List of Potential Malfunctions at Sydney Tar Ponds PCB Hazardous Waste incinerator Project with a Uninterruptible Power Supply and Backup Generators

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When a major lightning strike hits the Sydney Tar Ponds PCB incinerator facilities and causes a massive power failure plant wide, including failure of the backup generators to startup and electrical disconnect of the UPS, then Sydney Tar Ponds could have serious problems and rely heavily on the emergency bypass stack to dump emissions from the rotary kiln and SCC.

It's impossible to determine in the EA how many double or triple redundant systems Sydney Tar Ponds will utilize in the incinerator, and I would recommend all electrical controls-computer controls have triple redundant capabilities installed in case of electronic noise and glitches showing up and shutting down a system or misreading the data. Triple redundant electrical control systems are being used in industry increasingly to reduce malfunctions and upsets caused by electrical glitches. Since the mid-1980s, all state-of-the-art natural gas fired turbine engines have NOx Continuous Emissions Monitoring Systems installed with a triple redundant computer system in case one computer improperly reads the NOx saying the unit is exceeding its NOx concentration limit. Utilities wanted to minimize NOx but optimize O2 without dropping combustion temperatures too much and were walking a fine line in balancing the two components.

The Sydney Tar Ponds Agency claims that the UPS and backup electrical generators are sufficient to minimize emissions from upset-malfunction events, but one of the worst-case scenarios would be an explosion and fire in the rotary kiln and/or SCC while they are filled with volumes of solid and gaseous wastes. Other hazardous waste incinerators have suffered such kiln accidents, although they tend to be liquid waste incinerators rather than soil burning incinerators. Nonetheless the high PCB content of the Sydney Tar Ponds sludge will provide a significant organic content in the incinerator. Some of these malfunctions were incorporated into comments to be made at the Joint Panel Briefing but not all.

Hazardous waste incinerators, no matter how well they are designed including Sydney Tar Ponds proposed Sydney PCB-contaminated sludge incinerator, are prone to various types of upsets, malfunctions, glitches, electrical/computer system failures, human errors, mechanical equipment failures and breakdowns, which can routinely lead to serious air pollution control problems and significantly increased emissions that are immediately dangerous to public health, safety and the nearby community. Commercial incinerators tend to operate more hours per year and thus are prone to equally as many, if not more problems, due to the high number of hours of incineration putting wear and tear, stress and strain on the structural-mechanical-electrical-electronic systems maintaining it. Incinerators are complex machines, but like other machines, incinerators suffer many kinds of problems and failures.

The list of more than fifty malfunctions presented here is basically a summary of either known or potential hazardous waste incinerator operational problems, but it is not intended to serve as a comprehensive analysis of all the difficulties that transpire in incinerators. However, even the best run and well maintained incinerators, which the Sydney Tar Ponds Agency claims it intends to operate at Sydney, will suffer from upsets and breakdowns, some unpredictable and others predictable when little or no maintenance is performed. Sydney Tar Ponds Agency officials need to be aware that a number of upsets and breakdowns have occurred during the operations of Bennett Environmental's incinerators such as the facility at St. Ambroise.

These malfunction events may occur singly or in combination with other problems, including those listed here and many more unlisted, and are not necessarily isolated events.

Many incinerator upsets and other operating problems may cause harmful-to-dangerous levels of emissions to be released by the incinerator, including dioxins, dibenzofurans, unburned PCBs, acid gases like hydrogen chloride (HCl), polycyclic aromatic hydrocarbons (PAHs) like benzo[a]pyrene, PM2.5 fine soot particles, metals such as mercury, vinyl chloride, benzene, and many more substances. Many other pollutants can be emitted depending on the waste stream Sydney Tar Ponds incinerated. Elevated emissions can escape from the main stack, the bypass vent stack, or as fugitive leaks at dozens of locations throughout the incinerator train.

Bypass vent stack (Sydney Tar Ponds Agency calls it a "thermal relief vent") use is particularly undesirable and dangerous. This vent is a standard feature on all hazardous waste incinerators and is a basic reason why they are too dangerous to use. Generally there are no limits placed on how many times the bypass vent stack can be opened per year, no limits set on the length of time per event, and no maximum allowable limits on the toxic emissions resulting from such events; therefore bypass vent use tends to be unregulated. All emissions modeling and monitoring typically ignores all use of the bypass vent stack, which produces a significant bias in the lower emissions data for dioxins and other substances than is the case. The bypass vent stack, when opened for any length of time, is totally unmonitored as to its actual emissions (since no emissions monitoring devices are normally installed on this vent opening), and, in my opinion, its use, at any time during waste incineration, is an exceptionally dangerous practice, since bypass vent opening results in release of significant volumes of unburned toxic chemicals, uncontrolled acid gases, PM2.5 soot particles and other harmful toxins. Bypass vent stack opening is associated with many of the incinerator problems listed here. Bypass means that the air pollution control system at the tail end is 100% bypassed, which is one of the most dangerous modes of incinerator operation possible.

