



presents



ExploGuard-en.pptx

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Explosion protection system



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Advantages

ExploGuard, the explosion protection system of **Paar Logistik GmbH**, prevents explosions in all kind of fuel tanks.

ExploGuard thus prevents the function of the fuel tank system and enables the crews of armored vehicles to get away from the danger spot.

ExploGuard reduces the swash movements in fuel tanks tremendously.

ExploGuard can be applied to all kinds and shapes of fuel tanks.

ExploGuard protects crew, operating and maintenance personal from the danger of explosions of fuel tanks.



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Active principle

- The high thermal conductivity of the **ExploGuard** aluminum alloy diverts the heat, fed thermal energy is diverted immediately and therefore tremendously reduced. Possible flames can be extinguished with water where appropriate.
- The structure of **ExploGuard** always separates explosive gas mixtures into small areas.
- Thus **ExploGuard** builds a physical barrier to the flames.
- The function of **ExploGuard** is purely based on physics. For the development of its fire- and explosion-preventive properties no additional actions are necessary.



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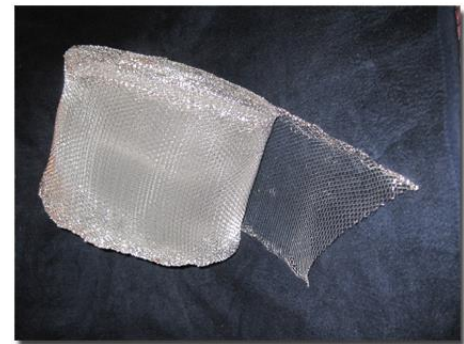
Product range



ExploGuard Balls



ExploGuard Wraps



ExploGuard Network

Product range / sample applications



ExploGuard Jerry can (retrofit action or new)

Jerry can after BLEVE Test



Due to the longtime experience of our team where explosion prevention of fuel tanks is concerned **Paar Logistik GmbH** can offer following attainments:

- Assembly design
- Development of new explosion protection network
- Tool manufacturing for assembly
- Assembly of prototypes
- Packaging (on request including longtime conservation)
- Delivery of explosion prevention systems as module
- Self Sealing Fuel Tanks (self sealing up to caliber 14,7 mm) including explosion prevention



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Properties

ExploGuard

- is a stabile and durable network which protects fuel- and gas-tanks, shafts or pipelines.
- is adaptable to nearly all shapes of containers.
- is, due to the requirements of the application, available in network, balls and wraps.
- meets the standards of NATO concerning the prevention of fuel and gas explosions.



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Danger of explosion with Diesel fuel

Nearly all military vehicles are equipped with Diesel engines.

With missions in hotter regions an additional danger arises:

The danger of explosion rapidly increases above a fuel temperature of 131° F (55° C).

Measuring of the German Army in Afghanistan showed that during the summer months the average temperatures of the fuel was 158° F (70° C).

	Diesel	Benzine
Flammable range in air	0,6 – 6,5 %	0,6 – 8 %
Ignition temperature in air	428° F / 220° C	428° F / 220° C
Flame point	131° F / 55° C	-4° F / -20° C



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Advantages

Danger of explosion with Diesel fuel

This was also proven in a test of the German Army:

Fuel tank MBT Leopard 1*	protected	unprotected
Ammunition: 27 mm API, DM 33	Bullet hole in fuel tank	Tank exploded, fire in engine compartment
Ammunition: Hohlladung 106 mm HLSPK	Full penetration through tank and fuel tank, small fire outside the tank	Tank exploded, fire in engine compartment
Ammunition: AT II Mine Typ B	Shelling from bottom to top through tank and fuel tank, small fire outside the fuel tank	Unprotected part of the fuel tank exploded, both of the outside containers, which still carried explosion protection material, remained in function**

* 100 l fuel tank filled with 40 l Diesel, temperature in gaseous space average 149° F (65° C)

** fuel tank of the first trial was repaired, middle container without explosion protection material



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Advantages

The danger of exploding and burning tanker trucks and tank cars worldwide increases, not only in military operations. Therefore e.g. the German BAM (Federal Institute for Materials Research and Testing) is concerned about the growing number of Autogas stations: the gas tanker trucks are of a much higher risk in public traffic as tanker trucks carrying normal fuel.

Furthermore civil tanker trucks offer less or even no protection against shelling, no matter what caliber. That's why the German Bundeswehr ordered tanker trucks with armored cabins.



