



European Union  
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# SmartArmour – new idea of the smart personal protections

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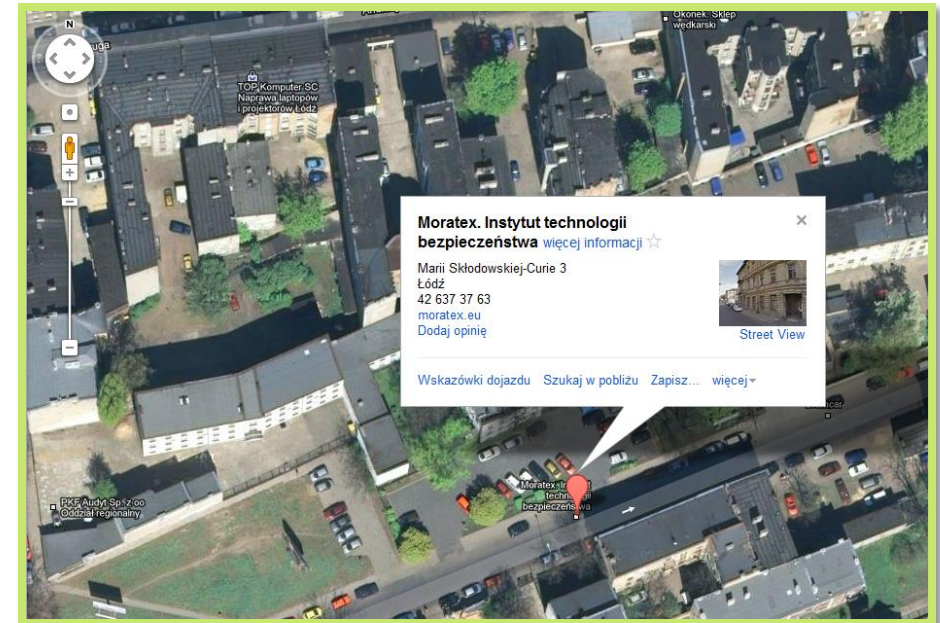
4<sup>th</sup> RESET Seminar on  
“Smart textiles and new ways of production”  
Chemnitz, 20<sup>th</sup> June 2017

**Institute of Security Technologies “MORATEX”**  
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## About the Institute ...

- Institute of Security Technologies „MORATEX” is a research institute (according to Journal of Laws of 2010 No. 96, item 618, as amended) supervised by the Minister of Interior and Administration.
  - The subject of our activities is performing the research and development works to develop new technical and technological solutions in the field of manufacturing the equipment and individual means for the protection of human life and health as well as to transfer them into industrial practice.
- MORATEX is also a notified body No. 1475 under the directive 89/686/EEC regarding the personal protection equipment (PPE).



Google Map



PROTECTION PRODUCTS

PROTECTION VESTS

- SPIKE- AND KNIFE RESISTANT
- FRAGMENTS AND BULLETS RESISTANT
- MULTIFUNCTIONAL

HEAD PROTECTION

- BALLISTIC
- ANTI-BLOW

BALLISTIC SHIELDS

- FIREGUARD HELMETS

ANTI-BLOW PRODUCTS

- BODY PROTECTORS
- HEAD PROTECTORS
- LIMBS PROTECTORS
- ANTI-BLOW SHIELDS







CLOTHES AND SPECIAL PRODUCTS

UNIFORMS

SPECIAL

ORDINARY  
ACTIVITES/OFFICIAL

GA-LA-SUIT,  
CEREMONIAL SUITS

SPECIAL CLOTHES

CBRN

OTHER





OTHER PRODUCTS AND TECHNOLOGIES

PNEUMATIC PRODUCTS

ARMOURING OF THE  
TRANSPORTATION MEANS AND  
BUILDINGS

PROTECTIONE DEVICES AND  
MEDICAL DEVICE

JUMP CUSHIONS

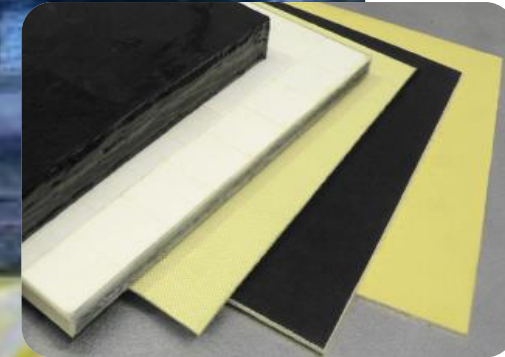
PNEUMATIC BRIDGES

CORNER TILES

ANTI-FLOOD SLEEVES

WOUND DRESSINGS,  
HEMOSTATIC TOPICAL AGENTS

OTHERS





# GOOD PRACTICE INFORMATION

## AIM:

Research objective was focused on designing modern nanostructural body armour with application of rheological fluids and implementing it into the industrial practice. For this purpose many activities were realised:

- development of the rheological fluids as components of body armour;
- designing and making the magnetizing system for magnetorheological fluid;
- developing the technology of fabrics impregnation with the use of rheological fluids for smart body armour;
- developing the computer simulation methods of high-energy impact into smart body armour models consisting of rheological fluids with nanostructures;
- developing the smart body armour models using rheological fluids with nanostructures and protective capacity tests.

## Stakeholders involved

The main stakeholders of the GP are:

- 1) end users of the ballistic protections (services acting in security area and the military forces as well as services responsible for securing persons and sensitive goods);
- 2) manufacturers of the ballistic protections responsible for implementation of modern solutions into industrial practice;
- 3) scientific institution as a user of the new generated knowledge for the commercial utilization of the smart textiles products made of the new generation materials and fibre technologies.

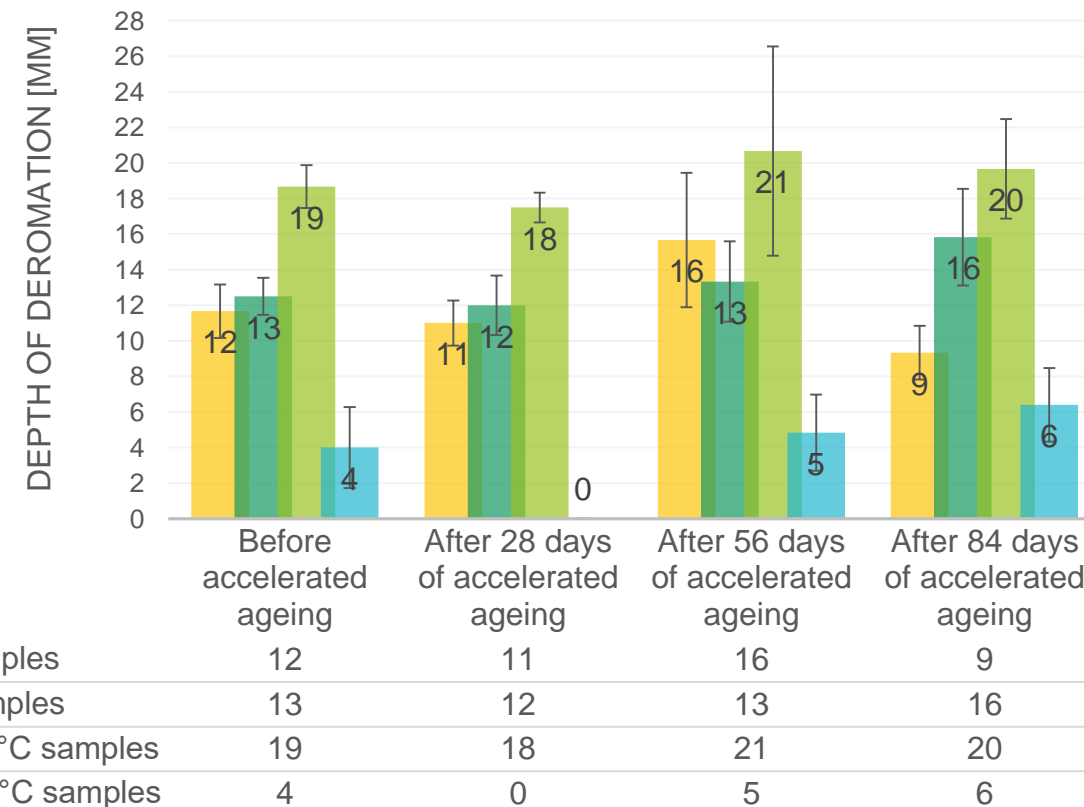




Institute of Security Technologies „MORATEX”,  
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Institute of Armament and Technology

The newly developed anti-trauma pad containing STF applied behind the hard ballistic insert (made of UHMWPE fibrous composite) protect better the user's chest from projectile energy than traditional soft insert. The depth of deformation for composite system with anti-trauma pad was about 60% lower than for the system with soft ballistic insert (according to the standard PN-V-87000: 2011/K3A).

Moreover, the shape of the pad, due to its specially designed surface provides the formation of a thermal channel in the target ballistic personal protection. It also should increase wearer's comfort.





