

CHEMICALS



INTEROFFICE / LAKE CHARLES

TO Distribution

DATE April 28, 1983

FROM Roy E. Sanders

SUBJECT Loss Prevention Review of th
Incinerator Systems (Confidential)

A handwritten signature in cursive script, appearing to read 'Roy E. Sanders'.

Attached is a comprehensive review of all four incinerator systems as written up by Jim Wood. Jim has worked with Clark Graybill, Mike Huber and Jim Keith in developing the points raised in this report.

Please review both the so-called "Resolved" and so-called "Unresolved" questions. After four to six weeks or so, an Operations Review Committee Meeting will be scheduled to make decisions on how these items should be best handled. If there are any questions, please call.

RES/cac

Attachment

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TO Roy Sanders

DATE April 21, 1983

FROM Jim Wood (20)

SUBJECT Loss Prevention Review of
the Incinerators

A Loss Prevention Review is an evaluation of the loss potential in a process unit in order to define unrevealed process safety hazards before an accident occurs. The concept of Loss Prevention Reviews originated in the late 1960's at Lake Charles with the growth of the organics plants. Specified areas were reviewed during the succeeding years. A Reliability Overview of No 1 and 2 Incinerators was done in 1977. Since then two more Incinerators have been installed. During parts of February and March, 1983, Incinerator operations were reviewed with the area foreman to review loss prevention type questions which had some impact on process safety.

All but four questions were resolved to our satisfaction. The more important "resolved" questions are asked and answered below. Some of these may need further discussion. The "unresolved" questions need answered. The usual procedure has been to call an ORC meeting to resolve any differences of emphases or opinions.

RESOLVED QUESTIONS

Incinerator Waste Gas Headers

1. Do operators check the nitrogen purges of the vent gas header on their rounds?

Ans. They may or may not be doing this since they are not required to enter this on their log sheet. Where nitrogen purge meters are installed, operators should verify the flows at these locations.

2. Is the vent header to the Incinerator Scrubber purged to exclude air during times the Incinerators are in operation?

Ans. It is in VCM II, but not in the B-1 area. Although the B-1 Incinerator vent scrubber is very small compared to the atmosphere vent scrubber in VCM II, a nitrogen purge would assure the scrubber and vent does not become explosive.

3. The B-1 waste gas headers are supplied with knockout pots for collection of condensed liquids, whereas the headers in VCM II are equipped with disengaging boots. Should a knockout pot be considered at No. 4 Incinerator for better liquid removal?

Ans. Yes. No. 4 Incinerator operations have reported flame arrestor corrosion on the lower section where liquids tend to collect. To extend the life of the arrestor to about three months, they have resorted to rotating the element so that the arrestor corrodes in areas not previously attacked. A knockout pot could extend flame arrestor life by eliminating the "water mellow slice" type of corrosion.

4. Is it possible to line up the vents to the wrong Incinerator? If so, what are the consequences?

Ans. Yes. An operator could incorrectly valve the vents in the B-1 Incinerator area since there are three Incinerators at that location. For instance, vents could be burning in No. 1 Incinerator when the control board selector switch is set on No. 2 Incinerator. In this case, if No. 2 Incinerator tripped, the vent from that plant would also trip, upsetting and perhaps even tripping No. 1 Incinerator. If No. 1 Incinerator was the one to trip vents, the plant vent would be going to the Incinerator scrubber, and probably overloading the scrubber. If the Incinerator waste gas trip valve leaked through, some waste gases could enter No. 1 combustion chamber, possibly while the Incinerator was down. While all these potential upsets are undesirable, nothing catastrophic will result if the vents were valved incorrectly. Vent trips to plant scrubbers are proof tested.

5. Should an oxygen analyzer be installed on the waste gas to the Incinerator?

Ans. No. 4 Incinerator has an oxygen analyzer on the waste gas stream. The B-1 Incinerator operations foreman does not feel a need for analyzers. The liquid phase EDC reactor vents are monitored for oxygen by a G.C., and oxygen analyzers will be installed in the EDC Plants. Other plant vents should have very little oxygen.

Incinerator Operation

1. Incinerator combustion air blowers are not spared. Is adequate preventive maintenance performed on the air blowers and are spare parts set up in the warehouse?

