

INTER ORGANIZATION - INTERNAL

(11)

TO	C. J. Nosal	FIELD POINT OR DEPT. & BLDG. NO.	DATE THIS LETTER
FROM	J. M. Smith	Pedricktown	7-13-81
SUBJECT	PEDRICKTOWN, NEW JERSEY FACILITY REPETITIVE ACCIDENT TYPE 10A CHEMICAL RELEASE		

SUMMARY

At 0128 hours on June 30, 1981, a reverse current sensing relay recently installed on the existing plant's main breaker in the main substation, tripped causing a total power outage of approximately 2 hours. The emergency generator started but would not accept the load. Subsequently 6 polys (3 pearl and 3 paste) in building 513 - pearl/paste polymerization - vented to the atmosphere. No injuries or exposure to personnel resulted; nor was there any equipment damage. The incident was reported to the N.J.D.E.P. and to EPA Region II.

BOARD OF REVIEW

Two boards of review were convened on June 30.

The first board convened at approximately 0700 with the following in attendance:

C.J. Nosal	Facility Manager
J.M. Smith	Plant Engineer
R.R. Szmerda	Latex Area Manager
J.A. Kiel	Senior Environmental Engineer
S.T. Bissot	Senior Electrical Engineer
H.A. Kline	Senior Electrical Engineer
P.R. Ferraro	Allied Maintenance Superintendent
T. Farner	Allied Maintenance Supervisor
J. Fuglio	Allied Electrically Qualified Maintenance Mechanic
D. Farner	Allied Electrically Qualified Maintenance Mechanic

NGC 23815

A second board of review convened at 1100 with the following in attendance:

J.M. Fletcher	Professional Services Manager
J.M. Smith	Plant Engineer
J.A. Kiel	Senior Environmental Engineer
B.A. Prusinoski	Mass Area Manager
M.J. Slimbarski	Pearl/Paste Area Manager
S.T. Bissot	Senior Electrical Engineer
J. Dorsey	Electrical Consultant
S. Silberstein	Engineer Pearl/Paste
S. Warmkessel	Engineer Pearl/Paste
G. Kaswell	Safety Engineer
D. Farner	Allied Electrically Qualified Mechanic
D. Robinette	Lead Technician Pearl/Paste
C. Hertz	Process Engineer - on shift
P. Hildebrand	Technician Pearl/Paste
D. Heritage	Technician Pearl/Paste

NARRATIVE

On June 30 at 0127 all manufacturing operations were running normally as itemized below:

Compound was running one line.
Latex was in operation
Pearl resin w/8 polys (5 in reaction, 1 in heatup, 1 on recovery, 1 in transfer).
Paste resin w/7 polys and 1 premix (5 in reaction, 1 being charged, 1 on clean).
Mass resin w/4 polys and 1 prepoly (1 in reaction, 1 in heatup, 2 on recovery, prepoly on vacuum).

At 0128 all power to the existing plant failed. The DDC computer went down, all building lighting went down, motor driven equipment went down and all communications except via telephones were lost. The emergency lighting worked properly and the supervisory computer and fire pump had power because their power source was ahead of the fault (SK-1482 - TRN-X1).

Immediately the auxiliary steam turbine driven pump came on and was adjusted to proper speed by the environmental technician.

At approximately 0129 Cy Hertz, who was on shift, heard the emergency generator start, but it did not pick up any load. Almost simultaneously power was lost to the boilers and both boilers went down. It was then impossible to maintain cooling tower pressure or air pressure. One of the boilers was on A.C. power and one on the UPS system.

During the short time we had some cooling tower pressure reactors 8100 and 8200 in mass were successfully shortstopped. Also all pearl polys in reaction (5 total) plus burp tank were shortstopped with a total of 1600# of shortstop. The pearl/paste building technician normal practice during this situation is to pull air from the charge valves and put all agitator switches in manual to determine it is a true power failure and not a computer failure. If no power is on the agitators they immediately shortstop the poly.

Darrel Robinette the lead technician in pearl/paste called in Tom Farner, Allied supervisor with electrical background, for assistance. All the other lead technicians who could leave their areas met in the computer building to lend what assistance they could. Dave Gill called Atlantic Electric to come in to determine if the fault was theirs. He also called Ron Szmerda and Con Nosal for assistance.

At 0150 a paste poly that was peaking was shortstopped (poly 27). During this time the area was being monitored with a Hnu by Hertz and Robinette who were wearing Scott air packs.

