

ENVIRONMENTAL RISKS ASSOCIATED WITH ACTIVITIES INVOLVING AMMONIUM NITRATE IN THE NETHERLANDS

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Safety indicator system at discharge site for ammonium nitrate solution

SUMMARY

Since the early 1990s the Inspectorate of the Ministry of Housing, Spatial Planning and the Environment (the VROM Inspectorate) has implemented enforcement campaigns with a central focus on risks for human safety. The most recent campaign involved a study of the risks associated with the storage and use of ammonium nitrate in the Netherlands, and the extent to which the statutory regulations are being complied with. The study was carried out at the four big ammonium nitrate producers in the Netherlands and at a limited number of storage companies where ammonium nitrate or products containing that substance are being stored. This particular study was initiated in response to the explosion of an ammonium nitrate storage centre in Toulouse on 21 September 2002, in which 30 people died.

The enforcement campaign revealed that the risk control procedures at the big ammonium nitrate producers are adequate and, hence, that incidents like the one in Toulouse are not likely to happen. However, at the storage companies the risks associated with ammonium nitrate were shown to be more substantial. In addition, there appeared to be room for improvement in the labelling of products containing ammonium nitrate and in the directive regulating the storage of such products.

1 RISK POLICY AS PART OF ENVIRONMENTAL POLICY IN THE NETHERLANDS

In the Netherlands, risk policy has been a major component of environmental policy for over two decades. Before the oil crisis in the 1970s it was common practice to flare the gaseous fraction if it could not be used on site, but in the wake of the crisis the market value of fossil hydrocarbons increased to such an extent that the large-scale utilisation of the gaseous fraction became commercially interesting. Since that time the application of LPG (Liquefied Petroleum Gas) as a fuel for motor vehicles and as a raw material for the chemical industry has increased exponentially in the Netherlands. The authorities realised, however, that certain risks were associated with the storage, application and transport of LPG and commissioned a study into those risks in the 1980s. That study made use of the "Quantitative Risk Analysis" as an instrument for risk assessment. This risk assessment strategy was then implemented as a policy instrument in the Netherlands by virtue of the government's "Integrated LPG Memorandum".

2 RISK POLICY ENFORCEMENT

The government complemented the new policy with a number of statutory regulations to ensure that the policy could be effectively enforced. Examples include the LPG Filling Stations (Road Traffic) Decree and the Serious Accident Risks Decree. The latter decree also served as the instrument under which the EU Post-Seveso Directive was implemented in the Netherlands.

In the early 1990s the Inspectorate for the Environment at the time launched a risk-oriented enforcement campaign, the purpose of which was to implement the LPG Filling Stations Decree. In subsequent enforcement campaigns conducted

by the Inspectorate, risk policy enforcement was repeatedly shown not to attract the attention it deserves.

The fact that risk policy in the Netherlands was not properly enforced and that the safety of citizens was being jeopardised was brought home with a vengeance by major incidents involving many fatal casualties in the towns of Enschede (May 2000, explosion of fireworks factory) and Volendam (New Year's Day 2001, fire in a café/dance club). Since then new statutory regulations in the area of risk policy (fireworks, fire safety of buildings etc.) have been introduced, and all public authorities involved (municipalities, provinces and central government) have reinforced systematic risk policy enforcement procedures. The Inspectorate for the Environment (which later merged into the VROM Inspectorate) was also strengthened as part of that overall effort.

3 ENFORCEMENT STUDY INTO THE RISKS ASSOCIATED WITH THE PRODUCTION AND STORAGE OF AMMONIUM NITRATE

In the morning of Friday 21 September 2001, an explosion took place in a chemical factory in the French city of Toulouse. The Grande Paroisse company (part of the Total/Fina/Elf group) is situated in the southern part of the city, in the middle of a residential district. The explosion had disastrous effects, and the newspapers reported 30 deaths, 2,442 injured (34 of whom seriously) and 600 homes that would be uninhabitable for a long time to come.