Ans. Preventive maintenance consists of bearing lubrication every six months and periodic vibration monitoring. Bearing temperatures are not monitored directly but the bearing housings can be felt for unusually hot extremes. Unusual noises would be apparent to the operator making rounds in the area. Recommended spare parts list were supplied by the vendor (Spencer Turbine Co.) for all four machines, and they are stocked in the warehouse. The Spencer blowers are very dependable compared to the original Buffalo Forge blowers on 1 and 2, which were a maintenance headache.

2. Are critical isolation valves up to date?

Ans. The isolation valve on the new natural gas line to the Incinerator units in B-1 should be added. The critical iso-valve for natural gas in VCM II is for the entire VCM II Plant.

3. Are local Incinerator control panels purged to exclude flammable vapors and meet the National Electric Code?

Ans. Yes, all 4 enclosures are purged. The control panels for Incinerators 1 and 2 do not have a loss of purge alarm and they are not sealed very well. Operations is planning to upgrade the enclosures.

4. Natural gas utilized in the B-1 Incinerators is odorized, whereas natural gas to VCM II is not. Should an odorizing station be installed for VCM II?

Ans. The consensus among operations personnel is that the natural gas should be odorized for detection of leaks (such as the gas hose to the burner).

5. Are safety shutoff valves leak tested periodically to conform to the codes and insurance guidelines?

Ans. They are not now nor ever were leak tested. A procedure could be defined and set up on a proof test/PM schedule.

6. Are explosion meter checks made of the combustion chamber before lighting off the Incinerator?

Ans. Yes. Operators do this on all 4 units.

7. No. 3 Incinerator had water enter the combustion chamber because the absorber bottoms pumps tripped and a blind had accidentally been left in the emergency overflow line. Are there written tag out lists for valves and blinds during outages?

Ans. There are no standard forms used for valves and blinds during outages. This is because outages are different in scope. Instructions are usually handwritten on a piece of paper or in the logbook. VCM II spray paints the flanges of valves marked out for blinding. Nevertheless, because of the possibility of something being overlooked, written tag out lists should be considered for part of the SOP.

8. Liquid feed hoses can develop leaks or rupture. Is there danger of fire in this situation?

Ans. No. The temperature of the liquid feed for the B-1 Incinerators is usually below 200°F and the auto ignition temperature is probably over 1000°F. Even if the liquid would spray directly on the Incinerator, it would not burn. No. 4 Incinerator does not burn liquids.

9. Are any safety features bypassed in order to keep the Incinerator onstream?

Ans. Yes. This is occasionally done in order to be able to get the vents in to avoid vent violations or plant shutdowns. The shift electrician may do this on back-shifts or weekends. While it is admirable to avoid costly plant shutdowns, some procedure should be set up to administratively control the jumpering of safety shutdown features. One suggestion was the issuance of bypass permits from the Shift Supervisor. This would assure that safety features are not negligently and indiscriminately jumpered and that the jumpers are not forgotten about and left in place. It could also be a means to determine how widespread this practice is.

10. Can liquid waste leak through during shutdown periods of No. 1, 2 or 3 Incinerator?

Ans. Not under normal conditions because the liquid feed pumps shut down when the Incinerator trips the shutoff valve. However, there is a selector switch at the pump pad which could be set to the wrong Incinerator. If the Incinerator burning liquids tripped, then the feed pump would not. If the liquid solenoid valve leaked through, unburned liquids could collect in the combustion chamber. However, the chance of this happening seems remote.

11. Natural gas is temperature controlled and combustion air is manual. Should the oxygen analyzer be used to control air flow to assure complete combustion?

Ans. The oxygen analyzer is indicated and alarmed. No. 3 Incinerator also has a CO analyzer with an indication range of 1000 ppm. Improper fuel-air ratios (indicated by black stacks) can be easily and promptly corrected, even on No. 1 and 2 Incinerators which share a common analyzer.

12. Should overpressure protection be provided on the natural gas to the Incinerators to provide protection in case the regulator failed?

