variations (Months): If variations exist, describe them.

Operating using primary fuel: _____ From_____ to_____
Operating using secondary fuel: _____ Form_____ to_____
Non-operating: From_____ to_____

2. Specify the primary, secondary and startup fuel. Furnish the details in item 3.

N/A

Section B - Combustion Unit Information (Continued)

3. Fuel – **N/A**

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	SCFH	X 10^6 Gal	gr/100 SCF		Btu/SCF
Gas (other)	SCFH	X 10^6 Gal	gr/100 SCF		Btu/SCF
Coal					
Other*					

* Note: Describe and furnish information separately for other fuels in Addendum B.

4. Burner – **N/A**

Manufacturer	Model Number	Type of Atomization (Steam, air, press, mech., rotary cup)
Number of Burners	Maximum fuel firing rate (all burners)	Normal fuel firing rate
If oil, temperature and viscosity.		
Maximum theoretical air requirement		
Percent excess air 100% rating		
Turndown ratio		
Combustion modulation control (on/off, low-high fire, full automatic, manual). Describe.		
Main burner flame ignition method (electric spark, auto gas pilot, hand-held torch, other). Describe.		

5. Nitrogen Oxides (NO_x) control options – N/A

Mark and describe the NO_x control options adopted

Low excess air (LEA)	Flue gas recirculation	Other._____
Over fire air (OFA)	Burner out of service	
Low-NO_x burner	Reburning	
Low NO_x burners with over fire air	Flue gas treatment (SCR / SNCR)	

Section B - Combustion Unit Information (Continued)

6. Miscellaneous Information

Describe fly ash reinjection operation

N/A

Describe, in detail, the equipment provided to monitor and to record the source(s) operating conditions, which may affect emissions of air contaminants. Show that they are reasonable and adequate.

Delta Thermo Energy will monitor the steam pressure and temperature as well as the boiler feedwater conditions.

Describe each proposed modification to an existing source.

None

Describe how emissions will be minimized especially during start up, shut down, combustion upsets and/or disruptions. Provide emission estimates for start up, shut down and upset conditions. Provide duration of start up and shut down.

N/A

Describe in detail with a schematic diagram of the control options adopted for SO_2 (if applicable).

Anticipated milestones:

Expected commencement date of construction/reconstruction: _____
Expected completion date of construction/reconstruction: _____
Anticipated date(s) of start-up: _____

Section B - Processes Information

1. Source Information

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

The steam turbine will be used to produce electricity.

Manufacturer	Model No.	Number of Sources
Dresser Rand	**U**	**1**
Source Designation	Maximum Capacity	Rated Capacity
Turbine Generator	**4.0 MW**	**4.0 MW**

Type of Material Processed

Steam at 580 psig and 752 °F will be used to produce electricity.

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	**7**	**320**	**7,680**

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – N/A

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information (Continued)

3. Burner – N/A

Manufacturer	Type and Model No.	Number of Burners
Description:		
Rated Capacity	Maximum Capacity	

4. Process Storage Vessels – N/A

A. For Liquids:

Name of material stored		
Tank I.D. No.	Manufacturer	Date Installed
Maximum Pressure	Capacity (gallons/Meter^3)	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)		
Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)	
Type of Roof: Describe:		
Total Throughput Per Year	Number of fills per day (fill/day): Filling Rate (gal./min.): Duration of fill hr./fill):	

B. For Solids

Type: ☐ Silo ☐ Storage Bin ☐Other, Describe	Name of Material Stored	
Silo/Storage Bin I.D. No.	Manufacturer	Date Installed
State whether the material will be stored in loose or bags in silos	Capacity (Tons)	
Turn over per year in tons	Turn over per day in tons	
Describe fugitive dust control system for loading and handling operations		
Describe material handling system		

5. Request for Confidentiality

Do you request any information on this application to be treated as "Confidential"? ☒ Yes ☐ No
If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

The Process Flow Diagram is presented in Attachment A.

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

Delta Thermo Energy will monitor the inlet and outlet steam pressures and temperatures.

Describe each proposed modification to an existing source.

None

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

The steam turbine is not an emissions source.

