FIRE PROTECTION DESIGN CONSIDERATIONS FOR WASTE-TO-ENERGY FACILITIES

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Discussion by
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This paper discusses the fire protection considerations required for a refuse to energy facility from the designer's point of view. I concur with the author's message that control of the waste supply is the key to preventing the most common fire found in a mass burn, refuse to energy facility, mainly a refuse pit fire. Educating the plant operators and the haulers as to what is and is not acceptable waste is the key to control of the waste supply. In addition to educating personnel, we must also provide a program to control what is actually taken at the facility and detailed inspection programs are a part of this control. However, in addition to the education and inspection, there should also be included penalties to the hauler who fails to do his own self-inspection and rejection of unacceptable material. The author comments that haulers are screened randomly; other haulers, those who have repeated violations, are screened more often in the on-site inspections. I would suggest that these on-site inspections should be augmented with certain penalties for either gross violations or repeat violations of the service agreements which identify acceptable and unacceptable waste.

The description of good design practices for the tipping floor/refuse pit area design is very thorough and describes many key features of the structural design as well as the fire sprinkler system design that should be noted by the engineer. There are certain comments that I would like to add to this section, however, and they focus on the need to have the crane operating during any pit fire. We have experienced pit fires in which the fire started deep within the refuse from certain materials which auto-ignited long after the material was dumped into the pit. During these fires we found the most effective method of fire fighting was to remove the material covering the fire so that flames were visible. The water monitors, which are located at the feed chute area and the tip floor, could then direct their flow to the open flame. We also provided remote operation capability for these monitors from the crane operators control pulpit. As noted in the paper, it is extremely important that this pulpit be provided with fresh air from a source outside the building to allow the crane to be used to assist in combating any fire.

It was stated that combustion air is taken from the pit area and because this air is of a very high volume, there is no need to provide any requirement for a smoke exhaust system. This is only effective if the boilers are on line; if the boiler is off line and yet trash is being received at the facility or is in the pit, a pit fire can still break out at which time there is no provision for exhaust of the smoke. Therefore, it is necessary that smoke vents be provided which can be manually operated or react from a sensing device to allow smoke to be purged from the facility so that the crane operator has opportunity to see the pit area and support the efforts to control any pit fire.

Other features that should be included in the design are a method for water removal in the refuse pit, a CO₂ system for the turbine/generator enclosure, and a fire suppression system for the outside transformers, either foam or deluge water.
Each municipal fire protection authority has its own codes concerning water supply required for sprinkler systems and fire protection; therefore, I would suggest that the reference to water supply recommend that the engineer check with the local fire agency concerning minimum flow and pressure requirements. Those flows listed in the paper would not meet the requirements of our local fire protection authority. Engineers should also contact the local fire protection agency and the insurance company providing coverage for the facility to get their input early in the design of the facilities.

In conclusion, this paper describes the most common hazards found in a waste to energy facility and provides good design and operating procedures to prevent or control fires should they occur.

Discussion by

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In this paper, the author has presented an excellent and detailed check list for the designer's consideration in providing fire protection for a waste-to-energy plant. The designer must keep in mind, however, the fact that no two plants are identical in design, operation or site arrangement and the fire protection provisions must be tailored to the individual plant. This paper flags areas that must be considered, regardless of the details or layout of the plant being designed.

One consideration not mentioned—perhaps because the author felt it would be belaboring the obvious—is the necessity for designing to assure that combustible materials in the building cannot come in contact with hot exterior surfaces of chambers, such as the walls of the primary combustion zone. This can be accomplished by providing an air space with either forced or natural air flow between the wall and exterior casing or by providing a physical barrier to separate combustible materials from the hot surface. (This is also a consideration for safety of personnel.)

In the section headed "Fabric Filter Baghouses," the author states, "... the bag material should be designed for a maximum continuous temperature that corresponds to the maximum expected continuous temperature of the flue gas. ...". Since actual conditions in a waste-to-energy facility do not always conform to the expected, a more conservative design would provide bag material designed for a higher temperature than that expected in the flue gas.

With the above added considerations, this paper should be required reading for all waste-to-energy facility designers before they proceed with their designs.

AUTHOR'S REPLY

I would like to thank Mr. Eppich and Mr. Stephenson for their review of my paper. I strongly agree with them, as indicated in my paper, that the design of the fire protection system for a waste-to-energy facility must be tailored to the individual plant after consultation with the insurance underwriter and local code official.

Responses to specific comments are as follows:
(a) The use of smoke hatches, especially for plants with multiple boilers, should be approached on an individual basis. Instead of purging the smoke from the refuse pit, opening of a smoke hatch while the plant is still operating could draw outside air into the top of the refuse pit area, since the building is maintained under negative pressure by the combustion air fans which take suction from the top of the refuse pit area. Since waste-to-energy facilities normally have multiple boilers, there is almost always a negative pressure in the refuse pit area. In the unlikely event that all boilers are shutdown, the combustion air fans could be started to purge the refuse pit area.

(b) A portable pump should be used to remove water from the refuse pit.

(c) A CO₂ system should be provided for Hydrogen Cooled Turbine Generators.

(d) Specific guidance for the fire protection of oil field transformers can be found in NFPA 850.

(e) I agree with Mr. Stephenson that hot surfaces should be separated from combustible material.

(f) The bag material selected should have as high a design temperature as practical, this is typically fiberglass, which has a design limit of approximately 500°F.

ERRATA

On page 390, the callout on Fig. 3 should read "FEED HOPPER," not "FLY HOPPER."

On page 392, under the section entitled TURBINE AREA, in the fourth line of the first paragraph, the word "condition" should be changed to read "conditioner."

On page 394, right hand column, fifth line from the bottom, the word "lesser" should be changed to "lessen."

On page 396, under REFERENCES, in the first Reference, the word "Hardford" should be changed to read "Hartford."