Ans. No. 4 Incinerator has an SRV set at 20 psig. The B-1 Incinerators shut down if the pressure reaches 5 psig. The H118 hydramotor shutoff valves have a 25 psig WSP rating and should be replaced with a valve having a 250 psig rating since the Powerhouse could operate the line pressure at 250 psig if it becomes necessary to supply the gas turbines with Conoco gas. The old gas line should be blinded if 250# gas is used in the new line. On 9/25/81 th

upstream trip valve on No. 1 Incinerator was replaced after blowing apart. It was replaced by one just like it. Fireye sells a valve (made by Maxon) suitable for the Class I Division II Electrical Area Classification with hermetically sealed contacts. The valve body is good for 250 psig. The maximum operating pressure ratings of 40 or 50 psig simply means the valve may not open (or close fully) at pressure 1-1/2 times this.

No. 3 Incinerator Waste Heat Boiler

1. Is the steam drum and waste heat boiler internally inspected for corrosion and scale periodically?

Ans. Yes. The fireside of the boiler tubes is hydroblasted every six months. During the recent outage in March, the fireside of the tubes were hydroblasted to remove the salt and iron oxide, and thickness readings were taken of several tubes on both the hot end and cold end by the PPG Inspection Department. Readings ranged from .210 to .220 inches. Drawings note an original tube thickness of .220 inches. Corrosion so far is not a problem. The waterside of the boiler was inspected through the four inspection ports and the tubes examined for scale and corrosion. The normal thin iron oxide film was present on the tubes. No waterside corrosion or scale was found. Some deposits were observed at the bottom of the waste heat boiler shell, but not enough to impede heat transfer of the bottom tubes (unless the deposits washed out when the boiler was drained through the two blowoff connections). If periodic blowoff of the boiler is to be considered, the capacity of the blowdown tank level control system should be evaluated to determine if the blowoff valves can be used on line. The Travelers Insurance Companies also inspects this waste heat boiler to secure the "Certificate of Operation" issued by the State of Louisiana. This inspection is often a limited external inspection.

2. Is boiler water treatment adequate?

Ans. Yes. The blowdown pot is sampled once a shift and analyzed for alkalinity, phosphate, sulfite, and conductivity. Although corrosion and scale of the waterside has not been a problem, an operating procedure should be written for the deaerator, chemical feed, and blowdown systems to stay within accepted limits of boiler water quality. If Plant "B" condensate had not been already fairly pure, there could have been some problems with corrosion and scale. The operations foreman intends to write an SOP for controlling boiler water quality.

3. Can loss of boiler feed water be detected?

Ans. Yes. There is an alarm on loss of the boiler feed water pump but not an alarm on loss of flow. The flow indication is part of the steam drum level control system. Operations considers the pump motor alarm sufficient for loss of boiler feed water.

4. Can loss of chemical addition be detected early?

Ans. Yes, early enough. There is an alarm on the chemical addition pump motor but no flow indication. Since the chemical feed is introduced at the suction of the boiler feed pumps or drain line off the deaerator, the pump discharge relief valve should not relieve back into the chemical addition tank (as would be possible if chemical feed were pumped directly into the steam drum). Since chemical addition loss would not cause sudden depletion of the chemicals in the boiler, periodic analyses would pick up any gradual depletion caused by lack of chemical addition. Also, since Plant "B" condensate is relatively free of hardness salts anyway, installation of a flow indication or alarm will probably not be justified. The chemical addition pump external relief valve should be added to the SRV inspection schedule, however.

5. Should blowdown rate of boiler water be measured, indicated, or alarmed?

Ans. Blowdown rate can be adjusted by a 1-inch gate valve to control the range of dissolved solids in the boiler water. There is no maximum or minimum blowdown rate, so a flow indication or alarm would not be absolutely necessary as long as complete loss of blowdown is recognizable.

6. Does a ruptured waste heat boiler tube create a serious hazard?

Ans. Considerable refractory damage would occur. A ruptured tube should be easily detected by lower temperatures or loss of drum level control. Since there has not been steam explosions when scrubber water has backed up into the incinerator, more than likely boiler water in the incinerator would act similarly and soak the combustion chamber rather than exploding. We can not predict the severity of the hazard, but inspection and care of the boiler tubes is of primary importance for the prevention of ruptured tubes. The steam drum non-return valve should prevent backing 175 psig steam into the Incinerator from the header if a tube ruptured.

7. The front tube sheet of the boiler is exposed to furnace heat. What protects the tube sheet from these high temperatures?

Ans. Refractory protects the front face of the tube sheet and water on the other face keeps the sheet cool. The incon 1 ferrul s all burned off and are no longer used but are not n eded.