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Advantages

ExploGuard has developed a concept that meets following criteria:

- in conformity with EU laws and regulations
- eligible
- meeting military requests
- basic material approved by the German Bundeswehr and NATO
- environment-friendly
- longlasting



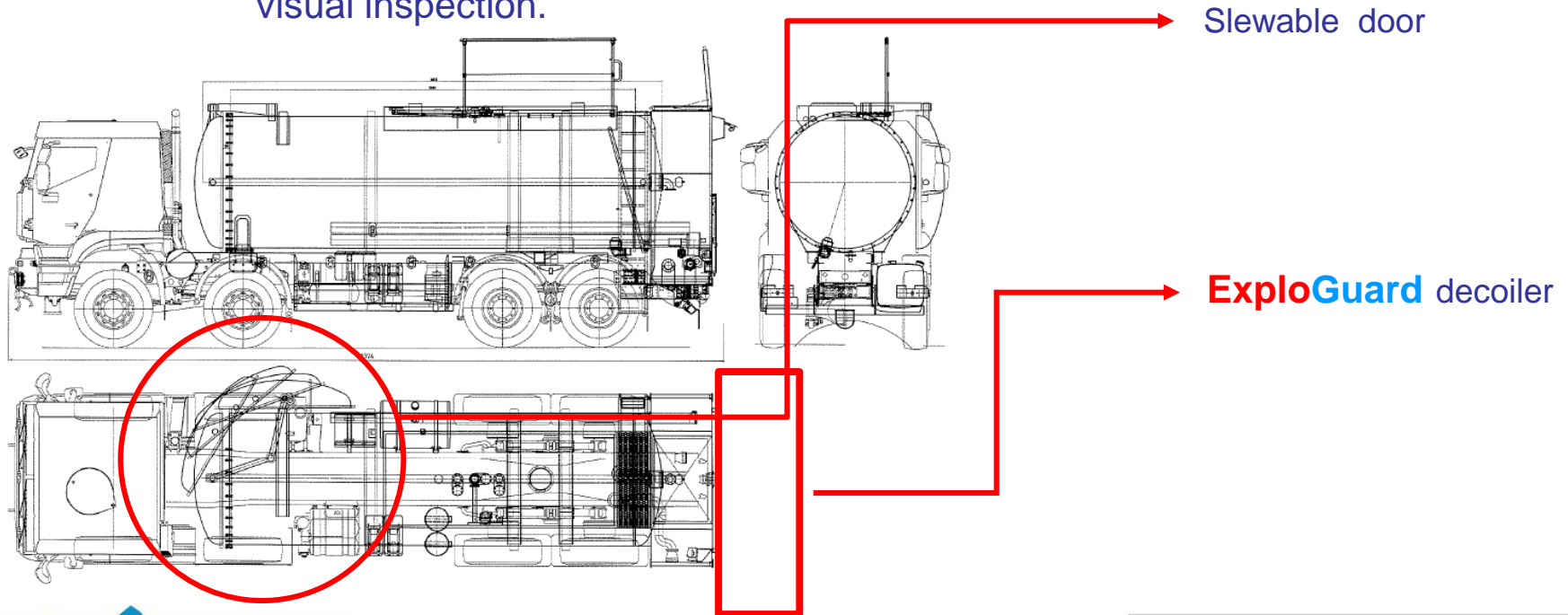
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Advantages

The slewable door makes sure that

- the installations for the instruments can remain at the back of the tank
- the **ExploGuard** decoiler can be easily removed in case of the regular visual inspection.



Delay of the BLEVE-Effect (Boiling-Liquid-Expanding-Vapor-Explosion)

Fed with high thermal energy from the outside (e.g. fire), pressure and temperature on the inside rise quite different. The container collapses.

Safety networks of aluminum alloy delay this effect:

Relief units gather precious time for fire fighting and evacuation.

The impact of aluminum safety network on the BLEVE effect was examined several times, 2 trials with ethanol filled containers at the Bundesanstalt für Materialwirtschaft showed no explosion of the containers filled with safety network. The unprotected containers exploded after 28 minutes at a pressure of 20 bar.



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Advantages



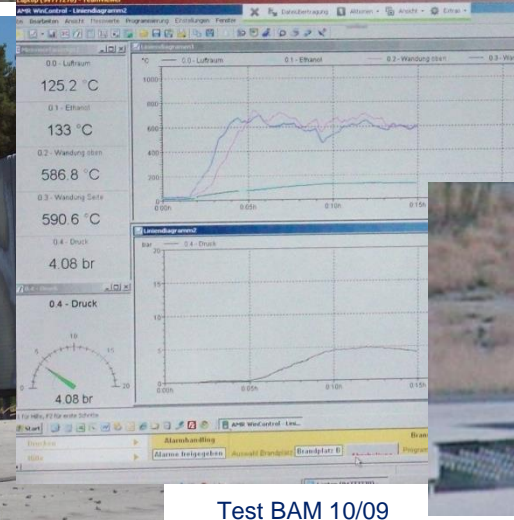
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Advantages

