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The Storage of POL and Chemicals in Packaging in the Royal Netherlands Army

by

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Introduction

1. In the ninety eighties a chemical storage facility of Sandoz inc. in Basel suffered a major fire. During this disaster tons of toxic chemicals polluted the river Rhine severely. As a direct result of this disaster, the Netherlands Government introduced new environmental legislation on the storage of POL and chemicals in packaging. This legislation makes a distinction between a facility with a storage capacity of no more than 10 tons of POL and chemicals in packaging (Regulation CPR 15-1) and a facility with a storage capacity of more than 10 tons of POL and chemicals in packaging (Regulation CPR 15-2). If a major accident happens in a CPR 15-2 facility far more than 10 tons of chemicals are involved. As a consequence, requirements for a CPR 15-2 storage facility are much more severe than the requirements for a CPR 15-1 storage facility. Therefore, a CPR 15-2 storage facility is far more expensive.

2. During the Sandoz-fire, all kinds of chemicals reacted in a uncontrolled way with each other. This caused additional risk to the environment. In order to prevent this happening in the future, both CPR 15-1 and CPR 15-2 regulations require the separate storage of chemicals, which can react dangerously with each other.

3. In 1991 the Royal Netherlands Army introduced Environmental Care. As part of this scheme, several storage facilities for POL and chemicals were checked against these new regulations. The findings were:
 - a. Chemicals which can react dangerously with each other, were not stored in separate compartments, as required by both CPR 15-1 and CPR 15-2 regulations; The average soldier had no idea, which chemical has to be separated from which;
 - b. There was no confidence in the logistics. Besides, every unit within the Army was licensed to order goods from the central Army-depots. As a result, every user within the Army had ample stores of POL and chemicals. At one barracks stores sufficient for one and three quarter years of maintenance were discovered;
 - c. The storage facilities didn't meet the new requirements as formulated in CPR 15-1 or CPR 15-2;
 - d. As a consequence of the high level of stock, many Army barracks required a new storage facility accordingly to CPR 15-2.

4. The Commander in chief of the Army ordered an efficient and cost-effective solution for all the above problems.

Storage of chemicals in separate compartments

5. The CPR 15-1 and CPR 15-2 require that, and I quote:

"Chemicals which can react with each other in the course of which dangerous vapours can arise, explosions can occur or drops of chemical product can splash around, should be stored in separate compartments".

6. At least oxidising-, inflammable-, poisonous- and corrosive chemicals have to be stored in separate compartments. Further more, bases have to be separated from acids, acids from cyanide etc. Where as the Army had to comply to this regulation, it had the option to give every user an extensive chemical training or give him unequivocal instructions. For practical reasons, the Army choose the last option.

7. In order to solve develop unequivocal instructions, the Army looked at the types of chemicals it uses. These types are:

- a. flammable liquids;
- b. flammable solids;
- c. oxidising chemicals;
- d. toxic chemicals;
- e. bases;
- f. acids;
- g. oil and lubricants.

8. Furthermore the Army looked at the European regulations on the transport of dangerous goods by road, the so called ADR-regulations. ADR gives clear criteria, how to classify a product as one of the above types of chemicals. The criteria can be found in the following marginal numbers:

- | | |
|---------------------------------|-----------------------|
| a. flammable liquids | marginal number 2300; |
| b. flammable solids | marginal number 2400; |
| c. oxidising chemicals | marginal number 2500; |
| d. toxic chemicals | marginal number 2600; |
| e. corrosives (acids and bases) | marginal number 2800. |

9. For instance the criteria for inflammable liquids are:

- | | |
|-------------|--|
| letter (a): | Very dangerous substances; flammable liquids having a boiling point or initial boiling point not exceeding 35 °C, and flammable liquids having a flash-point below 21 °C, which are either highly toxic according to the criteria of marginal 2600 or highly corrosive according to the criteria of marginal 2800; |
| letter (b): | Dangerous substances; flammable liquids having a flash-point below 21°C which are not classified under letter a), with the exception of substances of marginal 2301, 5°(c); |
| letter (c): | Substances presenting a minor danger: flammable liquids having a flash-point of 21 °C up to 61 °C and substances of marginal 2301, 5°(c). |