Note that Bennett has so far failed to identify the potential volume of bypass vent stack emissions from its incinerators, even though Bennett officials admitted in public (January 5, 2002 Kirkland lake meeting) that their Kirkland Lake incinerator will definitely possess a bypass vent stack and they intend to use it as necessary. Bennett officials additionally confirmed that there will be smoke and products of incomplete combustion including unburned PCBs if the bypass vent is opened during PCB incineration.

Finally, Bennett officials indicated that they are aware of no Canadian regulatory standards concerning PCB emissions from use of the bypass vent stack; this means that Bennett will not have a limit on the number of times per year they can open the bypass vent during PCB incineration, no limits on the quantity of PCBs released during bypass vent use, or how long the bypass vent would remain opened during any incinerator malfunctions.

1. Power failure due to local thunderstorms causes temporary loss of electrical power in the control and operation of the incinerator. Dangerous levels of harmful emissions may be produced. Increased dioxin and dibenzofuran levels probably result.
2. Lightning strikes the incinerator temporarily shutting down one or more control systems and disrupting sensor readings. Shutdown time depends on how serious the damage is from the lightning strike which easily can fry the electrical wiring, blow circuits, burn up sensors, knock out computers, and cause significant damage to the incinerator's systems.
3. Flameout in Primary rotary kiln. Loss of primary kiln temperature can promote incomplete combustion and large quantities of smoke and opening of the bypass stack. Increased dioxin and dibenzofuran levels will result.
4. Flameout in Secondary afterburner chamber. Loss of secondary kiln temperature can promote incomplete combustion and large quantities of smoke and opening of the bypass stack. Increased dioxin and dibenzofuran levels will result.
5. Primary rotary kiln plugged with solid ring of ash and mineral debris. Plugging (even partial) of the primary kiln can cause significant incomplete combustion and large quantities of smoke and opening of the bypass stack. Damage may occur to the refractory brick lining if hot spots develop.
6. Secondary afterburner chamber plugged with solid ring of ash and mineral debris. Plugging (even partial) of the secondary chamber can cause significant incomplete combustion and large quantities of smoke and opening of the bypass stack. Damage may occur to the refractory brick lining if hot spots develop.
7. Primary rotary kiln's ash chute plugged up with ash debris preventing ash from exiting the rotary kiln during waste treatment. Plugging up of the primary kiln's ash chute can lead to significant incomplete combustion and large quantities of smoke and

opening of the bypass vent stack. Bypass vent stack opening results in unburned, uncontrolled emissions escaping that are immediately dangerous to breathe.

8. Secondary chamber’s ash chute plugged up with ash debris preventing ash from exiting the chamber during waste treatment. Plugging up of the primary kiln’s ash chute can lead to significant incomplete combustion and large quantities of smoke and opening of the bypass vent stack. Bypass vent stack opening results in unburned, uncontrolled emissions escaping that are immediately dangerous to breathe.
9. Primary rotary kiln’s seals leaking fugitive unburned gases and even solid material until they catch fire. Fugitive gases and smoke particles can be easily produced at much higher than normal levels and may be dangerous to breathe.
10. Secondary afterburner chamber’s seals leaking fugitive gases and even solid material until they catch fire. Fugitive gases and smoke particles can readily occur at far higher than normal levels and may be dangerous to breathe.
11. Primary rotary kiln suffers fire and explosion. Catastrophic primary kiln failure will result in large volumes of unburned, uncontrolled waste gases and smoke which are immediately dangerous to breathe.
12. Secondary afterburner chamber suffers fire and explosion. Catastrophic secondary chamber failure will result in large volumes of unburned, uncontrolled waste gases and smoke which are dangerous to breathe.
13. Hot spots develop in refractory brick lining in primary rotary kiln. Damage to the primary kiln can be serious and permanent.
14. Hot spots develop in refractory brick lining in secondary afterburner chamber. Damage to the secondary chamber can be serious and permanent.
15. Primary rotary kiln temperatures too low and cause shutdown and automatic waste feed cutoff. Bypass vent stack may be opened resulting in unburned, uncontrolled emissions escaping that are immediately dangerous to breathe. Increased dioxin and dibenzofuran emission rates will result and probably exceed permitted rates.
16. Secondary afterburner chamber temperatures too low and cause shutdown and automatic waste feed cutoff. Bypass vent stack may be opened resulting in unburned, uncontrolled emissions escaping that are immediately dangerous to breathe. Increased dioxin and dibenzofuran emission rates will result and probably exceed permitted rates.
17. Quench water tank pump failure resulting in loss of water spray in quench process after the afterburner chamber and causes shutdown. Loss of quench water may lead to failure of quench system’s ability to drop incinerator temperatures from the 2200 degrees Fahrenheit range to less than 200 degrees Fahrenheit. Increased dioxin and dibenzofuran emission rates will result.
18. Quench water tank bottom plugging up with waste and other solids causing shutdown. Causes may be due to ash carryover from primary and secondary kilns, unburned waste or minerals.
19. Quench water tank’s has low water flow rate causing shutdown.
20. Quench water tank overheats causing shutdown.
21. Quench water tank’s water spray nozzles plugging up causing shutdown.