Even though the precise cause of the accident has not yet been fully established, the first signs were that the explosion took place in a storage space for materials containing ammonium nitrate. The Dutch authorities were obviously eager to know whether accidents of this nature could also take place at similar companies

in the Netherlands.

This is why the Minister of VROM commissioned the VROM Inspectorate to explore the manner in which ammonium nitrate and products containing ammonium nitrate are being manufactured, processed and traded in the Netherlands. The purpose was to find out whether

- the storage of and activities with ammonium nitrate in the Netherlands are sufficiently safe;
- the rules and regulations issued to guarantee safety are properly enforced;
- existing rules and regulations are sufficient to ensure safety.

The study was performed at the four biggest fertiliser producers in the Netherlands: Hydro Agri Sluisil and Zuid Chemie Sas van Gent (Zeeland province), DSM Agro Geleen (Limburg province) and DSM Agro IJmuiden (North-Holland province), but also involved a number of fertiliser storage companies.

4 PROPERTIES OF AMMONIUM NITRATE

The accident in Toulouse occurred when the substance called ammonium nitrate exploded (detonated)¹. Ammonium nitrate is a substance with a special risk profile.

It is a solid which, under specific conditions (high concentrations, high temperatures, confinement and the presence of catalysts such as oil and chloride), can explode or decompose releasing noxious fumes.

In the past this substance caused a number of very serious accidents, some of which involved hundreds of fatalities. Not surprisingly the production, storage and use of the substance are subject to strict precautionary measures. In the Netherlands, products that contain ammonium nitrate (fertilizer) are classified in hazard categories A1 and A2, B and C².



Bulk storage of fertilizer containing ammonium nitrate

The Dutch production companies exclusively make fertilizer in the A2, B and C categories. Import, storage and transshipment activities with fertilizer in category A1 take place on a modest scale.

5 FERTILISER PRODUCERS

The study of the four companies that produce and process huge volumes of ammonium nitrate has shown that under the present circumstances the chance of an accident in the Netherlands comparable to the one in Toulouse is negligible. This is mainly because the ammonium nitrate at those companies is different in composition from the substance that exploded at the storage company in Toulouse.



Discharge site for ammonium nitrate

The four companies in the study did, however, show differences in terms of product range, working methods, safety policy and safety record.

Nevertheless, the researchers con-

clude that at the moment of the study all four companies operated under sufficiently safe conditions as regards the production, processing and storage of ammonium nitrate and fertilizers containing that substance. The safety procedures for materials containing ammonium nitrate and checks on their composition were found to be adequate and properly complied with in practice.

All company sections involved in the study could produce up-to-date permits under the Environmental Protection Act. The permits had relevant coverage and were consistent with the applicable quality requirements. The companies were found to operate largely in conformity with the guidelines stated in their permits. However, the implementation of the 1999 Serious Accidents Risks Decree was found to be lacking in some respects.

The VROM Inspectorate took steps against one of the four companies, ordering it to halt the supply and upgrading of a material containing a particular type of ammonium nitrate. The company could not resume this operation until the VROM Inspectorate was satisfied that the quality of the material could be sufficiently guaranteed.

6 FACILITIES FOR THE STORAGE AND UTILISATION OF, AND THE TRADE IN AMMONIUM NITRATE

Firms that stock ammonium nitrate for trading or processing purposes form a second category of relevant companies. Given the large number of companies in this category and the enormous differences in terms of company type, size and nature of operations it proved impossible to produce a complete picture of all facilities where ammonium nitrate is or might be present.

The exploratory study, however, suggests that in the Netherlands an estimated 170 companies process, store or

use this product in some form or another.

The situation at companies that operate in the distribution chain for C- fertilizer, such as wholesalers, was generally found to be satisfactory.

Fertilizer refiners (blenders and coaters) proved to merit some closer attention, as blending and coating activities at those companies sometimes generated types in the risk category of B- fertilizer. At some companies storage conditions and fire fighting procedures were found to fall short of relevant category requirements.