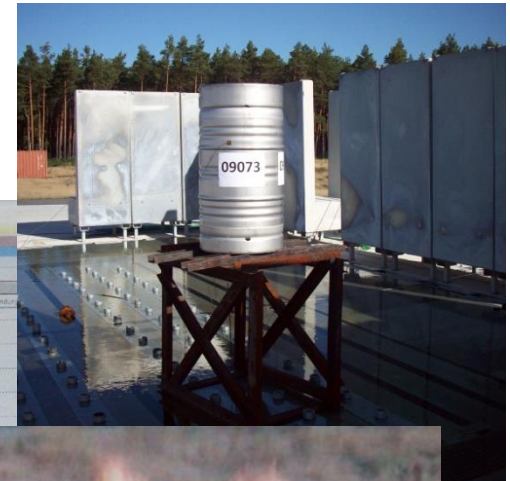
Tests BLEVE-Effect (Boiling-Liquid-Expanding-Vapor-Explosion)



Test BAM 06/09



Test BAM 10/09



Welding and soldering works on fuel tanks

The temperature reducing and explosion preventing properties of **ExploGuard** safety network allow welding and soldering work on fuel tanks without emptying or degasing them. Additional safety and simplification of this work is a result.



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Advantages

Reduction of swash forces

The use of **ExploGuard** safety network in fuel tanks of vehicles reduces the swash forces tremendously and leads in total to a more solid handling.

This was, beside the fire protection properties, the reason why the FIA (highest motorsports authority in Paris) in their appendix K 5.5.1. ff expressively dictates the installation of explosion protection systems.



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Advantages

Weight and volume reduction

Changing operation areas and revised levels of threat demand airlift operations, every pound counts here.

ExploGuard safety network marks itself by low weight and low loss of volume:

- Weight per liter: max. 45 g.
- Loss of volume at 100 % filling ratio: 2 - 3 %.



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Additional advantages

ExploGuard additional is

- **Flexible:** can be applied during production or later
- **Durable:** stand by duty min. 10 years
- **Economical:** reduces the evaporation of fuel under hot climatic conditions
- **24 / 7:** guarantees permanent safety and protection
- **Eco-friendly:** can be recycled after usage and cleaning
- **Ready to go:** in function without any additional procedures.



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Additional Advantages

- **Anticorrosive:** offers additional anti corrosive properties in steel tanks
- **Conductive:** prevents electrostatic charge of the fuel tank
- **Protective:** builds an additional barrier against shelling, mines, fragments and other kinds of explosive ammunition
- **Constructive:** Baffle plates can be left out
- **Resistant:** suitable for all usual kinds of liquid or gaseous fuel
- **Continuous:** works within a wide spread temperature range



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Comparison

	EXPLOGUARD	Foam
Long term stability	20 years	10 years
Loss of operating range due to absorption	0.1 to 0.5 %	1 to 1.5 %
Permissible operating temperature	-112° F to + 674° F - 80° C to + 357° C	-49° to + 248° F - 45° C to + 120° C
Melting temperature	+ 842° F / + 450° C	+ 527° F / + 275° C
Hazardous gases when burning	no	yes
Possible chemical disolvement (re. fuel)	no	yes
Fast heat absorption	no	yes
Loss of volume	2 to 3 %	5 %
Electrostatic charge	instant conduction	no conduction
Hazardous waste after usage	no	yes
Reduction of corrosion process in steel tanks	yes	no
Suitable for delaying/avoiding BLEVE	yes	no
Weight per liter	35 to 45 g	25 g



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Armored chain and wheel vehicles



MBT Leopard II*



ARV /AEV Wisent **



DINGO I + II*



Howitzer 2000*



AMPV (prototyp)*

Armored chain and wheel vehicles



ATV PUMA*



BOXER GTK*



MARDER A3

Photo: J. Klingelhöfer



RMMV

RMMV press picture

Armored chain and wheel vehicles



ENOK

Photo: T. Schuff



Tanker truck (concept)*



CV90 - 30 APC

Photo: BAE Systems



TOYOTA Landcruiser UN

Photo: S. Cuschieri

Water vehicles and historic race cars



Historic race cars*



Sailing yachts Photo: K. Coleiro



Yachts

Photo: K. Coleiro

Microlight planes



ELA 07s

Photo: Gyrocopter ES



Clouddancer

Photo: Rotortec



Skyranger

Photo: FUL GmbH

- Guarantees additional safety and mobility
- Wide variety of strategic deployments for sensitive areas
- Protects crew, vehicle and surrounding area
- Improvement of handling
- Can be applied during or after production, various applications

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