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

N/A

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: _____

ii. Expected completion date of construction/reconstruction/installation: _____

iii. Anticipated date of start-up: _____

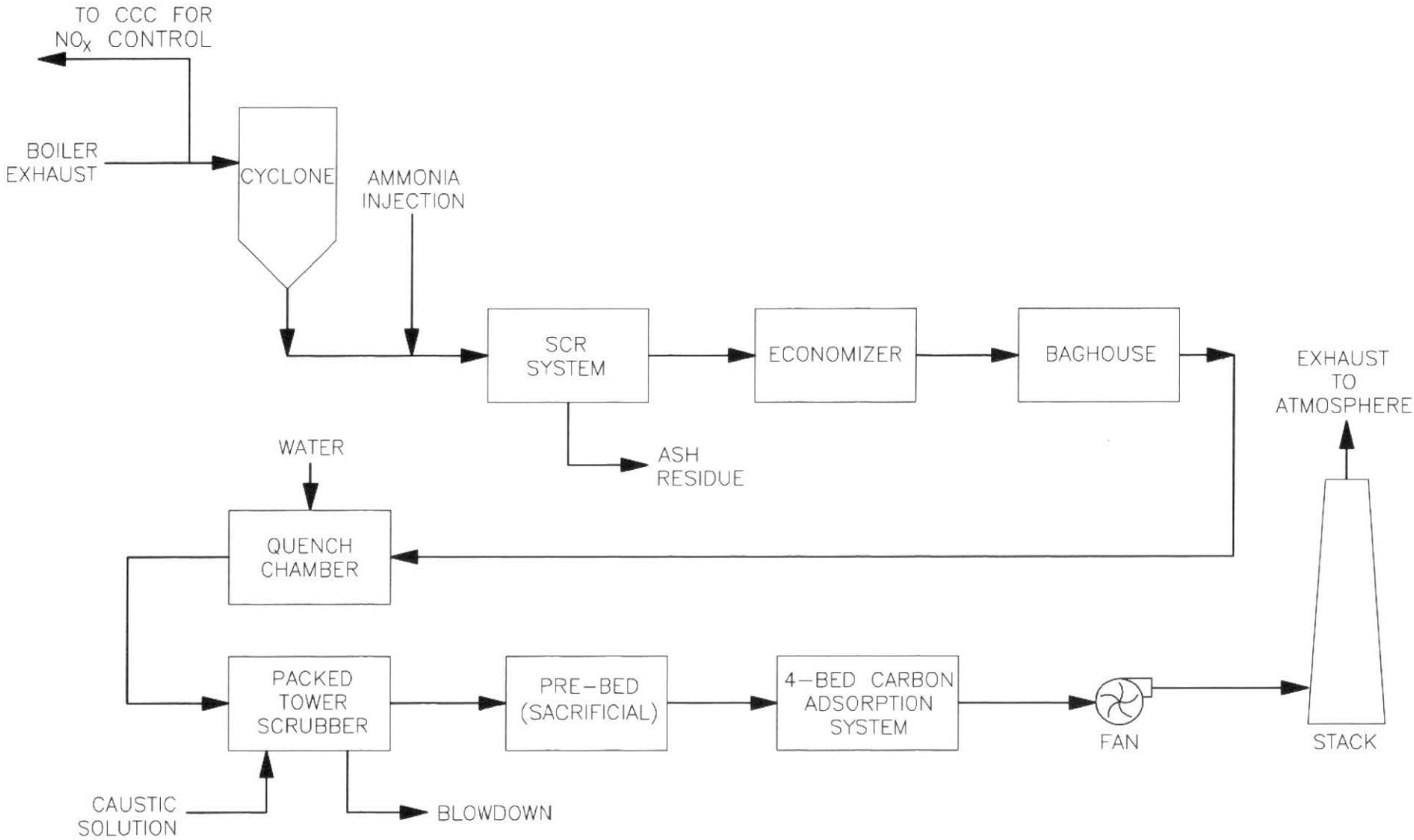


Figure 2-1

DELTA THERMO ENERGY, A, LLC
ALLENTOWN, PA

PROCESS FLOW DIAGRAM
EMISSION CONTROL SYSTEM

ENGINEERS

Date: 8-6-13 File: EV120894.04

ATTACHMENT C

COMBUSTION AIR AND EXHAUST GAS CALCULATIONS

Delta Thermo Energy
Calculation of Combustion Air and Exhaust Air Requirements

Pulverized Fuel to CCC — 4.78 ton/hr (9,560 lb/hr)

Solid material breakdown	MW	Wt %	lb/hr mat'l	O_2 req'd lb/hr	Air Req'd lb/hr
Carbon	12	42.39%	4,052	10,807	46,580
Hydrogen	1	6.14%	587	4,696	20,241
Sulfur	32	0.20%	19	19	82
Oxygen	32	22.84%	2,184	-2,184	-9,412
Nitrogen	28	1.06%	101	0	0
Water	18	18.00%	1,721	0	0
Ash	na	9.36%	895	0	0
Total		99.99%	9,559	13,338	57,492

Ratio of oxygen to other gases in standard air — 23.20% by wt

Combustion oxygen ratios

C +	O_2 ->	CO_2		
12	32	44	O_2/C =	2.6667 lb/lb
2 H +	O_2/2 ->	H_2O		
2	16	18	O_2/H =	8.0000
S +	O_2 ->	SO_2		
32	32	64	O_2/S =	1.0000

Total combustion air required for stoichiometric combustion is then	57,492 lb/hr
Assume an excess air of	100%
Then total air required is	114,984 lb/hr
Total air and fuel added to the burner system	124,543 lb/hr
Volume flow of combustion air	25,719 scfm (40,564 Nm^3/hr)

Now assume complete combustion
Exhaust gas composition (ash is assumed to remain in firing bed)

	MW	lb/hr	Break down by weight	scfm	Break down by volume (wet)	Break down by volume (dry)
Nitrogen	28	88,409	71.5%	20,366	73.4%	80.7%
Oxygen	32	13,338	10.8%	2,688	9.7%	10.7%
Carbon dioxide	44	14,859	12.0%	2,178	7.9%	8.6%
Water vapor	18	7,004	5.7%	2,510	9.0%	
Sulfur dioxide	64	38	0.0%	4	0.0%	0.0%
Total		123,648	100.0%	27,746	100.0%	100.0%

