I+D+i en Seguridad Industria y PRL: proyectos europeos

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Fundación TECNALIA Research & Innovation

(Secretario Técnico de PESI)

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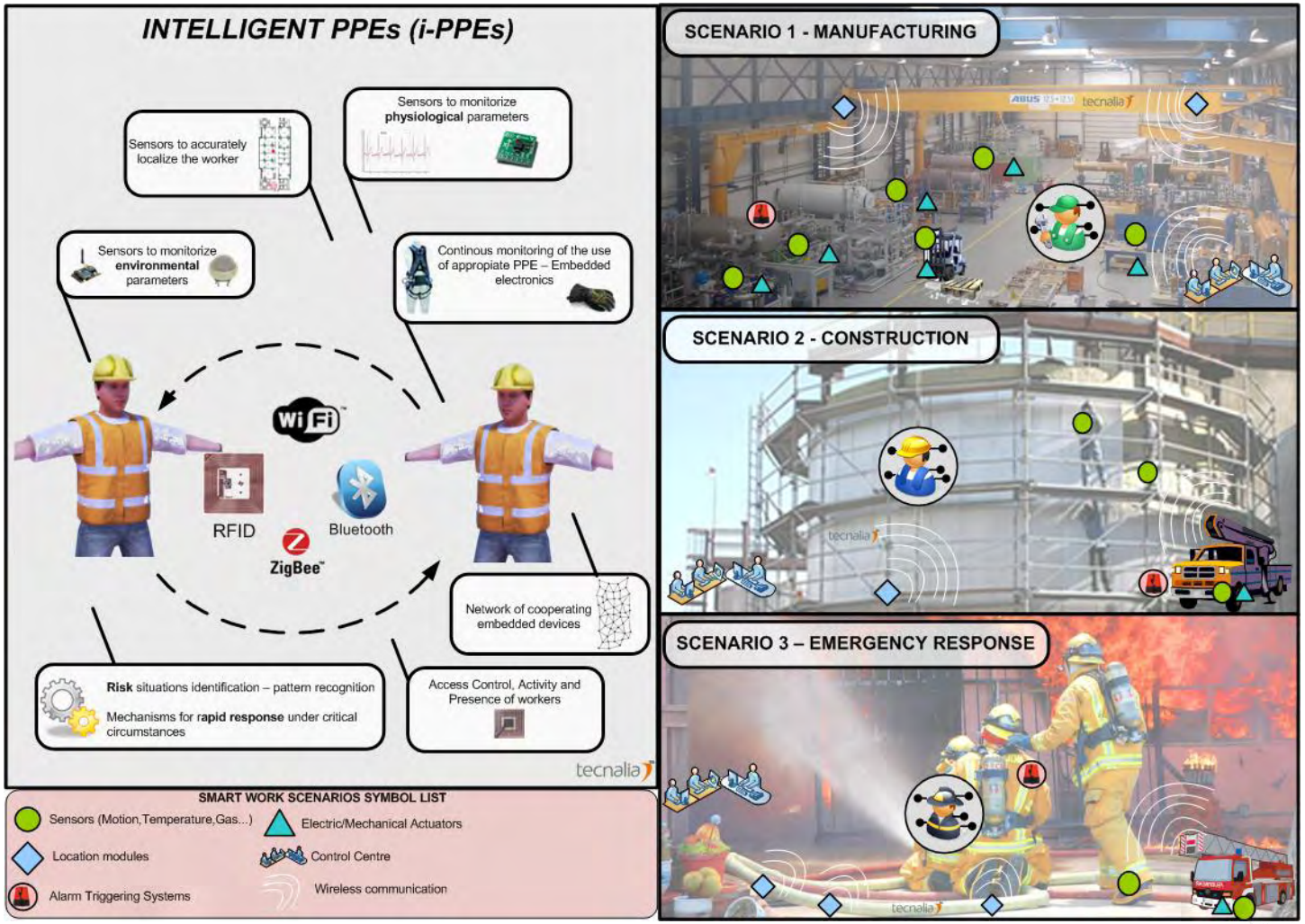
   2. SAFEPROTEX
   3. i-PROTECT

One step ahead:
Towards Smart Working Environments (SWE)



Towards Smart Environments at work (SWE)

tecnalia
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SEVENTH FRAMEWORK PROGRAMME

Level of Interaction & Complexity

LEVEL 4
LAN
(i- PPE / SWE)

LEVEL 3
LAN (i-PPE / i-PPE)
InterWorker

LEVEL 2
BAN (i-PPE / i-PPE)
IntraWorker

LEVEL 1
BAN (End user / i- PPE)

Protective clothing for improved safety and performance in the fisheries

Collaborative Project Targeted at SMEs
Work programme topics addressed: FP7-NMP-2008-SME-2

NMP-2008-4.0-9 Reducing the risk of injury in complex systems through advanced personal protective equipment