22. Quench water tank’s temperature sensor fails or is improperly calibrated and tank overheats causing shutdown.

23. Acid gas scrubber vessel plugged up with salt solids.
24. Acid gas scrubber pH level is too high and unit is shutdown.
25. Acid gas scrubber’s caustic solution flow rate is too low.
26. Primary rotary kiln’s pressure transmitter sensor failure. Bypass vent stack may be opened automatically resulting in unburned, uncontrolled emissions escaping that are immediately dangerous to breathe. Increased dioxin and dibenzofuran emission rates will result and probably exceed permitted rates.
27. Primary rotary kiln’s pressure transmitter sensor (monitors the kiln pressure level to ensure negative pressure-vacuum condition inside the chamber keep an air flow moving forward to the afterburner and air pollution control devices) is improperly calibrated. Bypass vent stack may be opened resulting in unburned, uncontrolled emissions escaping that are immediately dangerous to breathe. Increased dioxin and dibenzofuran emission rates will result and probably exceed permitted rates.
28. Secondary afterburner chamber’s pressure transmitter sensor failure. Bypass vent stack may be opened automatically resulting in unburned, uncontrolled emissions escaping that are immediately dangerous to breathe. Increased dioxin and dibenzofuran emission rates will result and probably exceed permitted rates.
29. Secondary afterburner chamber’s pressure transmitter sensor (monitors the pressure level to ensure negative pressure) is improperly calibration. Bypass vent stack may be opened automatically resulting in unburned, uncontrolled emissions escaping that are immediately dangerous to breathe. Increased dioxin and dibenzofuran emission rates will result and probably exceed permitted rates.
30. Primary rotary kiln’s oxygen level too low resulting in automatic waste feed cutoff and temporary shutdown in waste incineration.
31. Secondary afterburner chamber’s oxygen level drops too low under the required good combustion conditions, causing an automatic waste feed cutoff and temporary shutdown in waste incineration.
32. Primary rotary kiln loses negative pressure condition by going to positive pressure event. Fugitive gas leaks may transpire due to positive pressure . Increased dioxin and dibenzofuran levels may result.
33. Secondary afterburner chamber loses negative pressure condition by going to positive pressure event. Fugitive gas leaks may occur under positive pressure conditions. Increased dioxin and dibenzofuran levels may result.
34. Both primary rotary kiln and secondary afterburner chamber go from negative pressure to positive pressure. Fugitive gas leaks may result. Increased dioxin and dibenzofuran levels may result.
35. Primary rotary kiln’s seals leak large enough volumes of fugitive emissions and smoke to cause kiln puffs noticeable by incinerator operators in control room or outside. Increased dioxin and dibenzofuran levels may result.

36. Secondary afterburner chamber’s seals leak large enough volumes of fugitive emissions and smoke to cause kiln puffs noticeable by incinerator operators in control room or outside. Increased dioxin and dibenzofuran levels may result.
37. Particulate matter removal control device (Venturi scrubber or other PM controls) shuts down due to electrical, electronic or mechanical problems or failures. Increased dioxin and dibenzofuran levels may occur.
38. Bypass vent stack ("thermal relief vent") accidentally opens due to either electronic error, human error, lightning strike, mechanical failure, or a combination of problems and glitches. Increased dioxin and dibenzofuran levels will result along with other toxic emissions at higher rates.
39. Hazardous waste feed rate is too high and results in automatic waste feed cutoff. May result in temporary overload of primary kiln combustion conditions. Increased dioxin and dibenzofuran levels may result.
40. Primary rotary kiln’s temperature sensors improperly calibrated.
41. The primary rotary kiln’s temperature sensors undergo failure and need replacement.
42. Secondary afterburner chamber’s temperature sensors improperly calibrated.
43. Secondary afterburner chamber’s temperature sensors undergo failure and need replacement.
44. Primary rotary kiln’s rotating drive system malfunctions, breaks or experiences shutdown.
45. Malfunction or electrical/electronic problems occur in the hazardous waste’s hydraulic feed system.
46. Damage takes place in the bypass vent stack seals and lid refractory resulting in opening or fugitive emissions leaks. Bypass vent stack leaks PM2.5 soot particles, uncontrolled acid gases, increased levels of dioxins and dibenzofurans, and other pollutants.
47. Human errors transpire in the control room in monitoring and interacting with the incinerator’s complex electronic control system.
48. Induced draft (ID) fan failure or malfunction when one or more bearings burn out or are damaged, or other mechanical or electrical pieces of the ID fan fail. ID fan is critical to maintaining negative pressure in the incinerator from front end at the primary rotary kiln to tail end at the stack. Increased dioxin and dibenzofuran levels may result and other harmful emissions.
49. Liquid leaks occur in the acid gas scrubber/absorber during high pH levels due to problems such as pH sensor malfunctions. Elevated levels of hydrochloric acid may occur.
50. Acid gas leaks of hydrogen chloride/hydrochloric acid begin to result upstream of the acid gas scrubber due to corrosion and abrasive wear and tear plus heat stresses on the refractory and metal components.
51. Acid gas scrubber’s pH sensor is improperly calibrated. Lack of sufficient caustic feed to the acid gas scrubber causes elevated acid gas to be released from the final stack.
52. Ash tank overfills.