Delta Thermo Energy
Calculation of Combustion Air and Exhaust Air Requirements

Exhaust flow expressed in metric units			Wet Basis
scfm basis	14.696 psia	70 F	27,746 scfm
	14.696 psia	32 F (0 C)	43,760 Nm^3/hr
Exhaust gas recirculation is used at the CCC and waste heat boiler			
Approximate recirculation rate (as percent of exhaust)			25%
Recirculation rate : 27,746 scfm x 25% =			6,936 scfm
			10,940 Nm^3/hr
Therefore, total air flow from the CCC to the waste heat boiler is			34,682 scfm @ 1,860 F
			54,701 Nm^3/hr
Total air flow from the waste heat boiler to the APC			27,746 scfm @ 600 F
(after recirculation is removed)			43,760 Nm^3/hr

DELTA THERMO ENERGY
QUENCH CHAMBER CALCULATION

Exhaust gas flow rate to Quench Chamber	= 27,746 scfm @ 320 °F
	= 40,833 acfm
Water content (%volume)	= 9%
Amount of water vapor (WV)	= 27,746 scfm x 0.09 x 0.0468 lb/ft^3
	= 116.9 lb/min
Amount of dry air (DA)	= 27,746 scfm x 0.91 x 0.0749 lb/ft^3
	= 1,891.6 lb/min
Therefore, amount of WV/amount of DA	= 116.9/1,891.6 = 0.062 lb/WV/lb/DA
From Psychometric Tables and Charts	
Saturation Temperature	= 133 °F (Actually the saturation temperature will be slightly higher due to the injection of urea solution in the SCR system.)
Therefore, Saturated volume at 133 °F	= 17.867 ft^3/DA x 1,891.6 lb/min
	= 33,800 acfm @ 133 °F

ATTACHMENT D

JULY 25, 2013, LETTER TO KRISHNAN RAMAMURTHY
NSPS SUBPART AAAA APPLICABILITY

IES ENGINEERS

CONFIDENTIAL

1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

July 25, 2013

CERTIFIED MAIL; RETURN RECEIPT REQUESTED
Cert. No.: 7012 2920 0002 0263 3320
Mr. Krishnan Ramamurthy
Chief, Division of Permits
Bureau of Air Quality
Pennsylvania Department of Environmental Protection
Rachel Carson State Office Building, 12th Floor
P.O. Box 8468
Harrisburg, PA 17105-8468

Subject: Applicability Determination
NSPS, Subpart AAAA
Energy Production Facility
Delta Thermo Energy A, LLC
Allentown, Pennsylvania
IES Project No. EV130894.04

Dear Mr. Ramamurthy:

On behalf of Delta Thermo Energy A, LLC (Delta Thermo), IES Engineers is pleased to submit the following analysis of the applicability of NSPS Subpart AAAA to Delta Thermo's proposed energy production facility to be constructed in the City of Allentown, Lehigh County, Pennsylvania.

1.0 BACKGROUND

Delta Thermo submitted a Plan Approval application to the Department's Northeast Regional Office on March 29, 2013, for the construction of an energy production facility in Allentown, Pennsylvania. This application incorporated an analysis of the applicability of federal and Pennsylvania air quality regulations, including a review of 40 CFR 60, Subpart AAAA, *Standards of Performance for Small Municipal Waste Combustion Units for Which Construction is Commenced after August 30, 1999, or for which Modification or Reconstruction is Commenced after June 6, 2001.* Our analysis concluded that Subpart AAAA is not applicable to the proposed energy production facility. However, in its technical deficiency letter dated July 19, 2013, the Department has indicated that Subpart AAAA is applicable to the proposed facility.

In this letter, we are presenting a detailed analyis confirming our conclusion that Subpart AAAA is not applicable to the proposed technology for this project and the documentation to support this conclusion.

2.0 PROCESS DESCRIPTION

An understanding of the technology used in the Delta Thermo process is essential to making the determination of Subpart AAAA applicability to this project.

The major process components of the Delta Thermo energy production facility are listed below:

1. Receiving Municipal Solid Waste (MSW) and wastewater treatment sludge (Sludge)
2. Manual sorting and removal of recyclables and unwanted items from the MSW
3. Shredding of the MSW
4. Feeding shredded MSW and Sludge in an approximately a 2:1 mix, by volume, (hereinafter referred to as feedstock) into the Resource Recycling System (RRS) units, which are operated as batch units under high-pressure steam to convert the feedstock into a completely different material, which produces clean renewable pulverized fuel
5. Post sorting
6. Drying the pulverized fuel
7. Burning the pulverized fuel in the Complete Combustion Chamber (CCC)
8. Producing high-pressure, superheated steam in a water-tube boiler
9. Using the steam in the turbine to generate electricity
10. Ancillary operations include a boiler feed-water system; an emission control system consisting of a cyclone, SCR NO_x control unit, fabric filter, packed tower, and carbon adsorption system; and a wastewater treatment system

The first six of the above process components are critical to making the determination of Subpart AAAA applicablity; the others are conventional operations for the generation of steam, production of electricity, and pollution abatement.