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Partners

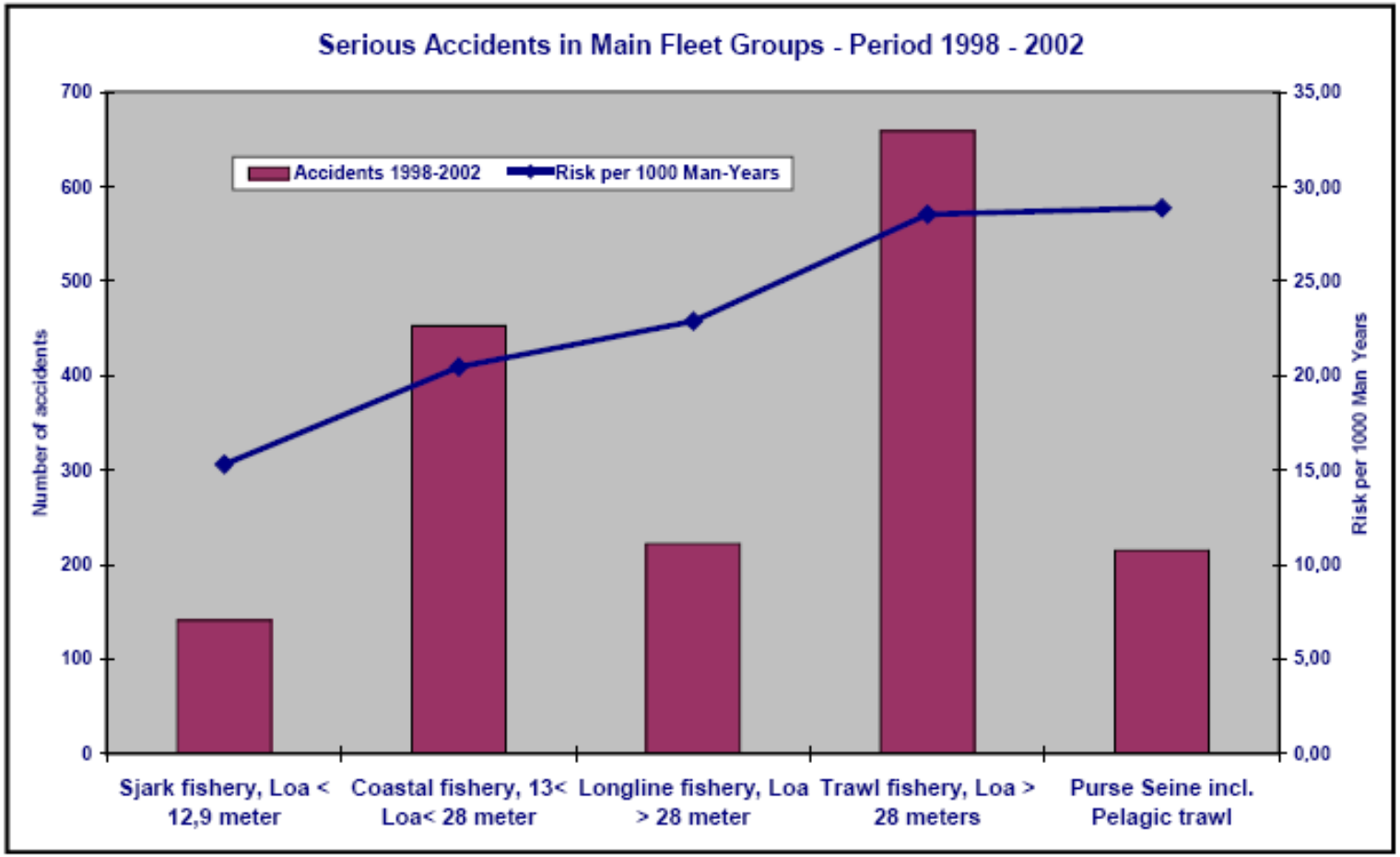
Beneficiary Number	Beneficiary name	Beneficiary short name	Country
1 (Coordinator)	SINTEF (RTD)	SINTEF	Norway
2 (Leader)	Helly Hansen Pro WorkWear	HH	Norway
3	Ohmatex (SME)	OHM	Denmark
4	Tampere University of Technology (RTD)	TUT	Finland
6	Swerea IVF (RTD)	IVF	Sweden
7	Sisyfos AS (SME)	SIS	Norway
8	CENTEXBEL (RTD)	CEN	Belgium
9	B.Huhta (SME)	B.Hu	Finland
10	Leia (RTD)	LEIA	Spain
11	Grado Zero Espace (SME)	GZE	Italy
12	International Safety Products (SME)	ISP	UK
13	International Maritime Health Organization	IMHA	Belgium
14	FOV Fabrics AB	FOV	Sweden

Background

- 28.5 million people are engaged in capture fishing worldwide
- According to the International Labour Organisation (ILO), fishing is among the most dangerous of all professions with as many as 24,000 fishermen around the world killed every year (1)
- Recent reports from the Nordic countries indicate that fatality rates in fisheries range between 90 and 150 per 100,000, and yet the accident prevention, survival training, and search-and-rescue services offered in these countries are among the best in the world. Developing countries have 10 times higher fatality rates
- Reports from Iceland states that every year, 10% of all fishermen and 15% of fishermen on trawlers are subject to injuries (2)
- Improved safety at Sea is a major concern to national authorities, international organizations and nongovernmental organizations
- Efforts have been put in safety education and training of fishermen, improved vessel design, construction and working conditions aboard and improvements in personal protective equipment (ppe)

[1]European Agency for Safety and Health at Work, http://osha.europa.eu/good_practice/sector/fisheries/
[2] http://www.cdc.gov/niosh/ National Institute for Occupational Safety and Health (USA) NIOSH Publication No. 2006-114: Proceedings, Second International Fishing Industry Safety and Health Conference, April 2006

Accidents in the Norwegian fisheries



Fatal accidents in Norwegian Fisheries (1955-2006) (3)

- Foundering; lives lost when loss of vessels like water filling, capsizing, grounding, collisions etc. (44%)
- Overboard accident; falling or pulled over board on the fishing ground and drowning (26%)
- Harbour accident; fishermen falling in the water and drowning when the vessel is anchored in the harbour (17%)
- Crushing or blow by gear; fisherman is fixed in the rope or net and goes into the hydraulic winch or drum and can be killed (6.1%)
- Hit by falling or flying objects; mostly onboard bigger vessels with heavy fishing gear like trawlers (1.6%)
- Other accidents like falling on deck or to a lower level (2.3 %)

(3) Aasjord HL (2006). Tools for improving safety management in the Norwegian fishing fleet. Occupational accidents analysis – period of 1998-2006. Internat. Marit. Health, 57, 76-84.

Fishermens requirements [1]

	User requirement	% of total (n=306)
1	Water-proof	59.2
2	Reinforced on parts especially exposed to wear and tear	54.6
3	Keeps the body warm	54.2
4	Provides freedom of movement	53.9
5	Ensures good visibility	52.0
6	Withstands tearing by fishing hooks	50.3
7	Ventilates water vapour and sweat	48.4
8	Feels light when wearing	48.0
9	Reduces risk of getting caught in fishing equipment and installations	46.7
10	Integrated buoyancy aid	45.8

[1] Geving IH et al. (2006). Safer work clothing for fishermen. Internat Marit Health. Vol 57, 94-102.