## Resources needed

The implementation of the practices is realizing by two ways:

- **Case A: Private founding investment by the financial supporting of the developmental works and the stage of the implementation to the practices – this way is strongly supported by the MORATEX' human resources and**
- **Case B: Own financial support of the new smart product and smart technologies development and licensing of the new ideas to manufacturers.**

The value of the founding/financial resources to set up and the run the practices are estimated at approx. 250 000 EUR (based on an existing industrial infrastructure) or 1 000 000 EUR (if the new investment is needed).



**Evaluation schemes and mechanisms (monitoring, indicators)**

**Several technological processes were modelled to obtain the multifunctional products based on the smart materials, such as: rheological fluids, fibres, composites applicable in aimed sectors of industry.**

**The main indicators of the GP are the following:**

- A. amount of the newly developed products used for the manufacture of the personal protection;**
- B. the number of industrial enterprises implementing developed technologies.**

**Smart materials find application in virtually any branch of industry. They also comprise a component of a number of textile products.**

# ANALYSIS OF THE GOOD PRACTICE

Relevance of the Good Practice to the policy theme

**The proposed GP will improve the effectiveness (economic and performance as well as safety aspects) of the textile materials applicable for the manufacture of the ballistic protections within a frame of the new, innovative multifunctional products design.**

## Relevance of the Good Practice to the policy theme

The new idea of the passive armours with colloidal fluid and with magnetorheological fluid, for human protection enables a production of much more flexible and lighter composite structures which allow for moving, while getting thick and hard immediately upon strong hit (bullet, knife), or exposed to magnetic field. So, they increase wearer's comfort.

But the application of the rheological fluids improves also the functionality – the resistance of personal protections to hits with a bullet or knife.



## **GPs tangibility: results and impacts on the partner's policy**

The implementation of this GP to the practice in other regions of EU allows to produce a new generation personal protections actively providing support in the fields like safety or health. They are high-tech and highly specialized products with a high added value.

The durability of the GP is not limited due to the observed growth of smart materials application in almost all branches of industry. The GP idea is easily adaptable to other products made of the above-mentioned materials as well as based on the other textiles, demand of which increases every year.

Due to the easy adoption in aspect of smart materials and fibrous or textile technologies, the proposed GP shows high flexibility and adoptability taking into the account leverage effect to trigger further improvements in policies and know-how.

## Success factors

## Difficulties encountered and lessons learnt from the practice

**The success factor of the presented GP is mostly connected with the implementation to the practice in the manufactures with good experience at distribution of the personal protections in areas of the defence and security. The degree of the success will be improved by the implementation of the GP in place with the easy-to-adopt technical and industrial infrastructure.**

**The success factor of the presented GP is mostly connected with the optimal implementation of logistic idea of combining the smart materials with the fabric textiles (high-strength para-aramid fibres) based on the assumption of the GP.**

## Remarks on the durability of the GP results and impacts

### Possible leverage effect to trigger further improvements in policies and know-how

The durability of the GP is not limited due to the observed growth of smart personal protections. The GP idea is easily adaptable to other products and industrial branches, where the demand increases every year. Due to the easy adoption, the proposed GP shows high flexibility and adoptability taking into the account leverage effect to trigger further improvements in policies and know-how.

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## ADDED-VALUE OF THE GOOD PRACTICE

Added-value of the practice in terms of innovativeness, effectiveness and efficiency

The main added-value efficiency is the critical change in aspect of the possibility to produce new generation of smart textile products actively providing support in the fields like safety or health. Smart armours with smart materials are high-tech and highly specialized products with a high added value. One of the main reasons for the fast growing development of smart textiles during recent years was their importance for both research and industry.

It will strongly impact the horizontal policy of the EU as well as sustainable development of every sector of industry that uses textile products and fibre technologies.<sup>18</sup>

## Conditions and requirements of GPs transferability

**The transferability of the GP is not strictly limited due to the observed growth of smart textile products application.**

**The GP idea is easily adaptable to manufacture other products made of the above-mentioned smart materials as well as based on the other types of fabric products, demand of which increases every year.**

**The possibility of easy adoption of the proposed GP indicates high flexibility and adoptability, considering the economic, social and cultural environment.**

**Long and short terms context impacts on GP feasibility and transferability in terms of economic, political, social and cultural environment, involvement of special competencies and skills.**

**The critical aspects affecting the long and short terms impacts are special competencies and skills in the area of designing the smart materials.**

**This risk will be reduced by the transfer of the competencies in subjected terms via education, training support and contacts with industry.**



# RESET

## Interreg Europe



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# Thank you!



*Project smedia*