After receiving the MSW on the tipping room floor, the bulk items such as matresses, large furniture and applicances are manually sorted and removed from the site. Then, the MSW is placed on a belt conveyor system from which workers manually remove recyclables such as metals and glass, which are sent off site. The remaining MSW is shredded by an electric-powered shredder and dumped into a pit where it is mixed with sewage sludge from the City of Allentown Wastewater Treatment Plant adjacent to the Delta Thermo site, in a 2:1 ratio, by volume. There are five RRS units, which are operated in the batch mode. In each RRS unit, the feedstock is converted into clean pulverized fuel by by Delta Thermo's unique Hydrothermal Decomposition technology. The Hydrothermal Decomposition process breaks down the chemical bonds in the feedstock material by using high pressure, high temperature steam that accelerates the separation of the materials into simple substances or basic elements. The resulting pulverized material from the RRS chamber is chemically, physically, thermally, and elementally different from the original feedstock. The Hydrothermal Decomposition process does not involve any size classification. The wet pulverized fuel from the RRS is post-sorted using a sifter and magnetic detector to remove any metals and noncombustibles, like ceramics, before it enters the steam dryer for the removal of moisture.

The clean, dried, pulverized fuel can then either be sold for use in off-site energy production facilities or combusted on site to produce electricity. At its Allentown site, Delta Thermo will be operating a complete combustion chamber (CCC) to burn the pulverized fuel to produce high-pressure, superheated steam to produce electricity in a turbine.

3.0 RELEVANT SUBPART AAAA DEFINITIONS

Subpart AAAA was originally promulgated in December 1995, but was vacated by the U.S. Court of Appeals in 1997. In response to the Court's vacatur, EPA re-promulgated the rule in 2000. This rule applies only to "municipal solid waste" combustion units constructed after August 30, 1999, that have the capacity to combust at least 35 tons per day but not more than 250 tons per day of municipal solid waste (MSW) or refuse-derived fuel (RDF). (Emphasis added.)

The following definitions from Subpart AAAA are relevant to this applicability determination.

> *Municipal solid waste* or *municipal-type solid waste* means household, commercial/retail, or institutional waste. Household waste includes material discarded by residential dwellings, hotels, motels, and other similar permanent or temporary housing. Commercial/retail waste includes material discarded by stores, offices, restaurants, warehouses, nonmanufacturing activities at industrial facilities, and other similar establishments or facilities. Institutional waste includes materials discarded by schools, by hospitals (nonmedical), by nonmanufacturing activities at prisons and government facilities, and other similar establishments or facilities. Household, commercial/retail, and institutional waste includes yard waste and refuse-derived fuel. Household, commercial/retail, and institutional waste does not include used oil; sewage sludge; wood pallets; construction, renovation, and demolition wastes (which include railroad ties and telephone poles); clean wood; industrial process or manufacturing wastes; medical waste; or motor vehicles (including motor vehicle parts or vehicle fluff). (Emphasis added.)
>
> *Refuse-derived fuel* means a type of municipal solid waste produced by processing municipal solid waste through shredding and size classification. That includes all classes of refuse-derived fuel including two fuels: (Emphasis added.)
>
> (1) Low-density fluff refuse-derived fuel through densified refuse-derived fuel.
> (2) Pelletized refuse-derived fuel.

4.0 REGULATORY ANALYSIS

The Delta Thermo facility will not combust MSW or refuse-derived fuel as defined by Subpart AAAA, but instead will burn a processed (pulverized and de-watered) clean fuel (not a waste) created from the feedstock in the Hydrothermal Decomposition batch process through the injection of high-pressure and high-temperature steam in a specialized piece of equipment identified as an RRS chamber.

While it is true from a review of the EPA's definitions that Delta Thermo utilizes the shredding activity in producing pulverized fuel, it does not utilize size classification. (Emphasis added.) Both the shredding and size classification activities must be satisfied to meet the Subpart AAAA definition of RDF. This lack of the use of size classification in Delta Thermo's Hydrothermal Decomposition process means that the pulverized fuel produced does not meet the EPA's definition of RDF presented in Subpart AAAA, which states that RDF is "a type of municipal solid waste produced by processing municipal solid waste through shredding and size classification."

Moreover, since EPA's definition of MSW or municipal-type solid waste "means household, commercial/retail, or institutional waste" and does not include ... sewage sludge...," Delta Thermo's pulverized fuel does not meet the definition of MSW or municipal-type solid waste since it contains processed sewage sludge. Therefore, the pulverized fuel is neither MSW nor RDF under the Subpart AAAA definitions.

In addition, during the development of Subpart AAAA, EPA's focus was on the combustion of municipal solid waste (MSW) and refuse-derived fuel (RDF) in mass-burn facilities. We believe that the unique, state-of-the-art technology incorporated into the Delta Thermo design was not available at that time and, therefore, could not have been considered by EPA during the rulemaking process.

In summary, Delta Thermo will be producing and combusting a clean, homogeneous, pulverized, de-watered fuel generated from Delta Thermo's Hydrothermal Decomposition batch process. This pulverized fuel has a higher heating value than the delivered feedstock and is is neither MSW nor RDF under the Subpart AAAA definitions. In addition, this fuel is no longer a waste and has a monetary value; it can be sold to third parties for use as a fuel.