- Main accidents are fall overboard/drowning and consequences are often fatal.
- Fishermen report that they rarely wear buoyancy aids while working on deck, in spite of being exposed to a significant risk of falling overboard (4)

- THIS EMPHASIZES THE NEED FOR PPE THAT ARE USER FRIENDLY IN A WORKING SITUATION AND AT THE SAME TIME PROVIDES SUFFICIENT BUOYANCY AND PROTECTION AGAINST COLD IN A EMERGENCY SITUATION IN WATER

Todays fisherman clothing

Highly traditional design

- Few details
- Loose fit
- PVC coated
- Resistant to fish oil, petroleum, concrete, chemicals and mildew
- Tough wear and tear

Flotation suits available are too warm and bulky to work in and are not preferred by the fishermen

Lifejackets are seldom used because they are too warm and bulky

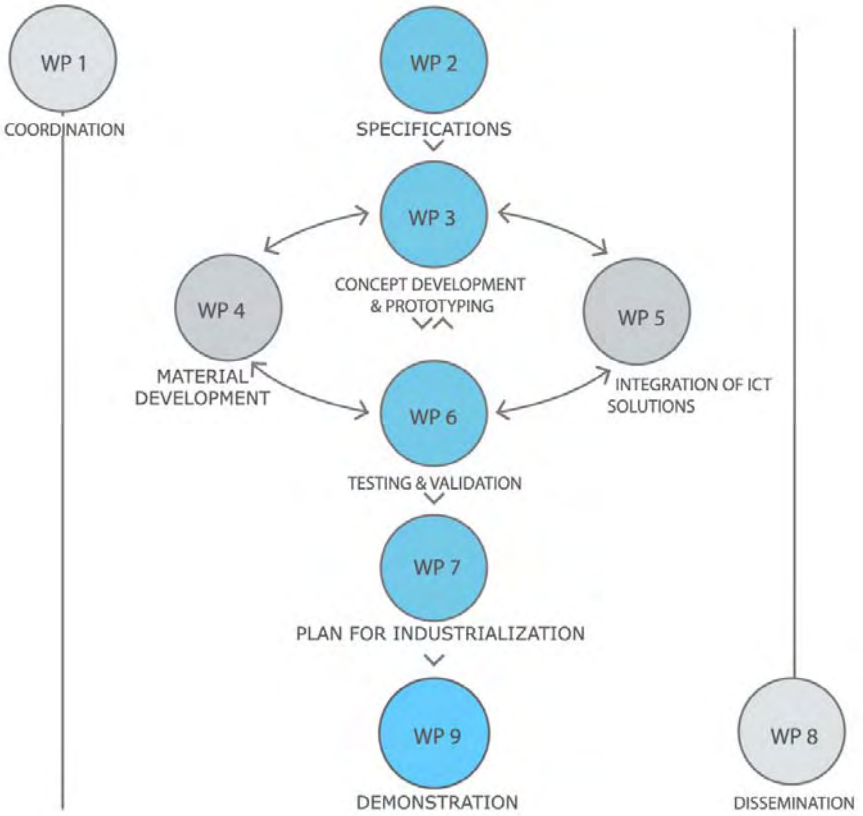
Objectives of safe@sea

The ***main objective*** is to develop a new generation of advanced **personal protective clothing for the fishing industry** that will lead to a **significant increase in safety without reducing work performance**.

Scientific and technological objectives:

- Development of some new specialty and **high-performance materials,** to be integrated in protective clothing capable of maintaining high levels of comfort.
- Integrate **lightweight and flexible solutions for buoyancy** with ergonomic design that does not reduce work performance
- Integrate **sensors** into protective outer garments to detect if fishermen fall overboard to be able to alert, localise and possible emergency stop of motorised equipment and ships engines
- Integrate shock absorber materials for **head protection**
- Develop **ergonomic design** solutions with high degree of user acceptance
- Develop new **total clothing concepts** based on the fabrics and design solutions selected
- **Validate the materials and design solutions** for developed outerwear, gloves and head protection
- Develop an **optimised strategy for the engineering and industrialisation process** and dissemination of the results

Work plan and responsibilities



Responsible:

- WP1 Coordination: SINTEF
- WP2 Specifications: SINTEF
- WP3 Concept development and prototyping: GZE
- WP4 Development and integration of materials: Swerea IVF
- WP5 Integration technologies for ICT solutions: Ohmatex ApS
- WP6 Testing and validation: TUT
- WP7 Plan for industrialization: Helly Hansen Pro
- WP8 Exploitation and dissemination: IMHA
- WP9 Demonstration, TECNALiA

Development of new specialty and high-performance **materials** (Swerea IVF)

- Development and integration of new fabrics with improved **tear strength and resistance to penetration of sharp objects** through high strength fibres and yarns based on UHMWPE (Dyneema, Spectra), LCP polyester or alternative metaaramid metal fibres of stainless steel or Inconel will be combined with polymer fibres (Swerea IVF)

- Development of coated materials with improved **scratch and wear resistance** as well as **stain/dirt repellence** and comfort based on sol-gel technology and special breathable coating layers (CENTEXBEL)

- Developments of materials with **self repair functions** will be integrated in existing coatings materials to restore the protective outer layer on garments damaged by subjection to daily wear and tear (SINTEF)

- Material trials will focus on optimisation of textile structures, plasma treatment of textiles and coatings
- The feasibility and processibility of these new materials will be evaluated of the SME partners

Buoyancy aids
Flotation suit – traditional rainwear - lifejacket

ICT safety solutions (Ohmatex ApS)