10. Although the CPR-regulations claim that chemicals can cause no more than one risk, ADR disagrees and gives clear criteria, which risk prevails the other. For example: Methanol, UN number 1230 is flammable and toxic. Accordingly to the marginal 2300 and 2600 of ADR, the risk of flammability prevails the risk of toxicity. Methanol therefore is a chemical of ADR class 3. Therefore, the Army decided to adopt the criteria of ADR. Where as most of the chemicals the Army uses fell within the criteria of the ADR regulations, the Army translated them into so called "Storage codes". These day's the Army uses the following storage codes:

Schedule 1. Storage codes used by the Dutch Army.

Storage code	Risk	Criteria
1	Flammable chemicals	Spraying cans of the ADR-class 2, 5F, Flammable liquids with a flash point of less than 100 *C (mostly chemicals of the ADR-class 3, Flammable solids of the ADR-class 4.1
2	Toxic chemicals	Chemicals, which can cause a risk to the health, mostly chemicals of ADR-class 6.1
3	Oxidising chemicals	These are chemicals of the ADR-class 5.1 and 5.2
4	Acids	These are mostly chemicals of the ADR-class 8, digit 1 till 40
5	Bases	These are mostly chemicals of the ADR-class 8, digit 40 till 56
6	Risk to the soil	Chemicals, not classified under the storage codes 1 till 5, who cause a risk to the environment, when spilled onto the soil
N	No known risk	Chemicals, who cause no risk to the environment or the user

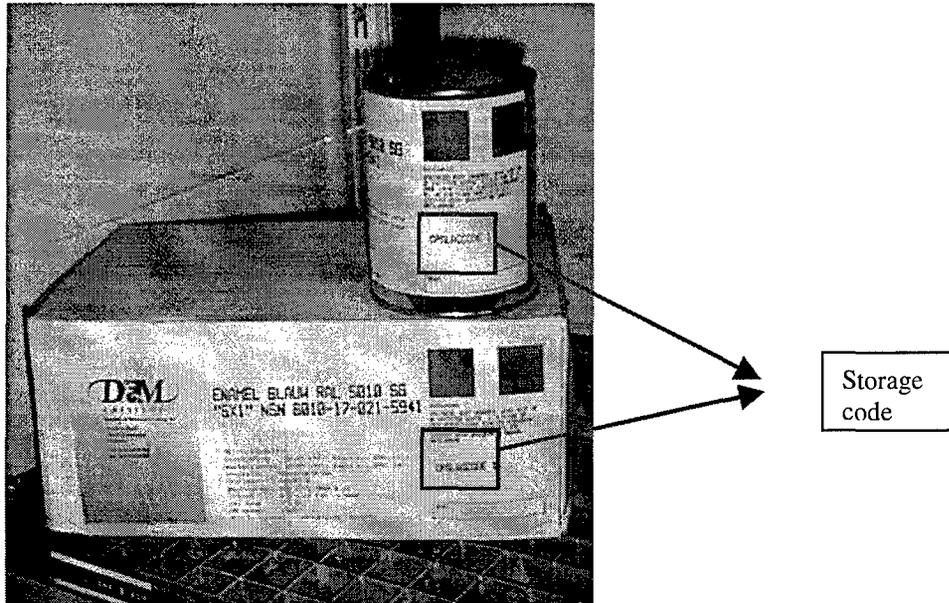


Photo 1. Example of a storage code on a packaging

11. In order to make it easier for the user, every packaging carries a storage code. In schedule 2, the user can read, which storage codes may be stored together in one and the same storage compartment.

Schedule 2. Storage codes that may not be stored together in one storage compartment

Storage code	1	2	3	4	5	6
1		x	x			
2	x		x	x	x	x
3	x	x		x	x	x
4		x	x		x	
5		x	x	x		
6		x	x			

x = may not be stored together in one storage compartment.

Conclusion.

12. If the user stores chemicals accordingly to schedule 2, he complies to the regulation of separate storage.

Reorganising the logistics.