Based on the above analysis, we conclude that the Subpart AAAA requirements are not applicable to Delta Thermo's proposed energy production facility. We look forward to the Department's concurrence on this matter. Should you have any questions, please feel free to contact me or Ashok Soni. We will be happy to arrange a teleconference or attend a meeting to discuss this matter in more detail.

Sincerely,

Robert W. Schlosser, P.E.
Principal Project Manager

cc: R. Kempa, DEP Northeast Region
S. Patel, DEP Northeast Region
M. Wejkszner, DEP Northeast Region
R. Van Naarden, Delta Thermo
M. Bonilla, Delta Thermo
A. Soni, IES

ATTACHMENT E

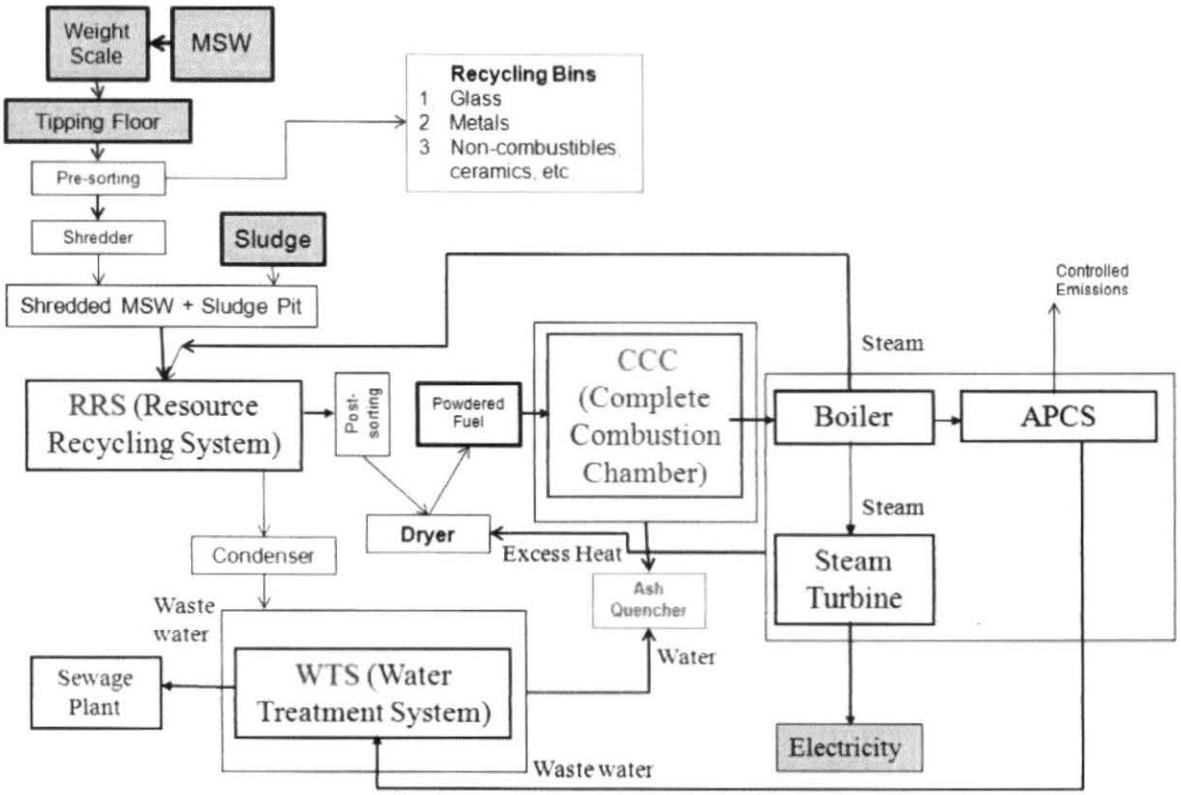
DETAILED PROCESS DESCRIPTION

Deficiency Letter Item:

b. Provide specific source details by completing the source information data form found in Section B on page 2 of the Processes Plan Approval Application. Complete a separate page for each component (shredder, feedstock pit, RRS unit, cyclone, dryer, boiler, and turbine).

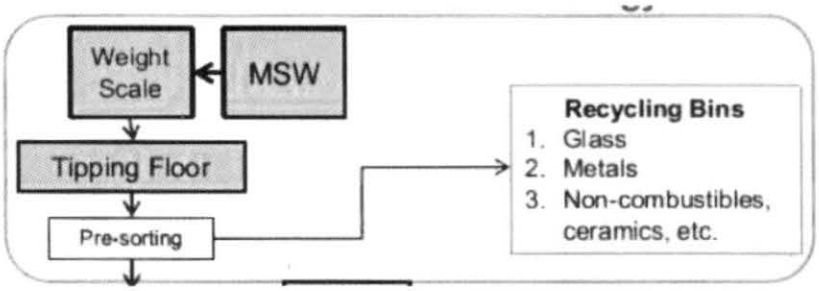
This includes the following key process areas, as depicted in the diagram below:

1. Receiving & Sorting
2. Shredding
3. Feedstock Pit
4. RRS Units
5. Dryer
6. Combustor (CCC)
7. Boiler
8. Turbine/Generator
9. Wastewater Treatment System (WTS)



Note that the figures and data included in these process descriptions are subject to change before the plant is completely installed.