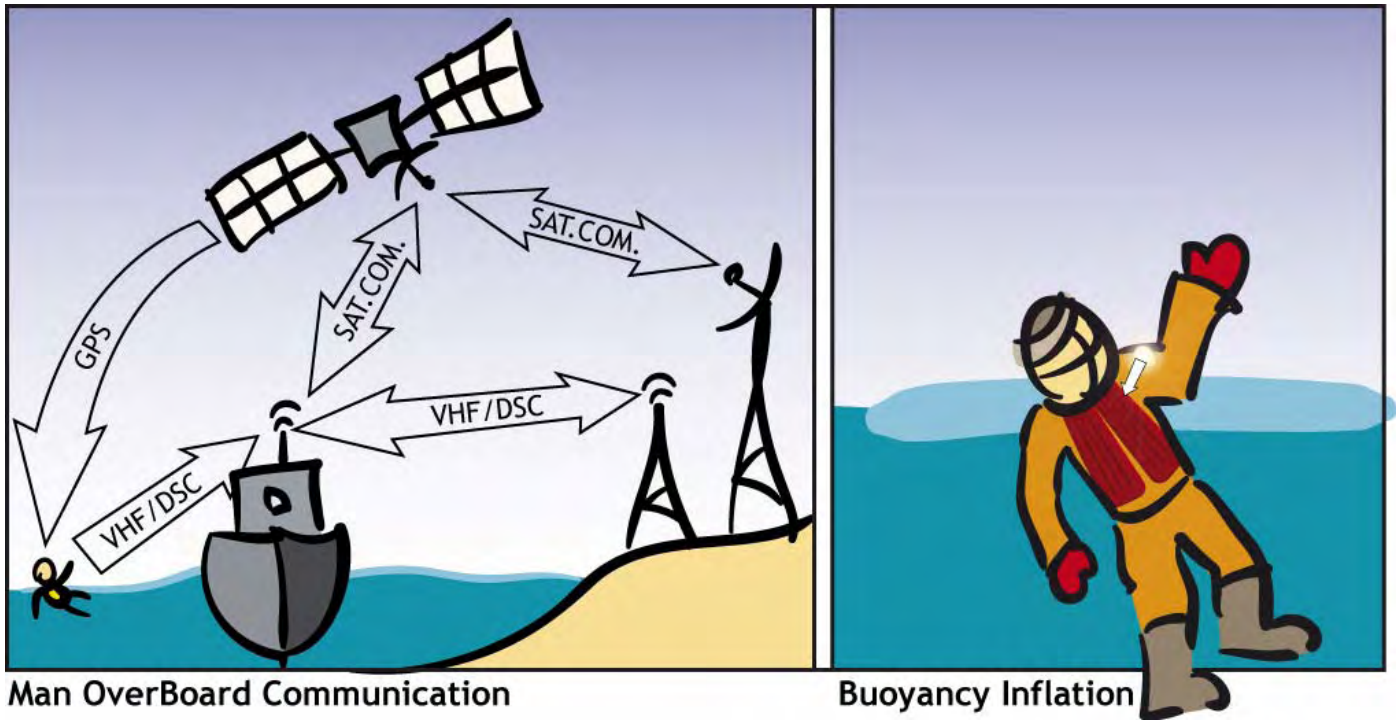
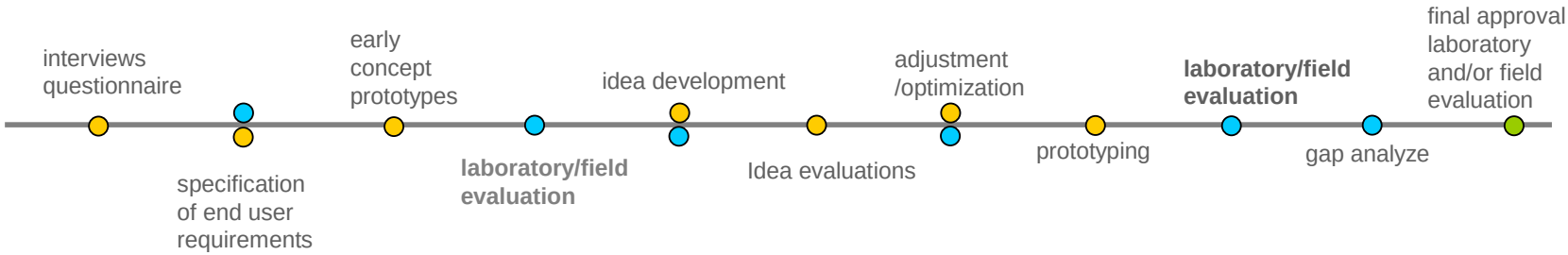


Figure by Torben Schaltz, Omhmatex ApS

User friendly ergonomic design (GZE, SINTEF)

- Obtain an in-depth understanding of the fishermen's working environment and identify possible differences between European fishing countries
- Define a total specification of requirements to personal protective equipment for fishermen
- Performance evaluation in laboratory and field situations
- Market survey on existing commercially available products
- Concept development and prototyping



Impact

Social impact:

- Protective clothing developed in Safe@Sea will contribute to a significant reduction in **work related accidents** in the fisheries.
- Improved protection against cold and hazardous environment will lead to a reduction in **occupational related diseases** as well as increased productivity.
- Attract more people to work in the fisheries
- For the European consumer Safe@Sea will create a base for total new solutions for PPE for the marine environments with enhanced safety without reducing work performance.

Industrial and economic impact

- Safe@Sea will contribute positively to the **Lead market initiative on protective clothing** proposed by the European Comission
- The Safe@Sea project clearly contributes to the idea of ERA (European Research Area) with movement of knowledge and cooperation between researchers and industry (particularly SMEs), all aiming at increasing competitiveness and bringing new energy to the **European textile and clothing industry**
- Safe@Sea project will contribute to the transformation **from resource-intensive to knowledge-intensive industry** by exploiting and **combining research** breakthroughs in **other high tech domains** such as advanced materials and ICT solutions.
- The SME partners in Safe@Sea will develop new products with **step changes** in performance and **high added value**.