Industrial ammonium nitrate is trad-



Combustible materials (pallets) in the storage of fertilizer containing ammonium nitrate

ed at wholesalers and chemical storage and transshipment companies. In many cases reliable information about the risk profile (read: detonation aspects) of the material is lacking. The study highlighted various companies of this type where conditions were so dangerous as to call for an intervention. A few companies use ammonium nitrate as a raw material or auxiliary substance in production processes, but no significant irregularities were encountered there.

7 PRODUCT QUALITY, LABELLING AND STORAGE CONDITIONS

In many cases ammonium nitrate and products containing the substance that are traded on the market come from outside the Netherlands. The labels suggest that these products qualify as "oxidising

agents” and should be treated accordingly, rather than as “explosives”. However, there are reasons to assume that some of those products are certainly “prone to detonation” and wrongly exempted from a strict treatment regime.

Many of these products are traded with little or no accompanying risk information. The statutory product information leaflets were found to be incomplete and misleading on a number of crucial aspects.

The detonation properties of ammonium nitrate and products containing that substance are assessed under various types of regulations, each associated with its own test system. This generates confusion and may cause the actual risks to be underestimated.

The CPR-1 directive, used in the Netherlands in the storage of fertilizers containing nitrates, needs to be updated. In a number of respects the directive appears to have become obsolete and its provisions are too vague. It should also be made consistent with (new) international provisions concerning the classification of substances, packaging and safety policy.

The 1999 Serious Accidents Risks Decree contains a relatively high threshold value for ammonium nitrate. The Decree only becomes applicable in the case of considerable storage volumes, in contrast to the threshold values for other substances with similar risk profiles. Harmonisation is called for, preferably within an EU context.

8 RECOMMENDATIONS

Given the findings of the study, the VROM Inspectorate makes the following recommendations:

- The knowledge about the risk profile of ammonium nitrate and products containing ammonium nitrate, and the translation of that knowledge into policy, must be improved. For example, the descrip-

tion and labelling of products available on the market must be refined and standardised. It is also necessary to update the CPR-1 safety directive.

- Information about the risk profile of activities involving the use of ammonium nitrate and products containing ammonium nitrate must also be improved. This is clearly a joint task for the public authorities and the business community.
- The public authorities should more effectively structure and intensify their supervision of safety procedures for the treatment of ammonium nitrate and products containing ammonium nitrate. This applies in particular to the import of these products, but production and storage methods used in companies within the Netherlands also call for continuous attention.

9 AFTERWORD

Time and again, large-scale calamities of the type that have also occurred in the Netherlands in recent years emphasise the need for constant vigilance at companies and public supervisory authorities alike. Risk-oriented enforcement campaigns like the one dealt with in this paper will continue to be necessary, as each successive campaign reveals the existence of companies where risks are still not being properly attended to, as well as low levels of compliance and poor-quality rules.

10 NOTES

- ¹ The term ‘detonation’ refers to the process in which a local shock in a substance brings about a reaction zone that moves through the substance on a shock wave at supersonic speed. Explosions have a highly destructive effect. ‘Deflagration’ refers to the process in which local heating of a substance brings

about a reaction zone that moves through the substance by transferring heat, without the need for oxygen. The decomposition process will continue even after the heat source has been removed. Deflagration causes large volumes of nitrous vapours to be released, and cannot be extinguished by cutting off the oxygen supply. Under certain conditions (confinement) the deflagration process may lead to detonation, also known as 'explosion combustion'.

²Danger categories for products containing ammonium nitrate / fertilizers

A1: risk of detonation

A2: will only detonate under exceptional conditions and releases noxious fumes (nitrous vapours) in the case of a fire

B: may deflagrate under certain conditions and releases noxious fumes (nitrous vapours) in the case of a fire

C: will release noxious fumes (nitrous vapours) in the case of a fire