13. As mentioned in the introduction, due to no confidence in the logistics, many Army-units had far to much POL and chemicals in stock. If this situation was not altered, the Army had to invest far to much in new storage facilities. In order to minimise the necessary investments in storage facilities, the Army made the following decisions:

- a. The user of POL and chemicals in a workshop only has stock for roughly 1 day of use. In practice, per product the user has one packaging in use. At the most, he has one spare packaging in stock; In practice, the stock hardly exceeds 150 kg of chemicals and 1000 kg of oil and lubricants; The user can replenish his stock daily.
- b. Every barracks has one local POL and chemicals depot. In total, the Army has approximately 50 local depots. The user orders the necessary POL and chemicals at a daily base at his local depot. Every local

depot has an average stock, sufficient for 14 days of normal use; In practice, the stock hardly exceeds 2500 kg of chemicals and 2500 kg of oil and lubricants; Once or twice a week, the local depot receives new stock;

- c. One central Army depot supplies its countrywide situated customers with POL and chemicals. The depot has sufficient stock for 3 to maximum 10 months of use. The central depot has space for 5000 pallets (approximately 2500 tons of chemicals and POL). The central depot guarantees a customer satisfaction of 98 %.

Conclusion

14. By reorganising the logistics, the Army was able to:

- a. Restore confidence in the logistics;
- b. Reduce the level of stock substantially;

Storage facilities accordingly to CPR 15-1 and CPR 15-2

15. Regulation CPR 15-1 gives the user the following possibilities to store POL and chemicals in packaging.

Schedule 3. Storage of POL and chemicals in accordance to CPR 15-1.

Storage facility	Storage of	Maximum storage capacity	Particulars
Retention basin	storage code 6	400 litres	
Removable hazardous materials depot	storage code 1 to 6	150 litres	<ul style="list-style-type: none"> ■ store each storage code on one separate shelf ■ depot is 30 minutes fire resistant ■ depot has a retention basin with 100 % product storage capacity
Hazardous materials depot in a building	storage code 1 to 6	2500 litre	<ul style="list-style-type: none"> ■ store each storage code accordingly to schedule 2 ■ walls of the depot are 60 minutes fire resistant ■ door and roof of the depot are 30 minutes fire resistant ■ depot has a retention basin with a product storage capacity of 100 % (storage code 1) and 10 % (storage code 2 to 6)
Separate hazardous materials depot, not connected to an other building	storage code 1 to 6	10.000 litres	<ul style="list-style-type: none"> ■ store each storage code accordingly to schedule 2 ■ walls of the depot are 60 minutes fire resistant (distance to other building minimal 5 meters) ■ door and roof of the depot are 30 minutes fire resistant ■ depot has a retention basin with a product storage capacity of 100 % (storage code 1) and 10 % (storage code 2 to 6)

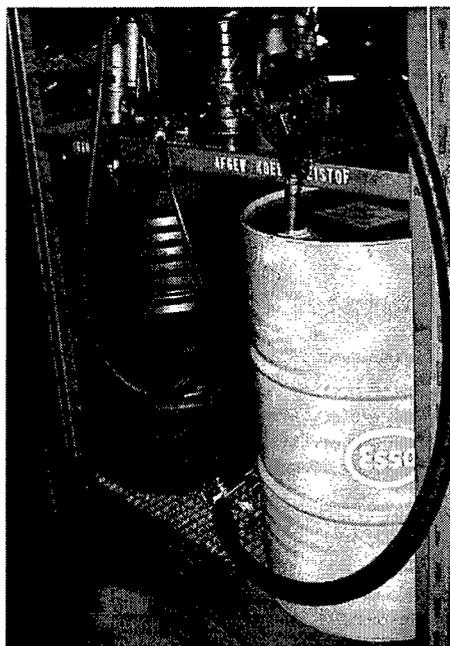


Photo 2. Retention basin for environmental goods
(storage capacity: maximal 400 litre)



Photo 3. Removable hazardous depot
(storage capacity: maximal 150 litre)

16. Regulation CPR 15-2 gives the user the user many possibilities to store POL and chemicals;

- store each storage code in a separate compartment;
- depot has a automatic fire detection system;
- depot has a retention basin with a product storage capacity of 25 % (depot has an automatic fire fighting system) to 100 % (depot has no automatic fire fighting system);
- depot also has a retention basin to store water used to extinguish a fire, the capacity may range from 1 m³/m² surface (with a minimum of 300 m³) to 16 m³, depending on the method of fire fighting;
- walls and doors of the depot are 60 minutes fire resistant;
- roof of the depot is 30 minutes fire resistant.