Thanks for your attention!
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Photo: Halvard Aasjord, SINTEF

CIOP PIB

i-Protect

Intelligent PPE-embedded system for personnel in high-risk environments

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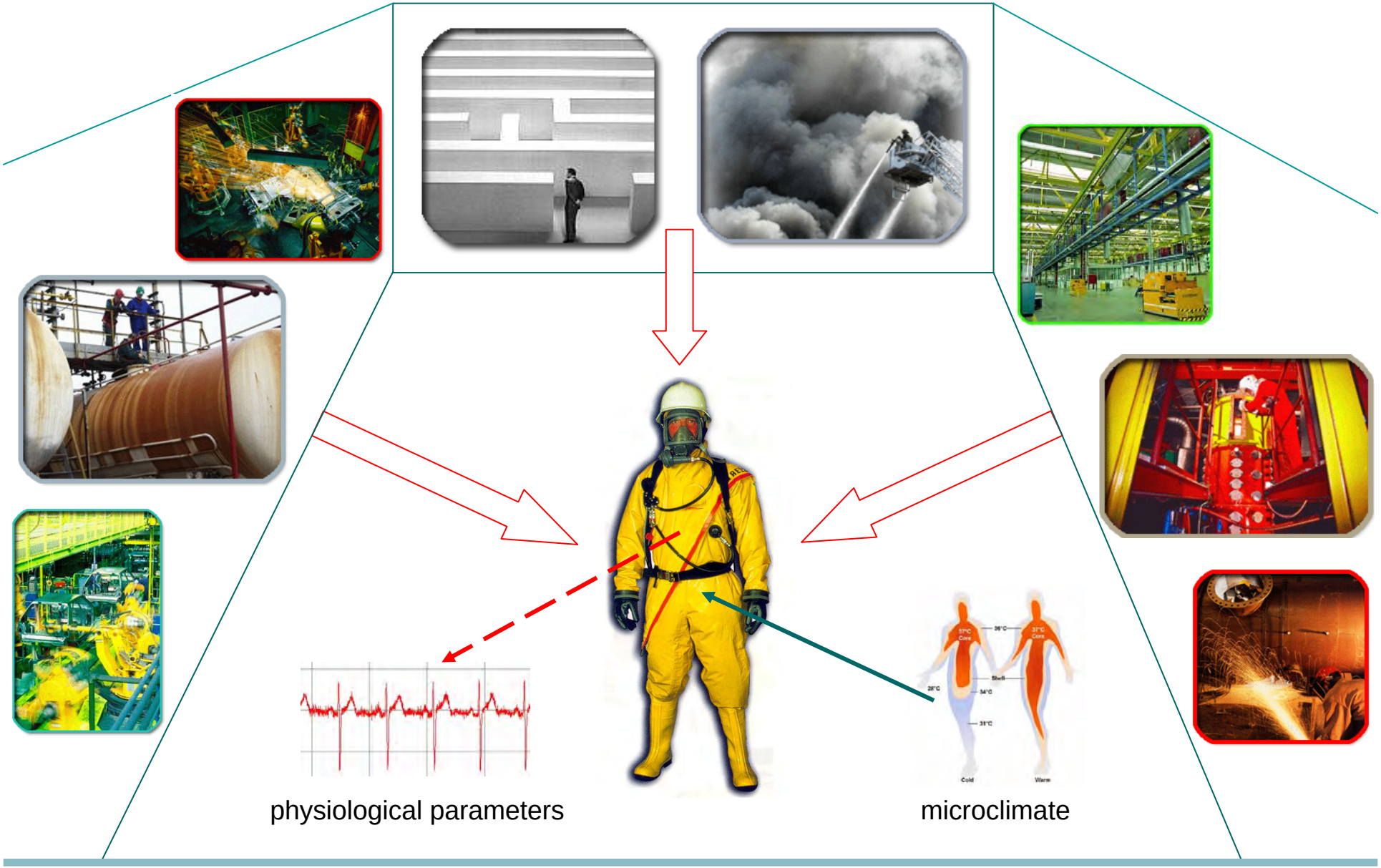
Central Institute for Labour Protection - National Research Institute