Shortly after 0150 the pearl polymerizers started to vent. Darrel Robinette, in agreement with other lead technicians and Cy Hertz, made decision to evacuate the plant. This was handled by personal contact through the lead technicians since there was no workable evacuation alarm. Evacuation was orderly. T. Drabold, lead technician from compound, took charge at the assembly point at the guard house and accounted for all people assembled and those still in the plant. Remaining in the console with Scott air packs available were Cy Hertz, Darrel Robinette, Larry Robinson, Ed Gibson, and Dave Gaston. At about 0215 J. Darby, the boiler house superintendent had been called in by the boiler operator Bill Gould. When he arrived, since there was nothing running and VCM readings were nil, both he and the boiler operator evacuated after making sure the boiler house equipment was shut down safely.

Also at approximately 0215 Tom Farner arrived. Prior to this time polys had vented since the shortstop was relatively ineffective without agitation. Tom donned a Scott air pack and had Cy Hertz and Robinette take Hnu readings of M.C.C. centers in pearl/paste poly building and mass building as a precaution before trying to pick up load with the emergency generator. Since this was the fastest way to restore power to the critical loads - the agitators; the diesel was still running. At 0230, since readings in M.C.C. were low, Tom Farner went to the emergency generator and noted that the breaker for the generator to pick up the critical loads had not closed and the indicating light showed that the right sequential steps had taken place for it to be in the closed position. He was able to close the generator breaker manually but when he did so the diesel generator ran into a stall position and would not take the load (see SK-1483).

At 0240 since the emergency generator would not pick up load, Farner, Hertz, and Robinette proceeded to the main substation to attempt to troubleshoot that area. About the same time additional assistance had arrived at the plant. S. Bissot, senior electrical engineer, along with others went to the main substation.

Upon arriving at the main substation Bissot determined that a reverse current relay on one of the phases of the existing plant main breaker had tripped. He de-energized all the relays and opened all the substation main breakers in the main substation and closed the existing plant main breaker.

Four more electrically qualified mechanics had arrived at the plant and were dispatched to assist in opening the mains at all the area substations, so as to reduce the plant load and insure safe operation when coming back up. This was all done with assurance of little or no vinyl levels as the switches were thrown. After this was done all the substation main breakers in the main substation were closed. The area substations were energized so that we could get power back first on the cooling tower pumps, the main plant air compressor and start up the boilers.

Power was then restored to the pearl/paste and mass areas for agitation and cooling tower return sump. All other areas were then brought up.

At 0258 the last charge blew. All power was restored at about 0310. By 0330 all utility support services were functional and all remaining polymerizers under control.

While the above was going on within the plant, from the point of evacuation, individuals were posted at the plant entrance road to keep out unnecessary traffic. Air Reduction - the plant to our south - was asked to turn off their flare as a precautionary measure. The guard area was used as a communication center.

In total out of 8 pearl reactors 3 vented (polys 2, 3, and 5) and out of 7 paste reactors 3 vented (polys 22, 23, and 24). No mass reactors vented and the burp tank in pearl/paste did not vent even though material was "burped" to it.

There was approximately 48,800# of vinyl vented. Over 62% of the amount which could have potentially been discharged was contained. There were no accidents and there were no personnel exposures to VCM. Areas were being monitored with an H₂ by people wearing self contained breathing apparatus. Atlantic Electric personally reported to the communications center that they could find no problems with their system.

FACTS SURROUNDING THE INCIDENT

- a. The plant had operated for over 11 years with very reliable power supply. We had never experienced any problem with the main substation breaker.
- b. We are continuously PM'ing area substation breakers since we have spares. The plant main and substation main breakers in the main substation were last completely PM'd and trips set in April of 1980.
- c. Within the last month the reverse current relays were installed in the existing main breaker and in the new main breaker for large poly. They were calibrated, set and tested on Thursday, June 25 and put in service at that time.

- d. The UPS system in the boiler house is checked monthly for the following:
 - 1. Specific gravity of the cells by hydrometer reading.
 - 2. Condition of terminals and wiring.
 - 3. Cleanliness of batteries and connections and any deficiency detected is corrected.

We have had only one loss of boiler on the UPS system in the past year and this was diagnosed as a construction person tripping the circuit breaker.

- e. The emergency generator was tested under simulated load conditions during the plant shutdown in April of 1980 and worked well.
- f. The emergency generator is tested on a weekly basis. This is done by bringing the generator up to speed under no load, paralleling the loads and then letting the generator take over the load. We have had no problems with the test mode during the past 16 months.
- g. In the emergency generator test mode the breakers are not operated automatically as they would in an actual or simulated power failure.
- h. Because there was a potential problem in the circuitry of the emergency generator with the wrong relay operating before the correct relay on the two main switches, a special circuit was designed by engineering and installed after the April 1980 test to eliminate this problem.
- i. There is a written procedure available to all areas outlining the operation of the emergency generator and who is qualified to operate it. T. Farner is well qualified to operate the unit. The procedure was followed in contacting T. Farner.
- j. There is a written procedure as to what the operating technicians should do in case of a complete power failure and it was followed.
- k. All personnel operating pearl/paste and mass during this particular incident were well experienced in the operation as well as the computer.
- l. The lights in the computer building of the new large poly area never went out during the whole incident. The fact that the supervisory computer and one fire pump came on indicated the fault was between that takeoff point and the plant load.
- m. Experienced supervisory personnel responded well. They along with the onsite personnel brought the plant up in a safe and orderly manner.

