Ammonia Plant
Safety
Feb. 13 1970.

AN AMMONIA TANK CAR EMERGENCY

The public could become as concerned about the hazards of chemicals in transport as they now are about pollution and product liability. Future legislation is bound to deal with this matter.

G. A. Cato and W. F. Dobbs
E. I. du Pont de Nemours & Co., Inc.
Belle, W. Va.

At 7:00 p.m., on January 21, 1970, Du Pont was informed that one of its railroad tank cars carrying anhydrous ammonia had just been involved in a switching accident. At the time the incident occurred, the tank car had been moved from Du Pont's Belle plant in Belle, W. Va., to the Dickinson Yard of the Penn Central Railroad for shipping to its final destination.

The tank car from which the ammonia was released, UTLX 88300, is a leased car of DOT 112A340W classification. It is made of uninsulated steel, is 9 ft. 10 in. inside diameter by 61 ft. long, and was loaded with 165,000 lb. of anhydrous ammonia at a pressure of 67 lb./sq. in. The setting of the relief valve of the tank was 280.5 lb./sq. in. gauge.

Figure 1 is a photo of the Dickinson Yard, which is located 4 mi. upriver from the plant along Route 60. The X marks the spot where the accident occurred. Figure 2 shows an empty tank car, SHPX 3226, after it collided with UTLX 88300. The collision forced the empty car up off its tracks leaving it to rest on the stub sill of the Du Pont car which suffered a puncture 30 in. long and 4 in. wide at the widest point' about ½ sq. ft. in area, Figure 3. The head has been dimpled inward around the hole 12 in. from its original semi-elliptical shape. The hole straddles the vertical centerline of the car 10 in. above the tank bottom.

How the news broke

We first learned of the emergency from our shipping superintendent about ½ hr. after it took place. He had been called by a Penn Central representative who asked for help stating that a tank car had ruptured in the Dickinson Yard and that the engineer of the train was missing. At that time we did not know the extent of the emergency, what product was involved, or which chemical firm had shipped it. As a precaution, the Belle plant ammonia emergency crew was sent to the scene of the accident.

Next we heard from the state police who reported that a chlorine car was burning and that possibly two people were dead. Since we don't make chlorine, the manager of one of the neighboring plants was alerted. This report turned out to be erroneous, and is indicative of the type of misinformation involved at the early stages of incidents.

When it was confirmed that the emergency involved an ammonia car, our line organization was alerted. Mr. Cato remained at home coordinating, talking with the press, radio and TV, receiving calls from the governor's office, the Air Pollution Control Commission Director and many others, and keeping our Wilmington management informed.

The assistant manager, production superintendent, safety superintendent, and shift supervisor went to the scene. The employee relations superintendent set up headquarters at the plant gate house answering the many calls directed to the plant during an emergency. The mechanical superintendent and assistant production superintendent went to the area hospitals to help look after people who were affected by fumes.

Our people at the scene set up headquarters at the Yardmaster's office with railroad officials, the state police, and the volunteer fire department from the town of Belle, who were handling the evacuation and trying to find out where the ammonia fumes were coming from. The state police had set in motion an emergency traffic diversion plan, but had lifted the road blocks when it became apparent that the ammonia fumes on Route 60 presented no hazard to traffic.

Prompt action at the scene

A decision was made to evacuate all residents within a 1 mi. radius. This announcement was broadcast on the Charleston communication loop, and by all radio stations in the area carried the same message. Meanwhile, the volunteer firemen had difficulty getting close enough to the scene to determine the specific difficulty. Since they had their own regenerative oxygen breathing packs which worked only sporadically in the cold weather they used our self-contained fresh air breathing packs, but had difficulty with icing of the face pieces.

Our NH_3 emergency crew set up headquarters along the highway, and were able to determine that the ammonia fumes were coming from a hole in UTLX 88300, and that the liquid NH_3 level in the tank was below the bottom of the hole. At this point, the fumes had dissipated so that clearance was given for all but a few evacuees to return home at 11:15 p.m. We stationed a plant guard by the tank car to prevent further exposure until all ammonia had vaporized four days later.

Reconstructing the events, the emergency started at 6:30

p.m. when the coupler on the adjacent empty car broke during a switching operation and the car rode up on UTLX 88300. The broken coupler pierced 88300's tank releasing liquid ammonia which sprayed out 100 ft. to both sides of the tracks, vaporizing slowly in the zero weather. The switching crew heard a strange sound, smelled fumes, and ran from the area.