1. Receiving & Sorting



1.1 Tipping Floor: These are the key characteristics of this area, which includes the weigh scale.

length	100'	ft, in
width	70'	ft, in
pile capacity	235	sh.t
leaky water	0,11	sh.t/day → WWTS

Before the feedstock is deposited in the tipping floor the trucks are received and pass through the weighing area which will be located after the entrance gate and within the fence of the Facility. Trucks delivering MSW and Sludge will be weighed when entering the Facility site before unloading their waste. Access to the Facility will be monitored and truck data and weighing information recorded before unloading.

A scale operator will be present during the times when the trucks of the City or of its contracted waste haulers are being weighed before unloading MSW or Sludge. The scale operator will be a certified as a Weigh Master by the Commonwealth of Pennsylvania. The bulk waste is separated from the rest of the MSW in the tipping floor. Bulk waste is then carried to a separate part of the plant and determined what is needed for their disposal. The rest of the MSW is loaded into the bag opener. After weighing, the sludge is directly deposited in a pit.

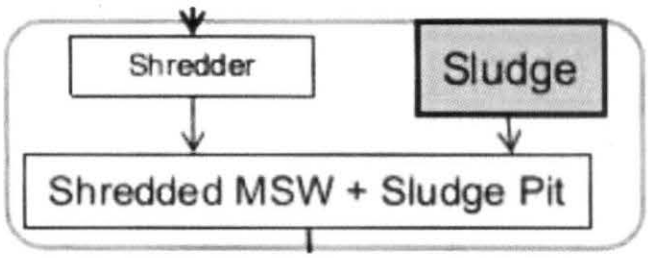
1.2 Sorting:

After separating the bulk waste out of the waste stream and loading the MSW into the bag opener, the MSW will be moved from the tipping floor to the sorting area, which is situated above grade, via a conveyor. The sorting line equipment and the sorting line conveyor will be installed with at least three sorting stations on each side. The collection Material Recovery Buckets ("MRBs") for recyclables glass, metals, ceramics, and other non-combustibles/discarded materials, etc, will be on grade and located just below the sorting line.

Sorting operators will be able to promptly discard picked materials before the rest of the MSW is automatically fed into the waste shredder. The sorting line has positions for up to six (6) operators and will be moving at a rate of 8 tons/hour.

2. Shredding:

There are two components in this area: the shredder equipment and the pit. They are both represented in the figure below.



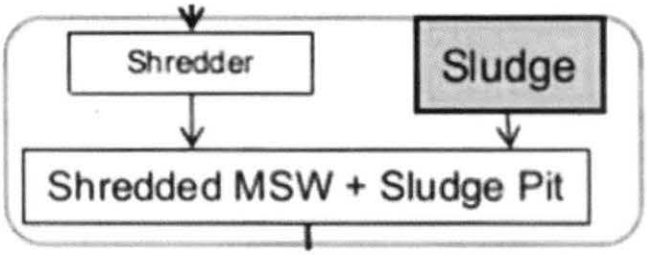
An industrial size shredder equipment, which has been developed to meet the demands of shredding sorted MSW, will be installed after the sorting line. It will have a slow-motion turner to avoid any spontaneous combustion. The shredder can also be coupled with a baler, which was designed with control technology adapted to the packing of the waste in sealed bales, when required for inside storage. The key specifications of the industrial shredder are:

Funnel width	11' 10"	ft, in
Funnel length	8' 10"	ft, in
Funnel height	5' 11"	ft, in
Funnel volume	424	Ft^3
Shred. Particle size	2"	in
Electrical Power	30	kW

The shredder conveyor has these key specifications:

working width	6' 7"	ft, in
length	16' 5"	ft, in
Electrical Power	2,2	kW

3. Feedstock Pit:

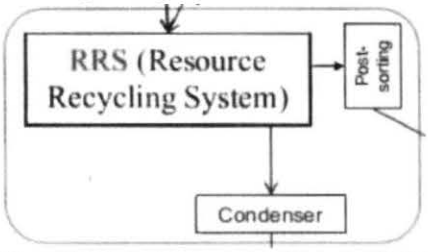


The Feedstock Pit is where the shredded MSW is deposited along with the sewage sludge. This pit is expected to be constructed of cast-in-place reinforced concrete including curbs to reduce the possibility of the sludge truck entering the pit by accident. Since waste can be stacked above the elevation of the surrounding floor, a wall will be constructed on two sides of the pit. This wall will also be constructed of solid concrete. The pit will be located below grade (18 feet below grade) and will contain both the shredder MSW and the Sludge. This mixed pit will be used to contain the mixed waste before loading it to the RRS using a crane.

length	68' 11"	ft, in
width	23'	ft, in
depth	14' 1"	ft, in
capacity	22320	ft³
MSW input	125,2	sh. t/d
MSW density	18,1	lb/ft³
MSW Volume	13843	ft³/d
sludge input	50,2	sh. t/d
sludge density	65,5	lb/ft³
sludge volume	1519	ft³/d
Total volume input	15362	ft³/d
storage time	34,9	h