17. The Dutch Army evaluated all the options and has chosen to build a depot with a automatic carbon dioxide fire fighting system. As a result, the depot only needs a retention basin with a product storage capacity of 25 % (150 m³) and 16 m³ of fire fighting water.

18. The average investment to upgrade the storage facilities are:

- | | |
|--------------------|---|
| ■ User in workshop | Approximately USD 2.500,00 |
| ■ Local depot | USD 25.000,00 (upgrading existing storage facility) to
USD 150.000,00 (new storage facility) |
| ■ Central Depot | USD 6.000.000,00 (new CPR 15-2 facility) |

Conclusion

19. Due to the reorganisation of the logistics, the Army was able to control the investment in upgrading and building new storage facilities.



Photo 4. One of 20 compartments with space for 192 pallets

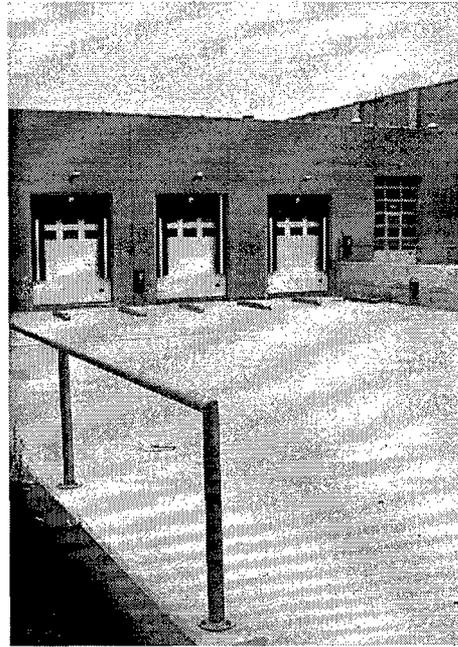
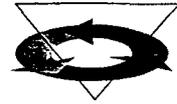


Photo 5. Loading dock, can be used as a retention basin

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Environmental & Safety Engineer

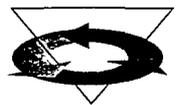


Royal Netherlands Army



POL - Division

Ing. Eric Hofstede
Environmental & Safety engineer

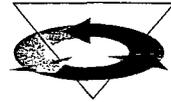


**STORAGE of POL and CHEMICALS in PACKAGING
in the**

ROYAL NETHERLANDS ARMY

May 5 - 7 Budapest , Hungary

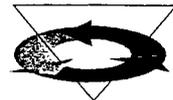




In 1991, the chemicals/POL - storage facilities were checked against new Dutch Environmental & Safety legislation

The conclusions were:

- No separate storage of chemicals that can react dangerously with each other
- No confidence in new army-logistics, resulting in high levels of stock
- Storage facilities didn't meet new environmental requirements

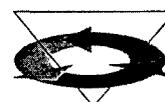


Storage of POL and Chemicals in separate compartments

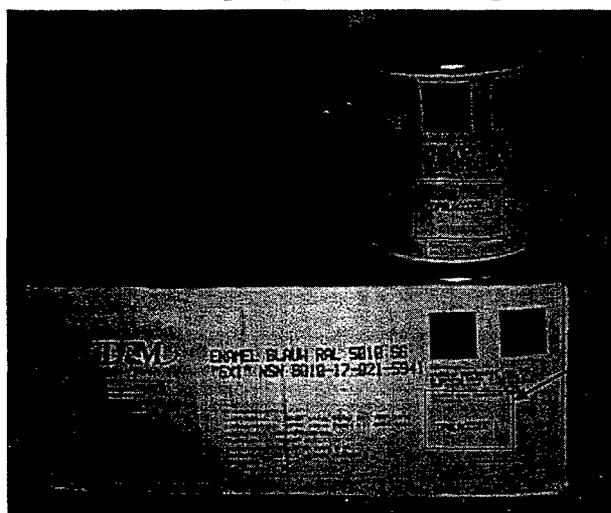
Chemicals which can react with each other in the course of which risks to the environment or health can arise, have to be stored in separate compartments of a storage facility