Nearby residents moved out in front of the advancing fumes. Railroad personnel called the volunteer fire department in the nearby town of Belle for help. Firemen helped with evacuation of residents. Those people affected by fumes were taken to Charleston hospitals. Several were treated at the plant hospital. A total of 30 people were treated and only two of these were held in the hospital overnight. These two men, a fireman and a railroad employee, were overcome while helping to search for the engineer of the switching locomotive, who was later found being treated in a hospital. Exposure of none of these people was serious. The total casualties were seven ponies and two horses in a nearby field and shelter.

Planning and preparing pay off

This emergency confirmed the value of preparedness. It tested our ability and the ability of our neighbors to respond properly under emergency conditions. Our line organization functioned well - each member of line organization involved discharged his responsibility promptly and well without detailed instruction. Good communications tied this group together. Many practice plant disaster dry runs helped us to respond almost automatically to this emergency.

Our Anhydrous Ammonia Transportation Emergency Procedure, developed for just this type of emergency, helped speed up our response. This procedure involves equipment kept in readiness, a telephone alert procedure, specific assignments for people, lists of available transportation, and a step-by-step plan to insure prompt and effective action. This procedure has helped us cope with anhydrous ammonia car emergencies as far away from our plant as Rochester, New York.

Our own planning was invaluable. However, without community planning in which we have participated, this emergency could have been far more serious. Here we are referring primarily to an organization formed with neighboring plants and businesses in 1952; the Kanawha Valley Industrial Emergency Planning Council (K.V.I.E.P.C.). This group was formed initially to help minimize traffic control problems resulting from an industrial emergency. An emergency at a plant down the valley from ours helped to spark this effort when the resultant traffic tieup interfered with access of help to, and escape from, the affected area.

From this beginning the organization has expanded to a total of 30 members and 30 associate members, the former ranging from large chemical plants to tool manufacturers and utilities, and the latter ranging from state, county, and city police, and fire fighting groups to the American Red Cross. All are united in an effort to ensure preparedness in our valley through planning and coordination. One plan which has been utilized most often is the traffic control plan. Figure 4 shows the valley divided into zones. The plan provides for highways leading into any zone in which an emergency exists to be blocked and non-essential traffic directed around the zone to ensure free movement of emergency facilities and authorized personnel in and out of the affected area. This plan was put into operation at the outset of our ammonia emergency. Another plan inaugurated by this group is the radio communication loop. This is a means of communicating with valley residents by tieing the facilities of the five local radio stations together for a simultaneous broadcast. This was employed to help clear the area in our ammonia emergency.

Members of K.V.I.E.P.C. have a mutual aid plan for material assistance - making available the emergency equipment of member plants to one requiring it in an emergency. Recently 13 member establishments were connected by a hot-line; a telephone connection which is used exclusively for emergency communications. Monthly K.V.I.E.P.C. meeting s keep the members up to date on emergency procedures. Disaster dry runs held periodically in the valley check effeciveness of planning and alertness of participating groups. Many of the member agencies joined in helping with our emergency; the Town of Belle Fire Department, the state police, the Red Cross, Civil Defense and many others. Our membership and participation in K.V.I.E.P.C. has been most rewarding.

Reaction of mass media

Public reaction to the emergency started during the emergency and the effect of this reaction will continue to be felt. Radio and television coverage started at once. Pictures in the newspapers and on television showed people fleeing from fumes, being treated for fume exposure in area hospitals, dead horses in the adjacent field. As an integral part of our emergency handling effort, we kept in touch with the communication media supplying news promptly, granting interviews and answering questions. We feel that our policy to "tell it like it is" as quickly as the facts are known helped to keep our normal good relations with our neighbors from deteriorating. However, it quickly became apparent that valley residents associated ammonia with Du Pont and even though they knew that we had turned the car over to the railroad in good condition and the emergency arose only because of the switching accident, they looked to us for answers.

Questions posed in the news media were "How can we prevent such accidents with ammonia cars in heavily residential districts of Charleston?" and "How could we protect people if an accident happened in Charleston?" Our release stating that we have been shipping ammonia from our plant for 35 years without real difficulty fell on deaf ears. One article in a Charleston newspaper was headlined, "Powder Keg on Rails — Valley Full of Cars Carrying Lethal Gas." The Public Service Commission began to investigate the condition of railroad tracks through Charleston, and the numbers and contents of cars parked on sidings and tracks through their limits. General sentiment was that rail travel through cities and towns should be restricted. Of course, restrictions would affect all industry in the valley.