4. RRS Units:

After the feedstock pit, the Hydrothermal Decomposition Process will start with the RRS. The RRSs, supplied by Hokuto, will be installed in reinforced concrete foundations, which will be geo-pier supported, as required by the engineering analysis. The RRS's flow is below:



The plant will have five (5) RRSs. The RRSs will function in parallel 24x7. The volume of each of these RRSs is ten cubic meters. They will be located after the receiving and mixed material pits following the flow of the plant process. RRSs will be installed on grade but the feeding hoppers for each RRS will be above grade. Each of the RRSs will be fed separately by using an overhead crane. The crane will carry the materials from the mixed feedstock pit to the RRS' hoppers. The crane is:

operating time	24	h/d
Crane capacity	8,8	sh. t
Grap capacity	70,6	ft³

The RRS equipment characteristics are, as follows:

	Operating time	24	h/d
	Number of RRS	5	-
	Time per batch	150	min/batch
	RRS capacity	353	ft³
	Batches per day	48	-
→ RRS Hoppers	Input per batch	3,66	sh. t/batch
	Average steam demand	4,1	sh. t/h
	Peak steam demand	7,9	sh. t/h

Average steam output	2,1	sh. t/h	→ RRS Cyclone/Condenser
Peak steam output	4,1	sh. t/h	

Pulverized fuel output	9,32	sh. t/h (wet)	→ Drying

Electrical Power	76	kW/RRS
Simultaneity factor	0,85	-

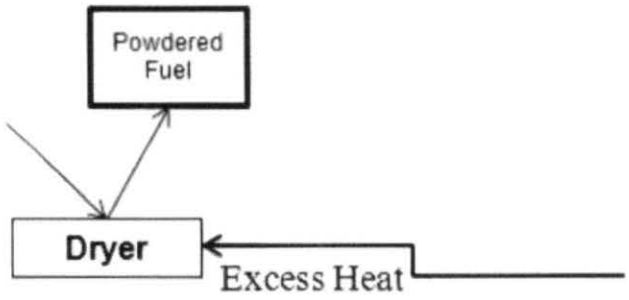
When Hydrothermal Decomposition is complete for a batch, the high pressure steam is released to a cyclone condenser. The key characteristics of the condenser are:

Average steam input	2,06	sh. t/h
Peak steam input	4,02	sh. t/h
Inlet temperature	230	°F
Outlet temperature	113	°F
m_cooling water	35,3	sh. t/h
Inlet temperature	97	°F
Outlet temperature	167	°F
Electrical Power	18	kW
Simultaneity factor	0,85	-

5. Dryer:

Each batch of pulverized fuel processed in the RRS is discharged unto a conveyor. This conveyor takes the wet fuel to the dryer, which works using the excess heat from the boiler and turbine. After discharging from the RRS, the PF has a moisture content of ~50%. As this level of humidity is relatively too high for direct combustion in the CCC, it needs to be dried. This is realized via a heating system inside the dryer, which will be supplied by Jasper GmbH. Moisture evaporates and is carried out by air blown throughthe dryer that works as supporting agent. Afterwards this air is cooled down and the water is brought to the Wastewater Treatment System. In this step the PF moisture content decreases to ~18% after going through the dryer. Note that, on average, the CCC can accept fuel with 30% humidity.

This is shown in the diagram below:



The key characteristics of the dryer are as shown in this table:

PF entering moisture	52	%
PF outgoing moisture	18	%
Carrier air	9800	ft^3/min
Entering temperature	77	°F (dry)
Outgoing temperature	122	°F (wet)
Water takeout	92,6	sh. t/h

→ Waste Water Treatment

6. Combustor (CCC):

The CCC will be installed on reinforced concrete above the geo-pier foundations. The CCC, invented and supplied by Jasper GmbH, will be designed to burn the fuel resulting from the RRS and drying process. The CCC will operate 24 hours (24x7) and will be designed with the ability to process the resulting dehydrated fuel after processing via the RRSs. The CCC system was designed by Jasper GmbH which is the inventor and designer of this technology. The CCC system will be used as the plant's thermal treatment component for pulverized fuel. For illustration, the CCCs basically will consist of:

- Material dryer as external and internal component of CCC
- CCC's charging and discharging system
- Post-combustion chamber
- Including the following key characteristics:

Number of CCC's	1	-
m_pulverized fuel	5,27	sh. t/h (18% moisture)
Q_pulv. Fuel	22,333	MW
Nat gas	0	ft³/min
Q_Nat gas	0	MW
fresh Air	23360	ft³/min
recirculation gas	5786	ft³/min
η CCC	88	%

V_flue gas	32133	ft³/min
t_flue gas	1863	°F
specific heat	0,60908	BTU/yd³ °F
Q_flue gas	20,5	MW
fly ash	198	lb/h

ash discharge	789	lb/h
No. Of container	2	day

Electrical Power	163	kW
Simultaneity factor	0,85	-

The CCC will be a controlled charged unit by the "fuel charging system". The CCC is designed with steel construction and an inside refractory lining. A gas burner system will be used only for start ups. The movement of the ash to the discharging container will be controlled and will be discharged using a chain conveyor. The off gas is transported to the post-combustion chamber. The post-combustion chamber is designed in horizontal and welded sheet metal construction, inside the refractory is lined. The post-combustion chamber will safely keep the burning temperature above 850 °C and the residence time of the off gas will be greater or equal to two seconds to reduce CO emissions. To increase safety conditions, oxygen measuring equipment and fuel gas burners will be installed. At the outlet of post-combustion chamber, there will be a connecting piece for interconnection to the boiler.

