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August 31, 1970

To: Representatives Attending the Vinyl Chloride
Safety Association Meeting, May 26 and 27, 1970

From: E. A. Rose, Plastics Plant Manager
Diamond Shamrock Company, Deer Park, Texas

Subj: Report on MVC Fire and Explosion

The attached is a report originally written July 10, 1970 on subject explosion, and is being disseminated to members of the Vinyl Chloride Safety Association in the hope that it may help someone prevent a similar occurrence at their plant. The report as presented herein differs from the original report only in that it has been updated and certain proprietary data has been excluded.

E. A. Rose
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A Unit of Diamond Shamrock Corporation

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EXPLOSION ON JUNE 27, 1970
DIAMOND SHAMROCK PLASTICS PLANT
DEER PARK, TEXAS

At approximately 6:55 A.M., June 27, 1970, an explosion and fire occurred at the Deer Park Plastics Plant. Five men were injured; two of the five were treated at First Aid and did not require hospitalization. Eddie Graham was hospitalized and released on Thursday, July 2, and reported back to work on light duty on July 13. David Myers was burned rather severely from the waist up; reports to date are that he is making good progress and, barring unforeseen circumstances, should be able to make a fairly complete recovery. The fifth man injured was Jeff Cain, a Brown & Root contract foreman. He received very critical burns and as of Thursday, July 2, was given no chance of survival. On dressing his wounds on Tuesday, July 7, the doctors reported a possible 5% chance of survival. However, he died on Friday, July 17.

The fire and explosion have been investigated as thoroughly as possible by Diamond personnel and by insurance company personnel. Recordings have been made of the various individuals involved as they explained their part in the episode, and a careful analysis has been made of the particular source of the difficulty. These investigations have led to the following general summary of the events:

Number 11 polymerizer in #1 poly room had been recharged at approximately 6:00 A.M. This means that the polymerizer had successfully gone through one complete charge, the slurry dropped to the blowdown tanks, the polymerizer rinsed without opening, and recharged according to standard procedure. The polymerizer had come up to reaction temperature and pressure at about the time of the explosion. These polymerizers in #1 Plant were purchased in 1952 and are equipped with 30" manholes to remove the fixed blade agitators. Removal of these agitators is infrequent, measured in terms of five, eight, ten years. The northeast quadrant of this manhole gasket began to leak and created a whistling sound that several operators attempted to investigate while other operators attempted to set the valving on the drop line in such a manner as to drop the contents to a blowdown tank which is a normal procedure in case of trouble with a polymerizer. Apparently, the break-through in the gasket grew very rapidly to eleven inches long, and within a matter of seconds, well under a minute, was releasing monomer at a tremendous rate and with a loud screaming noise that overpowered the monomer spill alarm which was being sounded as another step in our standard procedure. The insurance people tell us that the source of ignition was static electricity generated by the escaping MVC vapors. They discount completely the #1 dryer burner as a source of ignition. They also discount, I believe, the lighting fixtures in the area which are of the hazardous service type electrical light fixture. There is considerable variance of opinion as to whether the combustible in the #1 dryer area (located in an adjacent building separated by a fire wall) was monomer vapor, polymer dust shaken from the structural steel by the initial blast in the poly room, or a combination of both. The fire in the dryer area and tower was a flash fire of very short duration, but the intense momentary heat charred all surfaces black

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and it was this same heat that injured Jeff Cain. It is interesting to note here that three men were in the warehouse at the bagging area, and that Jeff Cain warned the other two men to run and they escaped without injury. At this time we do not know why Jeff Cain did not escape similarly. Most of the damage in the #1 dryer area and warehouse was water damage due to the sprinkler heads coming on, charring of surfaces including bagged inventory, melted instrument tubing, etc. Some soot was apparently drawn into air inlet ducts, but there is no evidence of MVC combustion inside the equipment.