Warsaw & Łódź, Poland

High risk environments



Advanced technologies for PPE applications

Textronics

fiber electronic textiles

textronic connection module

textile embedded alert sensor

flexible touch panel

Augmented Reality

precise engineering support

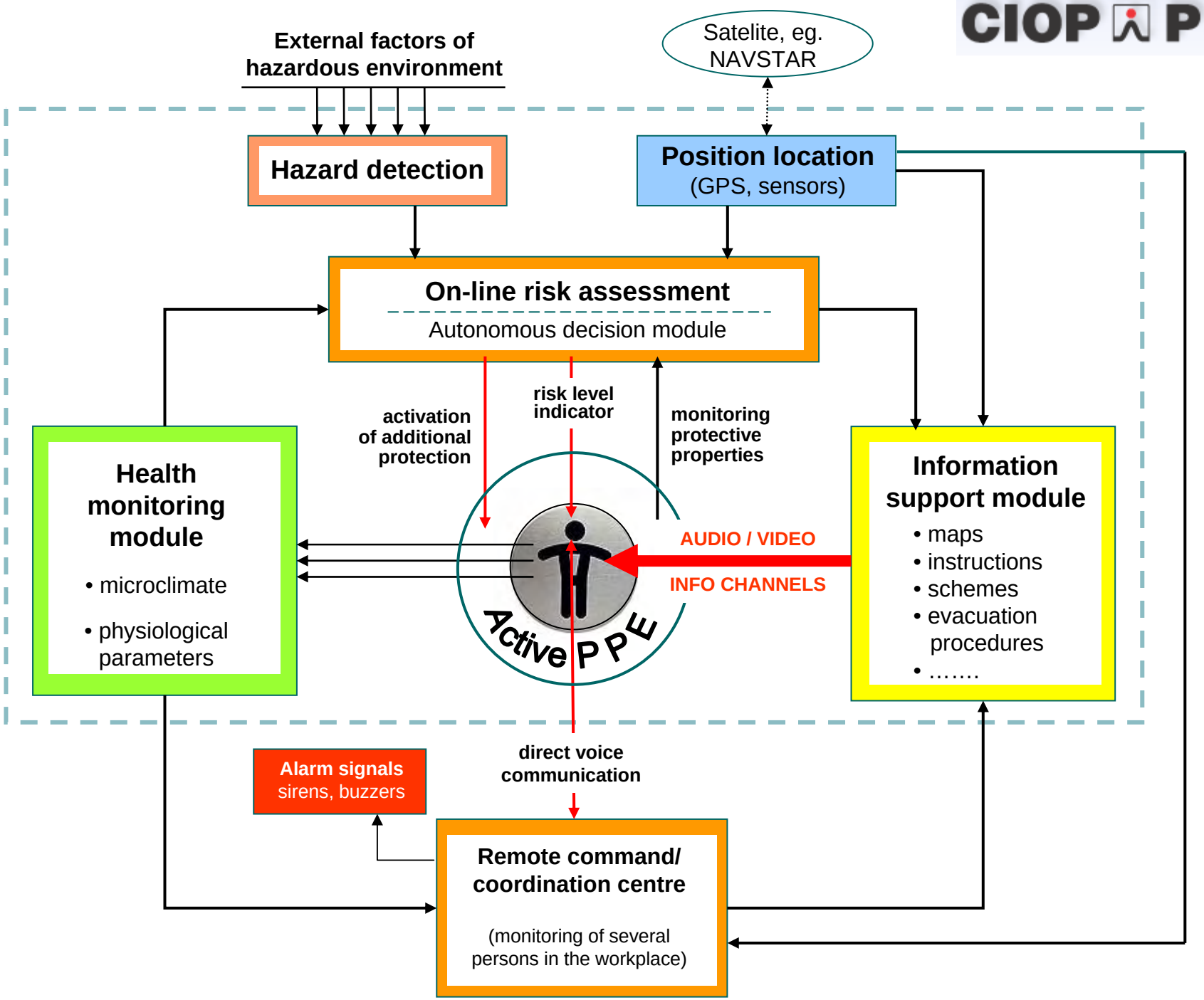
AR visualisation systems

Sensor technologies and ICT

physiology sensors

graphic & sound transmission

real-time networks


External factors of hazardous environment
Satelite, eg. NAVSTAR
Hazard detection
Position location
(GPS, sensors)
On-line risk assessment
Autonomous decision module
activation of additional protection
risk level indicator
monitoring protective properties
Health monitoring module
• microclimate
• physiological parameters
AUDIO / VIDEO
INFO CHANNELS
Information support module
• maps
• instructions
• schemes
• evacuation procedures
• …….
Active PPE
Alarm signals
sirens, buzzers
direct voice communication
Remote command/ coordination centre
(monitoring of several persons in the workplace)

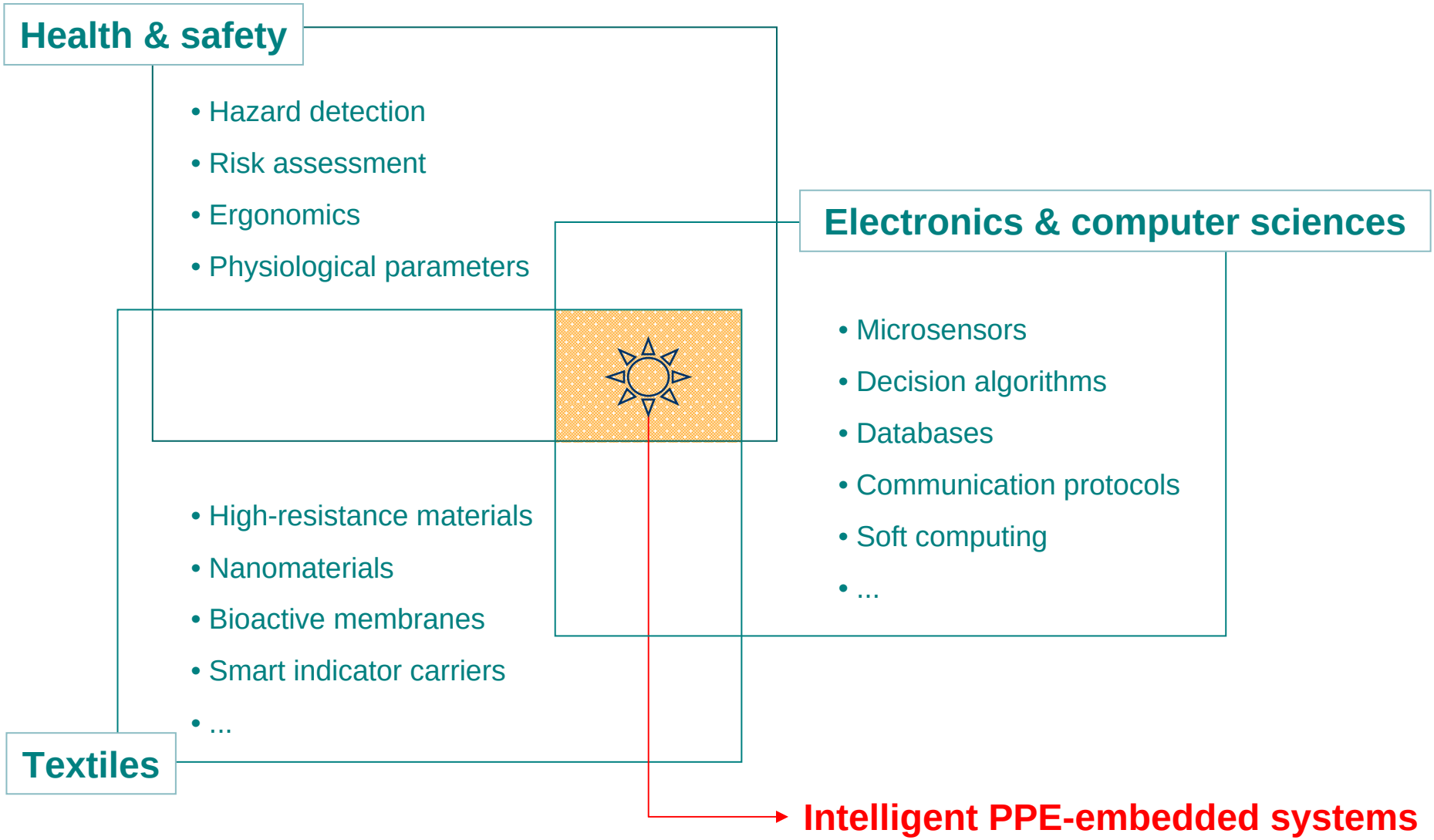
The objective of i-Protect

is to develop and validate a model of an intelligent PPE-embedded information management system supporting emergency personnel and operators of complex installations.