The CCC will be equipped with local process measuring, control equipment and combustion air fans. Fuel gas burners will be installed, complete with all prescribed and necessary fittings, ignition and monitoring devices, automatic firing devices, UV flame monitoring devices, etc.

7. Boiler:

This system includes steam generation with heat recovery. The flue gas from the CCC's combustion chambers will be supplied to the fire tube boiler for the purpose of generating high temperature steam. The superheated steam will be used for driving the steam turbine and for providing steam to the thermal process in the RRS system as well as supplying heat to assist in drying the processed fuel from the RRS. The boiler will be supplied by Hwa Seong Boiler Company, Ltd.

The boiler will be manufactured, equipped and installed in accordance to comply applicable regulations and standards. The boiler will include inspection openings, all necessary connection pieces for steam extraction, delivery, discharge, desalination and the necessary measurements. The boiler body will be insulated with mineral wool matting and a cover made of galvanized sheet steel. Essentially, the water-steam circuit consists basically of the steam system, steam turbo set, the condensation and feed water system and the cooling system.

It is estimated the fresh boiler water required is 100.75 short tons per hour. The characteristics of this are:

Number of boilers	1	-
V_flue gas	32126	ft³/min
fly ash	200	lb/h
t_flue gas inlet	1863	°F
η boiler	91	%
mud water losses	0,5	%
Energy	20,6	MW

average steam to RRS	4,06	sh. t/h
steam temperature	752	°F
steam pressure	580	psi a
average steam to turbine	11	sh. t/h
steam temperature	482	°F
steam pressure	580	psi a

waste gas to bag house	25066	ft³/min
temperature	320	°F
fly ash to bag house	110	lb/h
recirculation flue gas	7060	ft³/min
temperature	320	°F

8. Turbine/generator:

The water-steam circuit and associated systems will be used to generate power for the plant's own internal power use as well as for feeding the excess electricity into the public electric power producing grid. The steam power is built up in the steam turbine through the conversion of the thermal energy into mechanical and electrical energy. The turbine generator set will be a condensing steam turbine with output and operating characteristics to best utilize the output energy captured in the boiler steam. It will be supplied by Dresser-Rand. The condensing will entail one steam turbine/generator and surface condenser.

This set will provide 4.025 Megawatts of gross generated power. The overall steam cycle will comply with the A.S.M.E. Code in effect. The key characteristics of the system are:

Turbine	1	Dresser Rand
m_turbine steam	19.5	sh. t/h
Pressure	580	Psi
Temperature	752	°F
Q_Turbine in	15.8	MW
η Turb.+Generator	23.2	% (Dresser Rand)
Average electrical Power output	3.7	MW

steam out pressure	1.40	psi
steam out temperature	113	°F
Q_Turbine out	12.8	MW

The Dresser-Rand, Model U, steam turbine has been selected and designed to meet the plant requirements of any changes in steam conditions or loads. See the figure below, for example:

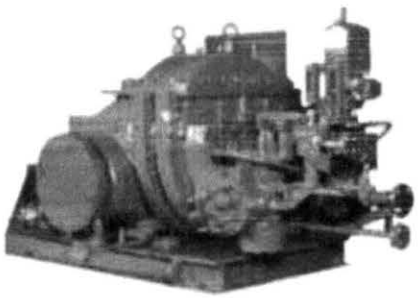


Image 7, Dresser Rand Type U Turbine

9. Wastewater Treatment System (WTS):

The Wastewater Treatment System (WTS) is a fundamental technology of the DTE's plant process. Water utilized in the boiler(s) will be provided from the water main located on the site prior some appropriate pretreatment. Additionally, all waste water, including leachate water, generated by the facility's process will be treated by the WTS before being discharged to the water sewage system (namely Allentown's Waste Water Treatment Plant). The wastewater treatment system will be supplied by ETC, Inc.

Boiler blowdown and other process waste water, including water from the scrubber, will be treated in the WTS as well. All waste water will be expected to be treated in this manner. This is except for toilets and conventional sanitary facilities, which will be discharged directly into the sanitary sewer system as any conventional building will do.

The key characteristics of the WTS are:

→ RRS	cleaning water	22	sh. t/d	
→ RRS Condenser	condenser water	50	sh. t/d	
	solids in condenser water	30	lb/d	
→ Tipping fl./RDF/Sludge Pit	leaky water	0,11	sh. t/d	
→ Dryer	drying water	93	sh. t/d	
→NaOh Tank	NaOH	1160	lb/d	
→Iron Tank	Iron	1840	lb/d	
→Polymer Tank	Polymer	255	lb/d	
→Defoamer Tank	Defoamer	70	lb/d	
	Dehydration cake	2,65	sh. t/d	→ dryer
	∑water	165	sh. t/d	→ City sewage plant
	Electrical Power	185	kW	
	Simultaneity factor	0,85	-	