The fire in the poly room continued as it was fed from the polymerizer containing essentially a full charge of monomer. Most, but not all, sprinkler heads were activated and the fire crew which performed admirably as did all people involved in the episode, quickly had three fire hoses directed into the poly room. Operating personnel valved off the remote MVC shut-off valve, the pure monomer pumps and associated valving, and later on valved off the same line in the north end of the poly room at the charge meter. At this point, the fire at the #11 polymerizer had died out and a fire that had been fed due to a partially burned-out gasket in the monomer charge header burned out, and only a relatively small fire at the 2" vapor line to the gas holder remained burning due to a fracture in the line immediately above the charge manifold in the #11 polymerizer. This line was valved off and at this point, all fires were extinguished. Electrical power was left on at Sub G, but as the fire progressed, wires in conduit became fused, shorted out, and dropped the agitators and cooling water circulating pumps in #1 poly room out of service. Five polymerizer rupture discs ruptured and some monomer was vented until the super-imposed pressure safety valves closed and maintained the polymerizers at this pre-set condition.

At approximately noon Saturday, representatives of Maintenance, Works Engineering, Safety and Plastics Plant personnel met in the Plastics Conference Room and we began to develop plans for getting as much of the overall plant back on the line as soon as possible, and to rehabilitate the damaged areas. Assignments were made and efforts started in this direction. The common reclaim system was isolated from #1 (suspension) and #2 (emulsion) plants, thus enabling us to put #3 and #4 plants back into operation by Saturday evening. Our plan of action called for first eliminating all MVC and slurry from #1 and #2 poly rooms and making whatever repairs were necessary to make the adjacent #2 poly room operable as soon as possible. It was recognized that the #1 dryer rehabilitation could be accomplished in relatively short order and certain spare capacity of the #2 poly room made available to produce feed stock for the #1 dryer. It was further recognized that the rehabilitation of #1 Plant would be the most time-consuming and would require the greatest effort. It was our opinion at this time that #2 Plant could be started by perhaps Monday or Tuesday, June 29 or 30, that the #1 slurry handling facilities and #1 dryer would take about 8-10 days, and the #1 poly room would require 6-8 weeks. Accounting procedures were established so that our insurance people would have the necessary documents, and a tentative organization was established in order to coordinate the efforts of the various groups.

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The rehabilitation work was carried out in a very commendable fashion and the #2 poly room was started Monday, June 29; the #1 Plant stripping system and dryer were started July 6, and the #1 poly room was back in full production July 30.

As indicated earlier in this memo, the prime source of trouble was the failure of the large manhole gasket on #11 poly. It has since been decided after investigating several alternatives, that we will completely eliminate these gaskets by welding the heads to the polymerizer nozzles. As it becomes necessary in the future to remove the one-piece agitator shafts, it will be necessary to cut them into pieces small enough to pass through the smaller imposed elliptical manholes, and we will replace with split hub-type agitators currently in use in the other newer polymerizers. Also, the two fire doors leading from the first floor of #1 poly room to the #1 warehouse will be blocked in and a new, improved, automatic doorway provided. The door in the #1 dryer tower leading out to the roof of the #1 polymerizer building will be closed with transite. We plan on submitting an appropriation request for a detection alarm and actuating device for the monomer handling areas. Also, we plan on eliminating all glass-lined pipe originally installed to handle pure MVC inasmuch as the gasketed surfaces on glass-lined pipe are always difficult to work with. The LPC teams are scheduled to review our monomer handling facilities beginning July 10, and we will review their recommendations thoroughly and incorporate those which will improve our overall safety situation.

I feel that all the personnel involved in this unfortunate episode are to be highly commended on their actions. The Plastics Plant operating personnel did, or tried to do, everything required of them when trouble developed. The Deer Park Works emergency program went into effect immediately and effectively. Also, many have worked long hours to speed the rehabilitation programs. I am sure that all of these efforts minimized our losses, as well as helping to get us back on the line in a very reasonable time.

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