

## **TRANSPORTATION OF DANGEROUS SUBSTANCES SUBSTANCES- RISK FACTORS FOR ENVIRONMENT PROTECTION AND HUMAN FACTOR. PRESENTATION OF CASE**

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### **Abstract**

*Recent events, especially international, but also some that happened in our country, such as the Mihăilești ammonium nitrate truck explosion, led us to believe that we have to be prepared for a rapid, correct and professional reaction.*

**Key words:** disaster, catastrophe.

### **INTRODUCTION**

Ammonium nitrate is used as fertilizer in agriculture, but imbued with diesel fuel becomes an excellent explosive, like dynamite (Wikipedia l'enciclopedia libre). To cause an explosion must be primed detonating combustion, which is usually done by the detonation of a small pyrotechnic cap as shotfirers proceed in mining. The chances of explosion are reduced only by heating, but increase significantly when there is a primer (Marinescu D. 1998). Vehicle rollovers are particularly dangerous when carrying ammonium nitrate and especially when they ignite and burst into fire, as in the tragic accident near Mihăilești (Ialomita).

### **MATERIAL AND METHODS**

We present the accident happened on 05.24.2004, near the locality of Mihăilești when a truck carrying 20 tons of ammonium nitrate, packed in bags, fell into the roadside ditch, the load spreading on the agricultural land and into the ditch. A number of issues mentioned in documents of the investigation are important for understanding the circumstances of the accident. Thus, immediately after the accident a fire broke out in the cabin. The driver didn't call the firefighters, a witness instead contacted the fire dispatcher. After the notification of the event (Buzau county fire dispatcher), individuals who were passing by stopped at the scene of the accident and together with local people tried to extinguish the fire using their own fire extinguishers. During this time (4.56- 5.479) the driver of the overturned vehicle didn't take quickly the necessary measures so the fire

extended to the trailer. Following referral (received at 4.57), Buzau military firefighters went to the site, but before they started the operation of extinguishing the fire an explosion took place.

On the morning of 24.05.2004, the legal authorities were notified about the accident. On this occasion, representatives visited the site of the Prosecutor and the Court Buzau Buzau County Police Inspectorate, the National Institute for Mine Safety and explosion protection - Petrosani, the Military Technical Academy and SRI, with inspectors in the inspectorate Buzau. Research at the site of explosion highlighted the existence of a crater of a truncated cone shape, with the large base at ground level, with its epicenter on the public road right-Buzau Rangers, the surface diameter of 21 meters, based on 7 m, and depth of 6.5 m. The crater is located near human bodies, fragments thereof, damaged cars, car parts scattered over a distance of approximately 1500 m.

Research on the spot also highlighted a number of issues important to establish the circumstances in which the accident occurred, namely:

- The existence of traces of 146 m running through the ditch on the right edge of the road;
- There were no traces found on the ground braking;
- Showed no traces of oil on the road (oil, gas), which could lead to skidding train;

At the crime scene examination there have been identified the bodies of 17 people.

Work to identify the corpses was the trimming and combining anatomical segments, each operation is fixed on photographic film by specialists from the IPJ Buzau - forensic service.

A total of 15 bodies were identified by carers, by visual identification, initially identifying two bodies remained unidentified, the vehicle driver reported missing and a military firefighter.

Later on the prelevation of anatomical segments of the muscle fragments collected on the spot, they managed to establish the genetic profile of persons reported missing on the basis of the samples from their genitors. The samples were compared with the genetic profile of the parents' set of blood samples collected from them. It was thus established with certainty which belongs deceased each anatomical segment (test report no. 107957-2004 prepared by the Institute of Criminalistics IGPR). A forensic anthropology was made, whose conclusions consistent with those established by genetic expertise (report no forensic anthropology. A9, 6069-2004 prepared by the National Forensic Institute "Prof. Dr. Mina Minovici" .

To proceed with the autopsy to determine how each body of death, medical cause of death, the mechanism of injury and their vital character. Forensic

reports prepared necropsy concluded that death occurred every person necropsied following polytrauma and multiple injuries resulting from an explosion.

Following the event described, there were also injured a number of 13 persons. Lesions produced at each person as a result of explosion of ammonium nitrate load required a number of days of care, in the range between 14 to 120 days of treatment. At the site there were identified 5 (five) vehicles belonging to individuals and two fire trucks belonging to the unit, damage occurred to them were fixed by judicial photographs.

The investigation and prosecution documents made in the case file revealed:

1. Firemen military intervention in the group "Neron Lupașcu" event in Mihăilești was within normal limits. If they had been informed 10-15 minutes earlier they might have prevented the catastrophe.

2. No finding from the report. 106 844 01.06.2004 prepared by the Department of Physical and chemical expertise of the Institute of Forensic IGPR shows that diesel spilled outside the container by inverting the train, absorbed ammonium nitrate bags partially or totally damaged packaging, is a mixture, which under the impact of heat given off by fire, may take over a detonation reaction.