8. The cold end of the boiler is approximately 450°F when the Incinerator is in operation, which is above the acid dew point of HCl. Under all conditions for burning vents or liquids, can the cold end temperature ever be below the dew point of HCl?

Ans. The only way would be leak-through of waste gas while the Incinerator was down. The minimum temperature for burning wastes is 1800°F in the combustion chamber, and hydrochloric acid would not condense at temperatures even as low as 230°F. Inspection of the cold end shows no evidence of corrosion. Free Cl_2 should be minimized to prevent direct Cl_2 attack of the steel tubes.

9. Is the water gauge glass blown down occasionally to assure proper water level?

Ans. Operations does not feel a need to blow down the gauge glass unless they suspect a trouble with the level transmitter. There have been very few problems. There is a float chamber with level alarms and a low drum level shutdown which could cause a false trip if the gauge glass were blown down. The level transmitter malfunctioned once as a result of inadequate freeze precautions, resulting in getting water in the steam header. Infrequent blowdown of the water glass may be permissible since deposits do not seem to build up in the float chamber or gauge glass connections. Precipitated hardness salts from the phosphate treatment must be very low. If well water were used as a source of boiler feed water instead of condensate, blowing down the water glass or float chamber very often would be necessary. Operations may not have had many occasions to blowdown the float chamber or water glass, but they might consider some interval, since there was sludge found in the bottom of the steam drum in a stagnant area during the last inspection.

10. The No. 3 Incinerator shuts down on low steam drum level. Is a backup needed for Plant "B" condensate supply failure?

Ans. No. With Plant "A" condensate in the system, Plant "B" condensate supply failure is already adequately backed up. Also, a less pure water source may begin to cause problems with corrosion and scale.

11. Is steam piping supported to limit stress on the steam drum?

Ans. Yes. There are braces and guides used on the expansion loops. It is obvious that piping stresses were considered in the design.

Scrubbers

1. Do all primary and secondary scrubbers have emergency overflows for protection of high scrubber levels and backup of scrubber water?

Ans. All scrubbers have emergency overflows except the primary scrubbers for Incinerators 1 and 2. There is a work order for installation of emergency overflows on these units also.

2. The source of primary scrubber water is Sabine Water. Upon loss of Sabine Water, firewater is used as scrubber water. The Nos. 1, 2, 3 Incinerators, weak acid cooler and CSS condenser would require about 2000 GPM firewater. This puts a strain on the firewater system to run a diesel-driven pump. Shouldn't an alternate source be considered?

Ans. There is a project to tie in the Lake Water Pumps to the Incinerator scrubbers for an alternate supply. No. 1 and 2 Incinerators are already tied in to the Lake Pumps.

3. Are adequate measures available for protection of the primary scrubber upon loss of scrubber water?

Ans. There are low scrubber water flow trips and high scrubber temperature trips. No. 4 Incinerator has even installed a control room mounted switch to remotely open the emergency scrubber water valve for immediate response. They did this because they burned up the carbon bars and dropped the packing during a power failure because they could not get the water on fast enough manually. The B-1 Incinerators probably should do this also, if the emergency source of scrubber water were immediately available (i.e., depend on firewater for immediate emergency scrubber water until the Lake Water Pumps could be lined up).

4. Can a salted up secondary scrubber be detected?

Ans. Yes. This would cause the emergency overflow seal to blow (The emergency overflow seal on the secondary scrubber relieves before the overflow seal on the primary scrubber).

5. Effluent from the No. 4 Incinerator scrubber emergency overflows would result in a pH violation if this effluent would go to the Pigments Ditch. Where do the emergency overflows drain to?

Ans. The scrubber effluent overflows drain to the covered separator, and the emergency overflow from the covered separator drains back to the impounding basin. This water is pumped to the WTU surge pond from either of these. The impounding basin emergency overflow does discharge to the Pigments Ditch, but simultaneous failures of 2 sets of pumps would have to occur.

6. If Incinerators were in the explosive range, could these gases back up into the scrubbers and Incinerators when they were down?

Ans. No. There are water seals on the overflow loops which would not only prevent gases from backing into the scrubber from the sewer, but also prevent gases from the Incinerator from blowing into the sewers.