Lessons from the emergency

The accident was investigated by the Penn Central Railroad and the Department of Transportation. We concluded from our own studies that the tank car met DOT regulations and was in good condition when we turned it over to the railroad. As a result we, in conjunction with Penn Central, have studied the routing of our shipments and the length of time such shipments are parked on sidings in congested areas, and have made changes. Penn Central now

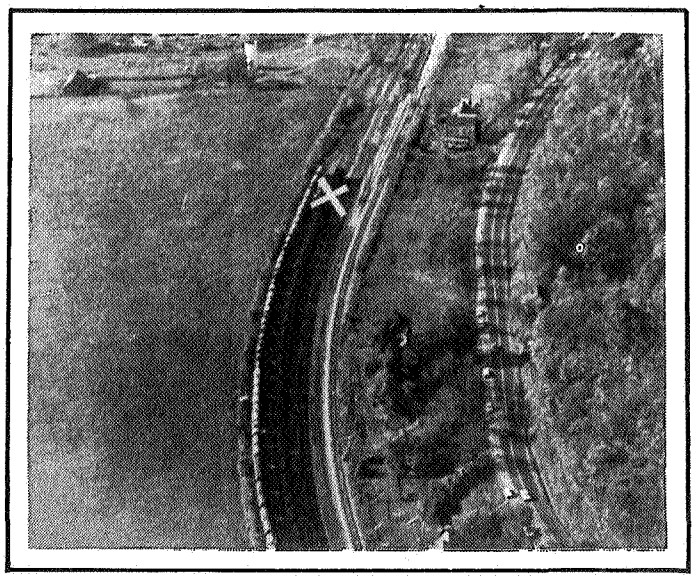

Figure 1. The X indicates where the tank cars collided.

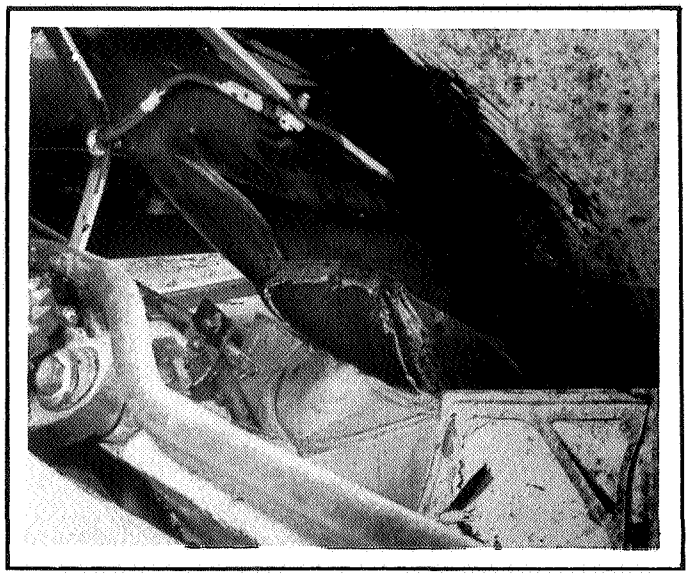

Figure 3. The hole punctured in Du Pont's tank car.

Figure 2. Position of the tank cars after the collision.

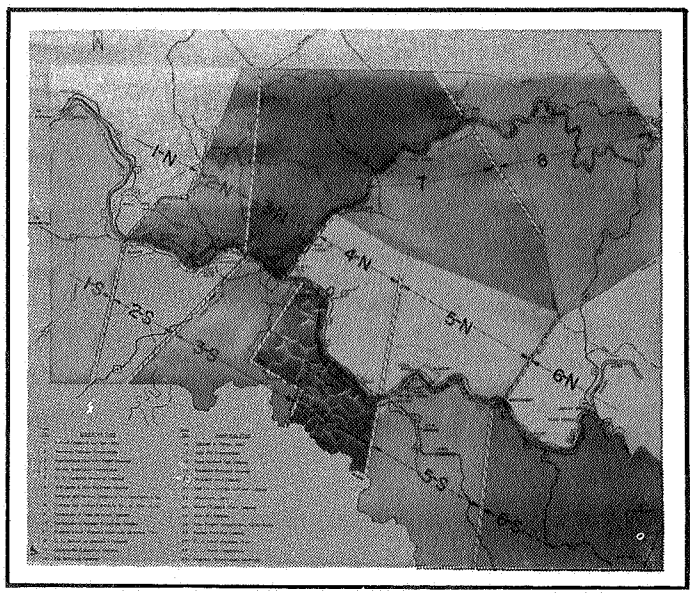

Figure 4. Map showing the Kanawha Valley divided into traffic control zones.

has "blocked cars"; cars kept together for the same destination to minimize switching in congested areas. They are also storing loaded cars separate from empties as much as possible. We have re-examined our procedures to handle transportation emergencies involving specific products and made sure that all products which could pose a hazard are covered.

We are thankful that no one was seriously injured in this emergency. Our own planning and neighborhood planning helped to ensure a prompt and orderly response to the emergency. Our cooperation with the news media helped to ensure our continued credibility with our neighbors. Nevertheless, we learned a lesson at first hand that pertains to the entire industry: **the public looks to us to protect them from the hazards of chemicals in transport.** In the eyes of the public, this subject could become equal in importance to pollution and product liability. It is being considered more and more for future legislation.