3. The report prepared by experts from Petrosani INSEMEX-No.S48-17.06.2004 has the character of "secret" and will be made available to the court that will decide the measures to be taken on technical data report. The most likely source of initiation of detonation was diesel vapor explosion in the fuel tank of the car by the shock wave generated. Detonation was equivalent of about 8491 tonnes T.N.T. experiments and data from literature shows that the mixture of oil and ammonium nitrate, in fixed proportions, is an industrial explosive known as Nitramonia, which is used in surface minning.

4. To obtain the explanation of physical phenomena and chemical product, we proceeded to draw up a technical-scientific report by experts from the Department of Munitions, Rockets and Explosives of the Military Technical Academy and the Romanian Intelligence Service - Department of Technical Operations, and the Antiterorist Intelligence Brigade. After experimental tests (conducted in polygon Jegalia) it was showed that some of the load because it was not detonated it was watered by rain, which contributed to insensivity of the substance( nitrate in the sacks/bags), whose content was not watered by the rain, did not detonate because the distance between the truck and the nitrate was higher than the opening distance by sympathetic determined experimentally.

5. As on the causes, conditions, circumstances of the accident, no. 113 of 18.06.2004 forensic, conducted by the National Institute of Forensic Expertise of the Ministry of Justice, concluded that they can not ascertain

why the driver lost control of vehicle steering.  
6. Ministerul Economy and Trade inspectors performed an inspection by the National Agency for Dangerous Chemical Substances, at the SC DOLJCHIM Craiova, where he was made of ammonium nitrate.

The verification results were described in minute no. 1945 to 2004, where they found the results were recorded: verified trader has appointed safety adviser; bags used for packaging, are not properly labeled (labeling should include identification of the manufacturer, emergency phone, hazard symbols), in accordance with ADR vehicle was required to obtain a license for execution dangerous goods (art. 25 of ord. MTCT no. 1842-2001).  
7. In the report prepared by a panel of safety inspectors have found several breaches of the law and identified the persons responsible for the violation of legal regulations.

## **RESULTS AND DISCUSSION**

1. Mixed team poor cooperation from the beginning by the late announcement of the accident.

2. The accident indictment will detail the deficiencies. The load blast of 20 tonnes of ammonium nitrate, an event that killed 18 people, 13 seriously injured, destruction of property, was the result of a contest of fault: violations of traffic laws on public roads; the driver's carelessness and recklessness driving in adverse weather conditions (heavy rain, wet, temperature around 10 degrees, the existence of a curve to the right); lack of notifying by the the driver of the imminent danger, which is expressed by a late referral to the competent bodies; passive attitude of the driver by itself demonstrates ignorance of the law on transportation of dangerous devices on public roads (according to the rules A.D.R. general measures of intervention is the announcement as soon as possible of the firefighters and police, alert and warn other road users and pedestrians from the risk of explosion, additional measures require the driver to try and limit leakage and limiting the product to fire not affect the load); delay of the precautionary action and announcement to the fora. Also not followed the procedure for obtaining a certificate of training for drivers carrying dangerous goods, established by Order No. MTCT. 82 of 27 February 1995. As regards the transport of hazardous materials, carrier loading is required to claim the product safety sheet, which contains characteristics of the goods. Passive attitude of the driver was transported product characteristics caused by ignorance (Ghimju S. Et al., 1980).

Fire and explosion moments before were videotaped by an operator of Antena 1 TV station. The images show the existence of two outbreaks of fire in the cabin and another to the burning rubber on the road axis. At that

time the movement is conducted on a one-way, cars were running at reduced speed.

3. Also there was no announcement to evacuate people, no car traffic diverted to another route.

4. Meeting in practice this type of accident again demonstrates the importance and practical introduction of protocols to address the collective accidents, the detailed roles of each institution will be empowered to intervene (Duțu M. 1998, Gavra V. et al., 2007).

5. Forensic acted efficiently by identifying all the victims in the crash results. Identifying the victims has focused on visual identification method in 16 cases and in two cases the identification was based on genetic profile, coupled with a case of anthropological expertise ( Radu Carmen-Corina et al., 2006).

6. I think that was poorly managed by the acute phase of the accident that were allowed into the area of unauthorized persons, see neighbors, TV operators.

## CONCLUSIONS

Mihăilești accident resulted in damage to 30 people, of which 17 died and 13 were injured. Of the 30 persons involved in the accident, 17 died (56.66%), five suffered serious injuries (16.66%) and 8 persons (26.68%) slight injuries. There were no persons unharmed.

In the case of the 13 people injured there was a forensic exam, releasing forensic certificates. The conclusions of the forensic provisions retain the main causes of injuries and number of production days of treatment.

Almost 85% of victims suffered injuries caused by impact with hard objects. In equal proportions (7.69%), the injured suffered burns politraumas and cranio-cerebral trauma. In equal proportions, the injured were passengers and firefighters (30.77%). Drivers were three in number representing 23.08%.

Approximately half of the dead were firefighters (47.05%) who came to the scene to extinguish the fire and a proportion of 23,54% of the persons on site for various reasons. Most victims of the accident were locals from Mihăilești (83.34%), who came having seen that the spot fire units were deployed and police staff.

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