Storage code	Description
1	Flammable solids and liquids (FP<100°C)
2	Poisonous chemicals
3	Oxidising chemicals
4	Acids
5	Bases
6	POL/Chemicals which may cause soil-pollution
N	No risks

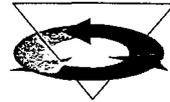


Packaging & labelling



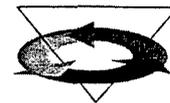
storage
code

Example of storage code on a can and case

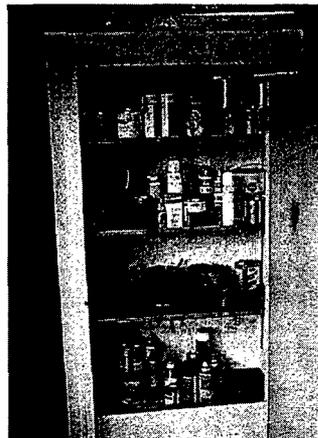


Reorganising the LOGISTICS

- Users in workshops (± 1000) stock for 1 day
 - Local POL/chemical depots (± 50) stock for 14 days
 - Central Depot (1) stock for 3-10 months
-



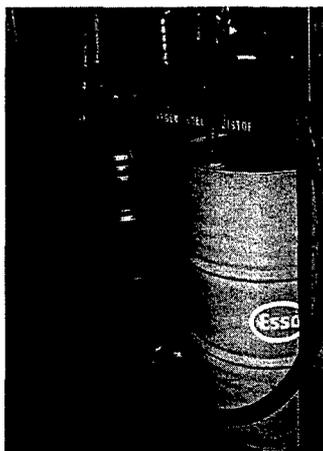
Average storage facility in a workshop for the storage of POL/chemicals of storage codes 1 till 5



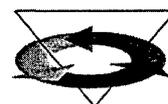
Removable hazardous materials depot
(capacity : max 150 kg)



Average storage facility in a workshop for the storage of Oil and Lubricants of storage codes 6



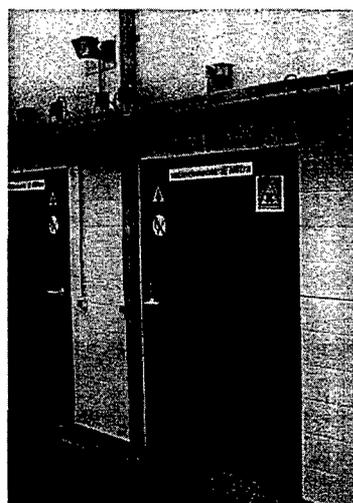
Retention basin for environmental goods
(capacity : max 400 kg)



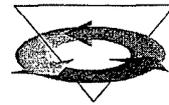
Average local POL and Chemicals depot (1)



Retention basin for storage code 6



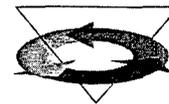
Storage compartment



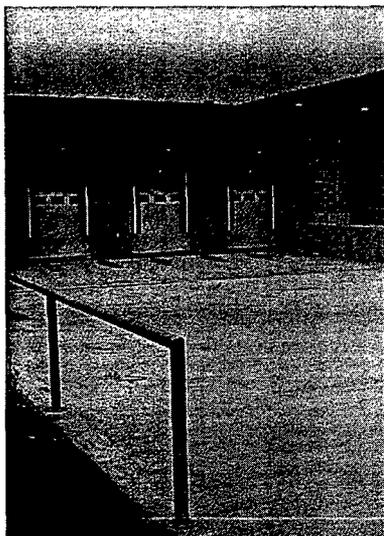
Average local POL and Chemicals depot (2)



Contents of a separate storage compartment

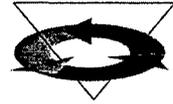


New Central Army POL and Chemicals depot (1)



Loading dock

In case of an accident, the loading dock can be used as a retention basin



New Central Army POL and Chemicals depot (2)



**One of twenty compartments
with space for 192 pallets**



Fire door