MANAGEMENT SYSTEMS INVESTIGATION

1. The individuals handling the boilers, the operation of the production areas, and the emergency generator were all qualified and well trained to perform their tasks.
2. There were operating procedures for the emergency generator including actual periodic testing.
3. There were operating procedures as to the steps to be taken by the building and console technicians in case of the loss of both computers and/or a complete power failure. These were followed.
4. What to do in the case of a plant evacuation is a safety procedure and is practiced at least quarterly to catch all shifts. SA-32
5. No defective equipment was found during normal PM's and inspections that were not already corrected.
6. The people setting the relays at the substation (G.E.) as well as the Goodrich personnel following the job were qualified to do this job. The equipment was designed properly for the function intended.
7. Safety equipment such as Scott air packs and Hnu's was available and used. The emergency lights functioned properly. The fog system activated in most of the buildings.

All rupture discs had less than one year of operation.

8. The weather was partly cloudy, warm and calm. There were no thunderstorms or other adverse conditions.
9. The main substation was and has been kept locked so that no unauthorized personnel can get into it.
10. Engineering had recognized the potential problem of a "relay race" with the two breakers on the automatic switchover of the emergency generator and designed a proper circuit to overcome this.
11. Management did not foresee the loss of vital communications during a complete power failure.
12. Management did not foresee the loss of the evacuation alarm with a complete power failure

CONCLUSION OR FINDINGS

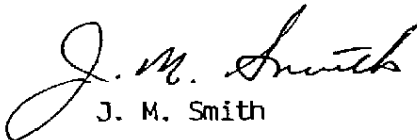
Based on the boards of review and subsequent investigations the following conclusions were made:

1. General Electric returned to the plant on July 8 to check the reverse current relays. They found two relays were more sensitive than the others and there was loose connection in one of the relays. It was their opinion in concurrence with BFG electrical engineers these would not have been critical enough to cause the relays to trip. The relays on the new main breaker feeder feeding large poly were de-energized also on July 8 because one appeared to be starting to malfunction. These units could not have seen anywhere near the current necessary to cause them to operate; the way we are designed other individual breakers would have opened first on an in-plant electrical fault (at least three backup before main).
2. Though the circuit to prevent the relay race in the emergency generator circuit was properly designed; it was improperly installed. In essence, though it appeared from the indicating lights that the generator had tried to take over the critical loads for which it was intended it could not. Actually when load was applied manually the generator pushed power backwards through the entire existing distribution system and was subjected to the total plant load. Hence the generator stalled out.
3. Though the boiler ran for a short time on the UPS system and was actually restarted after the power failure on the UPS system, it was determined that there was a cell failure on one of the batteries which caused the UPS system to malfunction.

CORRECTIVE ACTION

1. The reverse current relays in the main substations have been de-energized and will remain so until we find the cause for their tripping and/or can ensure their reliability. Alternative location for these relays are being studied wherein they will do their intended job but not cause a major problem if they trip inadvertantly. Bissot, Meier, Dorsey
2. The wiring that was wrong on the relays of the motor generator breakers was corrected on July 1. Since we could find nothing else wrong with the breakers or generator, either in the shop or field, it was put back in its automatic takeover mode on July 1.
3. As a precaution all batteries on the UPS system for the boiler house were replaced with some borrowed from large poly on July 1. An ammeter was also installed on July 2 in the battery circuit as a visual indication of the condition of the batteries. This will supplement the specific gravity test. The unit has already proved itself when we had a momentary "brown out" external to the plant on July 7. New batteries for this UPS system will be orderd. H. Kline

4. The incident will be reviewed with all personnel particularly the electrically qualified people and the pearl/paste and mass manufacturing areas.
5. A more reliable source of power - UPS system or others - will be investigated to power the communications system. R. Meier
6. A UPS system had been on order with delivery expected at the end of July. This will be installed on our existing computer system. This installation will be expedited. R. Meier
7. A simulated power failure test will be scheduled as soon as practical.
C.J. Nosal, J. Kiel, M. Slimbarski, B. Prusinoski
8. An auxiliary means of sounding the plant evacuation system alarm will be investigated. Engineering July 22
9. In order to reduce the starting load the emergency generator has to pick up from a cold start, the procedure for control of the agitators will be turned over to the console technician. On a pure power failure he will be able to manually shut off the computer output signal to the agitators. This will keep the agitator from running until he is ready to start them. Completed July 2 and communicated to all console technicians and shifts. A. Matyger


J. M. Smith

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Attached

NGC 23822