The model should enable collection and real-time analysis of reduced data on environmental factors, physiological parameters, protective properties and operators's position.

A user-interface based on AR and other advanced vision/sound technologies will provide easy-to-understand information on work operations, current risk level and emergency procedures.

Research areas



Tasks to carry out within the project

- Identification and analysis of workplaces with potential high-risk environments
- Analysis of technical solutions applied for collecting and managing information (microsensors, ICT, visualisation, GPS)
- Optimisation of sound- and visio-based information channels (communication interface under various conditions)
- Usability (ergonomic) analysis of the proposed system (adaptation to psycho- and physiological conditions of the user)
- Implementation of decision supporting algorithms (artificial intelligence - soft computing)
- Testing and validation of the developed system (various industries, various PPE types and solutions)

Consortium and Project Info (http://www.ciop.pl/21160.html)

Consortium

Central Institute for Labour Protection - National Research Institute (CIOP-PIB), Poland (the Coordinator)
BAM Bundesanstalt für Materialforschung und –prüfung, Germany
Colorobbia Italia S.p.A, Italy
Finnish Institute of Occupational Health (FIOH), Finland
Instituto de Biomecánica de Valencia (IBV), Spain
Instytut Techniki Górniczej KOMAG, Poland
Fundación TECNALIA Research & Innovation, Spain
Sperian Respiratory Protection France, France
Vereinigung zur Förderung des Deutschen Brandschutzes e.V. (VFDB), Germany
Safibra, Czech Republic
Aero Sekur S.p.A, Italy
Coalesenses GmbH, Germany
neoVision Sławomir Zwolenik, Poland
Polski Koncern Naftowy Orlen S.A. (PKN ORLEN), Poland
Central Mining Rescue Stadion (CSRG), Poland
Orneule Oy, Finland

Keys to the success of SAFEPROTEX

- **Protection against multiple hazards**

The project contemplates the exploitation of novel and advanced technologies to reach each functionality and then to combine the targeted properties. Functionalization is being achieved through bulk modification of the fibers and surface treatments of the developed textiles. The variety of options available regarding both the functionalizing materials and their application technology ensures that multiple protective properties will be simultaneously achieved.

- **Physiological, mechanical & ergonomic parameters**

Textiles functionalization is usually accomplished at the expense of comfort and/or mechanical parameters. SAFEPROTEX exploits recent advances in nanotechnology to avoid these detrimental effects. The proposed approach to thermo-physiological wear comfort involves the application of PCMs through innovative processes. Finally, the ergonomic wear comfort is being considered through the ergonomic design based on user requirements, while the psychological wear comfort is also addressed.

- **Extension of service life**

A common drawback of protective textiles is related to the deterioration of functional properties after use and consecutive washings. The solution proposed in SAFEPROTEX to ensure optimal performance over the whole service life of protective garments is their self-cleaning functionalization or the induction of water and oil repellent properties, in order to minimize washing requirements.

- **User & Environment friendliness**

Any materials and processes that are harmful to the environment (and humans) are being avoided in order to comply with current legislation and directives. Such criteria are being taken into consideration when selecting fibrous substrates, active agents and treatment application processes.

Partnership

CLOTEFI SA; www.etakei.gr

INOTEX spol,s.r.o.; www.inotex.cz

RESCOLL Technical Centre of Materials; www.rescoll.fr

TDV Industries; www.tdv-industries.fr

De Montfort University; www.dmu.ac.uk

Tampere University of Technology; www.tut.fi/swl

GAIKER Technological Centre; www.gaiker.es

Swerea IVF AB; www.ifp.se

Next Technology Tecnotessile Societá Nazionale di Ricerca r.l.; www.tecnotex.it

LEITAT Technological Center; www.leitat.org

Lenzi Egisto S.p.A; www.lenzie.it

Vyskumny ustav chemických vlakien, a.s; www.vuchv.sk

CALSTA Work Wear S.A.; www.calsta.com

NANOTHINX S.A.; www.nanothinx.com

Suministros Iruñako S.V.; www.suministrosirunako.com

Fundació Privada CETEMMSA; www.cetemmsa.com

SAR-ESPAÑA; www.sar-esp.es

RESCUE GR; www.rescue.gr

www.safeprotex.org

FP7-NMP-208-SMR-2 / 228439

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FP7-NMP-208-SMR-2 / 228439

High Protective Clothing for Complex Emergency Operations

SAFE PROTEX

High protective clothing for complex emergency operations

Coordinated by CLOTEFI S.A.

The SAFEPROTEX Project is funded by European Commission, under 7th Framework Programme

Concept & Objectives

The concept of the project lies in the development of protective uniforms, incorporating multiple protective properties and designated for rescue teams under complex risky conditions met in various types of everyday emergency operations.