Waste Storage Tanks

1. The waste storage tanks are vented into the waste gas header. There was at one time a back pressure control valve on the old EDC vent header which would open to the bottoms plant scrubber when the vent header pressure exceeded 10 psig. Its purpose was to relieve pressure surges from the Incinerator vent header during tar buggy unloading into the waste storage tanks. The control valve has been removed. Is there a need for such a valve?

Ans. No. Operation of the Incinerators has never been a problem during tar buggy unloadings. Such pressure surges are apparently relatively minor.

2. Waste storage tanks require nitrogen purges to exclude moisture present with the vent gases and prevent rapid corrosion of the steel tanks. The purges are on the level transmitter impulse legs to keep the nozzles from plugging. Do the operators check the nitrogen purge meters on their rounds?

Ans. Operators make such checks in the B-1 Incinerator unit, however there no longer is a purge meter on the nitrogen to the waste storage tank in the VCM II area. A purge meter should be installed and operators required to check this on their rounds.

3. No. 1 waste storage tank is no longer rated for full vacuum due to corrosion of the dome. The vacuum breaker could allow air intrusion into the tank and form a flammable atmosphere. What precautions are taken to exclude air?

Ans. At present the vacuum breaker is blinded off because it was leaking. The vent valve is chained open and there is a nitrogen purge on the tank. A new dome is to replace the corroded dome.

4. Are ground wires used for loading into and unloading from the waste storage tanks?

Ans. Yes, on the B-1 waste storage tanks. There are no buggy or truck loadings into or from the waste storage tank in VCM II.

5. Since the waste storage tanks are connected to the Incinerator vent header, how are the tanks cleared of flammable gases prior to inspection, maintenance, or cleaning?

Ans. They are emptied and purged with nitrogen for days. A bleed is then opened to check the tank atmosphere for flammable vapors. The procedure is no different than for tanks in any of a variety of flammable fluid services.

6. An operator once received chemical and thermal burns when a tar buggy unloading hose ruptured. The hose was not the correct type to handle hot chlorinated organics. Are the hoses now inspected for correct application?

Ans. Hoses are no longer used, the piping is all metal.

7. Are ferric chloride bearing tar buggy wastes segregated from non-ferric chloride wastes?

Ans. All ferric chloride bearing wastes (EC and LP EDC tar buggies) are unloaded into the classifiers, whereas other liquid wastes are unloaded into the waste storage tanks.

UNRESOLVED QUESTIONS

1. The burner nozzles for the B-1 Incinerators require atomizing steam if the combustion chamber temperature exceeds 1000°F for protection of the burner. However, since liquids are not burned in the No. 4 Incinerator, atomizing steam was not connected. The burner nozzle is the original nozzle and shows no erosion. Should atomizing steam be turned off to the B-1 Incinerators when liquids are not being burned since erosion as well as corrosion is increased as well as additional natural gas usage?

2. It is possible for natural gas to be burned at the burner tip while vent gases are being burned on the flame arrestor. This could happen if vent gases were in the explosive range. It could also happen if higher combustion chamber pressure caused combustion air to back into the vent header. According to recent tests at the jet propulsion laboratory in Pasadena, a spiral-wound, crimped-ribbon arrestor failed sustained burning tests of ethylene/air mixtures after 6 and 7 minutes. This is the time it took for the inlet face of the arrestor to reach or exceed the auto ignition temperature of ethylene/air (914°F). Should a high flame arrestor temperature switch be installed to trip the vents from the Incinerators in the B-1 area since they do not have an oxygen analyzer? Shouldn't a low flame arrestor Δp trip also be considered since salted scrubbers or tube sheet could cause backflow of combustion air into the waste gas header?

3. It appears that failure of the primary scrubber packing support cannot be detected. This has caused restrictions in overflow piping and backup of scrubber water into the combustion chamber. Earlier detection of this condition may have prevented a recent \$130,000 rebrick job on No. 4 Incinerator. While

thermocouples and emergency overflows on the scrubbers are necessary, they were not sufficient in this case. How can detection of packing support failure be assured to prevent costly rebricking?

4. No. 1 and 2 Incinerators use lances to dry out refractory brick and to heat up the Incinerators until the time that the LV-48 burner can be installed. There are no safety controls during this long period. In contrast, auxiliary burners are used on Incinerators 3 and 4. How can the initial heat-up period for Incinerators 1 and 2 be improved to provide flame safeguards?

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