



Solid organisation at PGS 8 storage

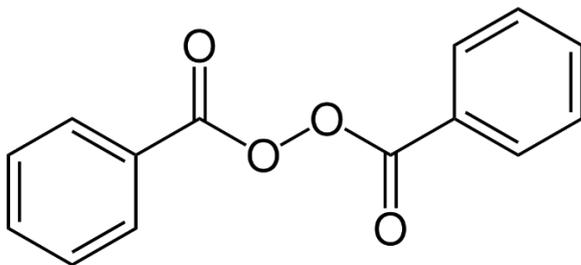
In 2019, Broekman Logistics built a state-of-the-art warehouse in Venlo in accordance with the latest regulations and the best available technology for the storage of hazardous substances. The logistics campus in Venlo is used for storage, logistics and assembly activities involving both non-hazardous and hazardous products. There are various types of storage available at this combined ADR/non-ADR site, including storage specifically for Organic Peroxides in accordance with the PGS 8 Guideline.

Broekman Logistics has specialised in the warehousing and distribution of goods for 60 years. Serving the Benelux region, Broekman Logistics is active in the storage and worldwide distribution of dangerous goods from logistics centres such as Rotterdam, Antwerp and Venlo. Additional services are also offered based on specific customer requirements.

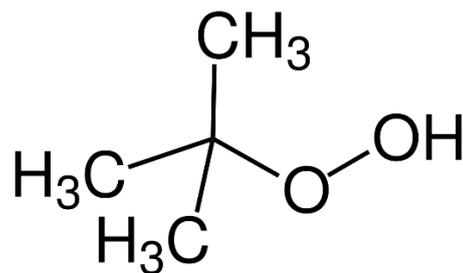
This article elaborates on the nature of organic peroxides, why their storage requires stricter safety measures and heavy-duty facilities, and how Broekman Logistics was able to realise this and comply with these requirements.

Hazards of Organic Peroxides

Organic Peroxides (ADR class 5.2) are highly reactive, flammable and thermally unstable due to the presence of the unstable -O-O- peroxide compound within their molecular structure. Typical structures of organic peroxides include R-O-O-H or R-O-O-R, where R forms the organic part of the peroxide structure. Some examples:



Benzyl peroxide



tert-Butyl hydroperoxide

Some organic peroxides are highly flammable liquids with low flash points and one group is even classified as explosive. Most of these peroxides are liquids, but they are increasingly being produced in the form of a paste. Almost all organic peroxides are explosive in their pure form, so their reactivity is

suppressed by dilution or phlegmatisation with liquids such as water or phthalates. For this reason, water (in sprinkler systems) is also a good extinguishing medium for cooling and neutralising peroxides in the event of fire.

In essence, all organic peroxides are self-heating and undergo a decomposition reaction under the influence of temperature or some contaminants. As a result, packaging can burst due to increasing pressure, releasing a flammable vapour that may ignite or even lead to an explosion.

All organic peroxides are subject to a self-accelerating decomposition temperature (SADT), which decreases as the package size increases. In other words: this is the temperature at which an organic peroxide shows a self-accelerating decomposition reaction in the tested packaging within one week. If the heat in the packaging does not dissipate effectively, the temperature will increase and the decomposition reaction will proceed in an uncontrolled manner (thermal runaway).

For this reason, the storage temperature is significantly lower than the SADT. This maximum storage temperature is called the control temperature (T_c). The temperature at which a runaway reaction starts is called the critical temperature (T_e). Starting from this temperature, it is advisable not to move the packaging and to provide cooling quickly. If this is not done quickly enough, the peroxide compounds will rapidly disintegrate, forming decomposition products such as hydrocarbons, carbon monoxide, carbon dioxide and other sometimes toxic substances. This rapid decomposition can lead to serious accidents due to explosion, fireball and/or a major fire. The temperature range between T_c and T_e is also not optimal due to the rapid deterioration of the quality and action of the peroxide, and therefore the loss of its desired properties.



UN 3105 Packaging

Classification of Organic Peroxides

The classification of organic peroxides is based on the rules laid down in the CLP regulation ([1272/2008/EC](#)). They are divided into seven types labelled from A to G. Type A is extremely explosive, which means that it is prohibited for transport and storage under the PGS 8 regime.

CLP regulation types

Type	IFC*	Hazard description
A	-	Explosive when enclosed
B	Class I	Explosive combustion when enclosed
C	Class II	Highly inflammable
D	Class II	Flammable

E	Class III	Combustible
F	Class IV	Low flammability/reactivity
G	Class V	No fire/reactivity hazard

*International Fire Code (US)

The above table gives only a brief overview of the dangers. Within each type, the intensity of the reaction varies depending on the property of the organic peroxide in question. The PGS 8 further subdivides the various types based on the burning rate (in kg/min). This has been further detailed for storage groups (1. to 5.), with storage group 1 being the most hazardous group, containing type B and type C organic peroxides with a burning rate of ≥ 300 kg/min.

PGS 8

The PGS 8 further distinguishes between storage with passive or active temperature control, with a maximum package size also applicable. The organic peroxide types B to F that are allowed for storage and may or may not require temperature control, are recognisable by their UN number. This is shown in the overview below:

Temperature control depending on UN number

No temperature control:	UN 3101 to UN 3110 permitted	$T_c \geq 30$ °C
Temperature control:	UN 3111 to UN 3120 permitted	$T_c < 30$ °C

From the table above it can be deduced that UN 3101 to UN 3120 can be stored in PGS 8 storage with temperature control. Organic peroxide type G is exempted from PGS 8, but may be stored with other organic peroxides. Those who wish to know about the above are advised to read Chapters 2 and 3 of the [PGS 8](#).

PGS 8 at Broekman in Venlo

Only organic peroxides with a $T_c \geq 30$ °C are stored in the PGS 8 area at Broekman. The room is equipped with underfloor heating, so there is no direct contact and there are no hot surfaces in the room. All storage spaces are extremely well insulated (Energy Label A), which means that heat from outside is also effectively blocked. This enables Broekman to also guarantee its customers a storage temperature below 25 °C. The room is equipped with temperature monitoring (see image 'Temperature profile PGS 8 room').



Temperature profile PGS 8 room

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There is an explosion-proof ventilation system and all other electrical components present are explosion-proof. All doors have a fire-resistance rating (WBDBO) of 2x 60 minutes. These doors are intended not only to prevent fire penetration, but also to stop heat entering from the outside, which could heat up the peroxides. There is a sprinkler system in the room and there are sprinklers installed in the racks.



Sprinkler heads in racks

The storage has a lowered and loose roof so that in the event of an explosion, the pressure wave is discharged in a safe direction. The lowered roof also significantly reduces the possibility of fire overtopping.



Lowered, freestanding roof PGS 8

In addition to PGS 8 storage, Broekman Logistics in Venlo also has several PGS 15 storage areas, forwarding areas, which are also equipped and operated in accordance with PGS 15, and a separate storage area for ADR-classified medicines (GDP). There are also a number of halls with sprinkler installations for the storage of goods and non-ADR products. The total area is 52,000m². In addition, there are four mezzanines that can be used for other types of business activities.

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