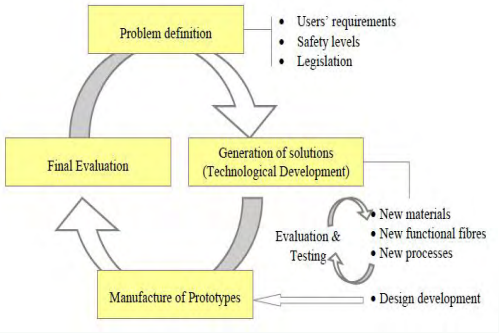
The idea that constitutes the basis of SAFEPROTEX is to create innovative solutions to address the main limitations of existing protective garments for rescue teams and emergency operators. Thus, the key scope of the project is to develop uniforms exhibiting the following characteristics:

- **Protection against multiple hazards.**
- **Physiological comfort and enhanced mechanical parameters.**
- **Extended service life compared to existing protective clothing.**

In the frame of SAFEPROTEX three representative operations are being considered and the corresponding protective uniforms are developed as prototypes:

- **Emergency operations under extreme weather conditions (floods, hail, etc).**
- **Operations under the risk of wild land fires.**
- **First aid medical personnel potentially exposed to any type of risk.**

Overall Strategy

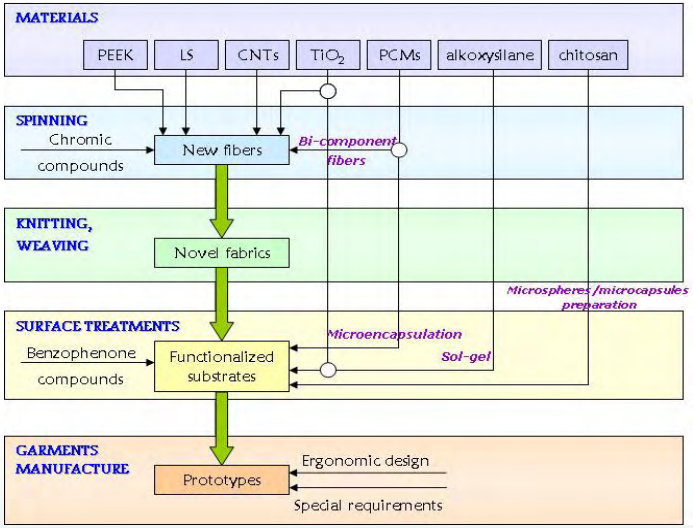


The process of protective clothing development adopted in SAFEPROTEX

First sets of risks & requirements

	Major Hazards to be met		Protective Properties required
Case 1: Emergency teams encountering extreme weather situations involving floods, hail, etc	Water permeation		Hydrophobic, water impermeable
	Low temperatures		Thermo-insulation
	Microbial contamination		Antibacterial
	Foul weather conditions		Weather & wind resistance
Case 2 Personnel exposed to the risk of wild land fires	Fire		FR and heat protection
	UV irradiation		UV protection
	High temperatures		Cooling effect, temperature alert
Case 3 First aid medical personnel, potentially exposed to any type of hazard	Microbial contamination		Antibacterial
	High or low temperatures		Thermo-regulation
	Static electricity		Antistatic
	Catch up fire		FR and heat protection
	UV irradiation		UV protection
General properties that apply in all three cases	*Self-cleaning*		
	Enhanced mechanical parameters		
	Thermal comfort: heat and moisture transfer, thermoregulation		
	Mechanical comfort: handle		
	.....		

Materials & Processes



Materials vs. Functionalities

- **Alkoxysilane nanosols & inorganic/organic hybrid nanolayers** are developed and applied through sol-gel processes to provide super-hydrophobicity, self-cleaning effect, chemical resistance, anti-UV, antibacterial and/or antistatic properties.

- **Carbon nanotubes (CNTs)** may provide enhanced mechanical properties, antistatic properties, flame retardancy and thermal stability when finely dispersed in the bulk of the fiber.

The reactor used for the production of CNTs

- **Layered silicates (LSs)** also provide flame redardany and thermal stability, particularly when combined with conventional FRs.

- **Nanocrystalline TiO2** will provide self-cleaning, anti-UV and antibacterial properties.

- **Benzophenone-based compounds and polymers (PEEK)** may provide self-cleaning, anti-pollution and antimicrobial properties. Low molecular weight compounds are investigated via surface application while modified PEEK is being considered as a potential fiber-forming polymer.

Core-sheath bi-component fibers

- **Phase change materials (PCMs)** may provide thermoregulation. Different approaches are being considered for their application including microencapsulation and direct incorporation in melt-spun bicomponent fibers.

- **Thermochromic dyes** are used to provide a high-temperature alert.

- **Chitosan microparticles** may provide antibacterial effect.

PARTNERS

- SINTEF
- Helly Hansen AS
- Ohmatex
- Tampere University of Technology
- Swerea IVF
- Grado Zero Espace
- CENTEXBEL
- Sisyfos
- B. Huhta
- Tecnalia
- International Safety Products
- International Maritime Health Organization
- FOV Fabrics AB

safe@sea

SEVENTH FRAMEWORK PROGRAMME

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SINTEF

Leader:
Helly Hansen Pro WorkWear

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www.safeatsea-project.eu

safe@sea

PROTECTIVE CLOTHING FOR IMPROVED SAFETY AND PERFORMANCE IN THE FISHERIES

SEVENTH FRAMEWORK PROGRAMME

GRANT AGREEMENT N°:
22933-2/SAFE@SEA

The main objective of Safe@Sea is to develop a new generation of advanced personal protective clothing for the fishing industry that will lead to a significant increase in safety without reducing work performance.
This will be realised by the following objectives:

1. Development of some new specialty and high-performance materials, to be integrated in protective clothing capable of maintaining high levels of comfort.

2. Integrate lightweight and flexible solutions for buoyancy with ergonomic design that does not reduce work performance.

3. Integrate sensors into protective outer garments.

4. Integrate shock absorber materials for head protection.

5. Develop ergonomic design solutions with high degree of user acceptance.

6. Develop new total clothing concepts based on the fabrics and design solutions selected.

7. Validate the materials and design solutions for developed outerwear, gloves and head protection.

8. Develop an optimised strategy for the engineering and industrialisation process and dissemination of the results.


Safe@Sea partners during fishing trip in Lofoten Island


Fishermen repairing nets