Strong lightweight
www.havel-mf.de

Havel metal foam

Aluminum foam products act as protection against explosions, fire and ballistics

Sandwiches | Panels | Foam filled profiles | 3D shaped elements

Strong lightweight

The Havel metal foam has worked with the series Havel Lite ® for the development and production of aluminum foam and aluminum foam sandwiches–highly innovative and lightweight materials. In cooperation with the Fraunhofer Institute for machine tools and forming technology IWU, a unique manufacturing technology for industrially producing this new material has been developed.

With the wide range of products available in this Havel Lite ® lightweight foam, there is the possibility for entirely new industry solutions.

- Research & development
- FEM calculations
- Product solutions
- Series production
- Further processing

Advantages of aluminium foam

our 2+1 advantages

Lightweight + High mechanical durability +

Low weight and high mechanical durability require innovative lightweight construction solutions. Combined with at least one of the other unique advantages of aluminium foam, completely new and cost-efficient solutions are possible for the industry.

At least one product advantage of aluminium foam

- Non-flammable, met fireprotection standard (DIN EN 45545-2)
- Achieved fire resistance classes as E30 (DIN EN 13501-2 ,DIN EN 1363-1)
- No toxic gases (DIN EN 45545-2)
- Transport packaging of explosives (UN 6A, 6B, 6C)
- Weldable
- 100% recyclable
- Strong vibration dampening
- Noise insulation
- Mechanical uses
- Further processing is possible (drilling, sawing, milling, welding)
- Reparable
- Possibility of various alloys
- Foamability of components (only SAS)
- Soundproofing or silencing material
- Energy absorption/ behaves well in crash situations
- Excellent absorption of shocks
- Vibration reduction
- Metallic bond

=

New and cost-efficient solutions for lightweight construction made of aluminium foam

Individual shape

Weldable

Various joining technologies

Potential uses:

Explosive protection at airports

Examples of the use of aluminum foam products:

- Waste containers
- Flooring of terminals and warehouses
- Potentially locks and shafts
- Partitions and exterior walls

Aluminum foam products act as protection against explosions, fire and ballistics

In most cases the idea is to prevent explosions. If this isn`t possible, equipment and buildings can have this constructive explosion protection attached. Should an explosion occur, the damage to both people and infrastructure can be significantly reduced or even averted.

The explosion forces would be absorbed by the material; this is done by plastic forming protective plates. Havel Lite® SAS – a sandwich composite of steel and aluminum foam – allows energy absorption of this nature. We achieved good results in testing, where the protection objective was achieved with these steel and aluminum foam sandwiches, whilst simultaneously reducing the weight of the material.

The benefits of using the aluminum foam sandwiches

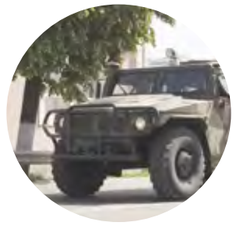
- Minimising physical damage by potential terrorist attacks
- Minimising damage of buildings and potential harm to personnel
- Prevention and protection

Buildings, containers and vehicles can all be fitted with the protective aluminium foam sandwiches quickly, easily and thus more cheaply.

Example sandwich

weldable
rigid
metallic bond

Cover layers e.g. armor steel, secure 500, AP 34



Potential applications

Could be used in large facilities, Industrial, infrastructure or SOC facilities

- Airports
- Power plants
- Central government buildings
- Embassies
- Logistics facilities in critical regions
- Security buildings
- Police stations

Military compounds

- Command post
- Barracks
- Bunkers and hangars
- Military containers

Transportation Vehicles

- Military vehicles
- Armored vehicles
- Cash ands valuables
- Vans and vehicles consulates

Aluminum foam systems are suitable for the protection of persons and buildings

Aluminum foam systems are suitable for protecting cars and buildings, particularly through being used as explosion protection, as well as being fire resistant.

Because of the cellular structure of aluminum foam, it can convert large amounts of kinetic energy into deformation energy. During this process, the cell walls break down and the foam is compressed. This is why aluminum foam is able to protect underlying load-bearing walls from damage.

Explosion protection
The ability to convert kinetic energy into deformation energy is what makes aluminum foam a great explosive protection.

Fire protection
Intrinsic non-flammability and the absence of any flammable adhesives makes aluminum foam systems an interesting option for fire-resistant applications.

Ballistic protection
When combined with highstrength steel or ceramic-aramid fiber – materials, aluminum foam can be used for ballistic protection.

Explosion tests with aluminum foam sandwiches

Test of strength against wringing

1.

Material:
30 mm composite panel made of 3 mm steel, 24 mm aluminum foam, 3 mm steel

Disintegrants:
grenade HG85
(155 g explosive mixture B)

Result:
The dynamic deformation of the test pattern was max. 23 mm. The disintegrant rear facing had no copies of splinters. The splitter indicator was undamaged

Material:
33 mm composite panel made of 3 mm aluminum, 25 mm aluminum foam, 3 mm aluminum

Disintegrants:
DM51 hand grenade (59g PETN)

Result:
The dynamic deformation of the specimen was max. 15 mm. The disintegrant Rear facing had no copies of splinters. The splitter indicator was undamaged.

2.

Reinforced concrete wall vulnerable to explosion

Reinforced concrete wall protected by Havel Lite® SAS

(Concrete wall remains intact because of the front-lying aluminum foam sandwich.)

Products

Havel Lite® sandwiches

The aluminum foam is produced by combining steel (Havel Lite® SAS) and aluminum (Havel Lite® AAS) in the form of sandwiches. Aluminum foam sandwiches are produced without the addition of adhesives. That`s why there aren`t any toxic gases **(EN 45545-2)** which could cause fire. They are recyclable and non-flammable. Transport packages of explosives comply with the standards: **UN 6A, 6B and 6C.**

SAS manufacturing technology: directly foamed-bolts and nuts

Manufacturing ability: curved sandwich

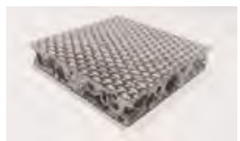
Further processing options: drilling, welding, milling

Steel-aluminum foam sandwiches with steel pipe

Havel Lite® pure foam & 3D shaped parts

Aluminum foam panels with steel mesh have particularly high tensile strength and are less brittle. However, they are even lighter than sandwiches and thereby cheaper than, for example, carbon.

Basically you can create almost any geometric shape with the powder metallurgy process, similarly to the casting process.



Aluminum foam panels with steel mesh

3D molding (aluminum foam crash absorber on the luggage rack of a Audi Q7)

3D molding (sill for a Bugatti)

Foam filled profiles

Research & development

FEM calculations

Product solutions

Series production

Further processing

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