In 1967 the Du Pont Company inaugurated its company-wide Transportation Emergency Reporting Procedure (TERP) This procedure set up reporting procedures for emergencies involving Du Pont products in transit. Marked on all shipping papers for materials being shipped in Du Pont's name or the customers' name is this message: "In the event of an emergency involving this shipment, call collect -)aREA Code 302) 774-7500 day or night." Calls are relayed to the specialist or plant in the company familiar with the product to institute action to handle the emergency if required.

In setting up this procedure we recognized that considering the transportation accidents throughout the country in recent years, the increasing number of shipments, the increasing density of traffic and they types of materials being transported, we must be in a position to respond promptly to emergencies. This is not our problem alone. The chemical and railroad industries must recognize the problem and work together to solve it.

Q. Several questions. Was it possible after the accident to determine the extent of the lethal cloud? Had this occurred at a poorer time—say when it was warm—would the maximum lethal effect been worse? You refer to a "fractured coupling" as the prime cause of the accident. Was it apparently sound and to specifications?

CATO: Well, I think I can touch on a few of your points. I'm not sure that I can answer them all. At the time of this incident, as I think I said, the temperature was low. It was 4 to 6 degrees. There was a very gentle breeze blowing, probably of the order of 3 to 5 miles per hour. There was also a temperature inversion situation in our valley, and this is common for the valley.

There were a number of horses and ponies in the area and I think I'm safe in saying that the "lethal area - if you will - was probably of the order of 100 - 150 feet radius arround the point of impact. Had the weather been warmer, we would have had a far more serious episode on our hands.

The hole in the end of the car was a few inches off the bottom, and we estimate that there were probably 300 to 400 gallons of liquid ammonia remaining in the car below the level of the hole. It took about 4 days for that to vaporize. Had the weather been warm, it would have been far more serious. It probably would have been more serious from the standpoint of human beings. I didn't point it out in the script but at about 200 feet from the point of impact, there was a tumbled-down house; a house that had long since been empty. The basement area was open with one wall partially gone. There were matresses, beer cans, etc., in this area. This led us to believe that in warm weather, this particular area was probably used by tramps and hoboes. Had they been there, they would probably have been killed.

Your third question has to do with the type of failure of the coupler. I don't feel qualified to make a judgment on this. All I can say is that as far as we knew, the coupler on the empty tank car was a normal coupler.

The knuckle on the end of the coupler broke off. There could have been a defect in the coupler but I have no reason to suspect it. The knuckle broke off, and left a sharp, jagged shank end, and the shank end lifted up and went through the end of the car. I hope that answers your questions at least in part.

Q. Everyone here would know the smell of ammonia, yet you got a report of chlorine, and I'm wondering what means of identification there was on the shipment to identify the contents of the leaking car?

CATO: The car was identified with the usual rail placard designating it anhydrous ammonia. This particular yard handles essentially all of our cars, and we ship many, and many of them are ammonia cars. Ammonia is pretty well known in the area. The reason I raised the point on chlorine is that this is exemplary of the mis-information in the early stages of an incident of this type.

At the beginning, you know something is terribly wrong, but you can't get a handle on it. You don't know the facts. You don't really know anything. It's a frightening situation.

Q. Have you considered telling the general public what to do in case of an ammonia spill? I mean if they're in the fumes?

CATO: We haven't told the general public, but all of the volunteer fire departments and volunteer police of the towns up and down that valley are part of what is known as a "mutual aid pact," which is independent of the KVIEPC. We have made available to them information about many of the products that we ship.

LARRY SIZER, Victoria, Texas, Du Pont Plant (previously from Belle, West Virginia): The gentleman asked about the identification of the tank car. Perhaps I could add to that by saying on each side of the tank car in approximately 3 inch high letters we have the identification -"Anhydrous Ammonia" or "Ammonia Liquor."

It is typical in this type of release that the vaporizing liquid forms a gas cloud around the car which makes it almost impossible to read the tank car identification until some clearing of the cloud.

In Victoria, Texas we had a report of what appeared to be a similar incident. I give you this information only to help you measure the difficulty in identifying the escaping material as questioned by the earlier gentleman.

We had an emergency call at 7 o'clock in the morning from a railroad employee stating that a chlorine car had ruptured and that the fumes were so dense they couldn't get near it.

Well this, of course, was potentially a very serious problem. It turned out that a steamline paralleling the tracks, in the railroad company car sorting yard, had failed and was enveloping the car in steam vapors.

During an actual emergency, it is most difficult to identify the contents of a tank car, even with binoculars, because of vapors released at the tank car.

Cato