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# NANORISK : Best practices, effectiveness, prevention and protection measures for risk control posed by engineered nanomaterials

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## Introduction

NanoRISK is a research project co-founded by the European Commission, through the LIFE+ Environmental Policy & Governance program. The project was launched in October 2013 and is expected to be completed in September 2016. The project is coordinated by ITENE and implemented in partnership with VITO, AVANZARE, CRP, INVASSAT, INSHT.

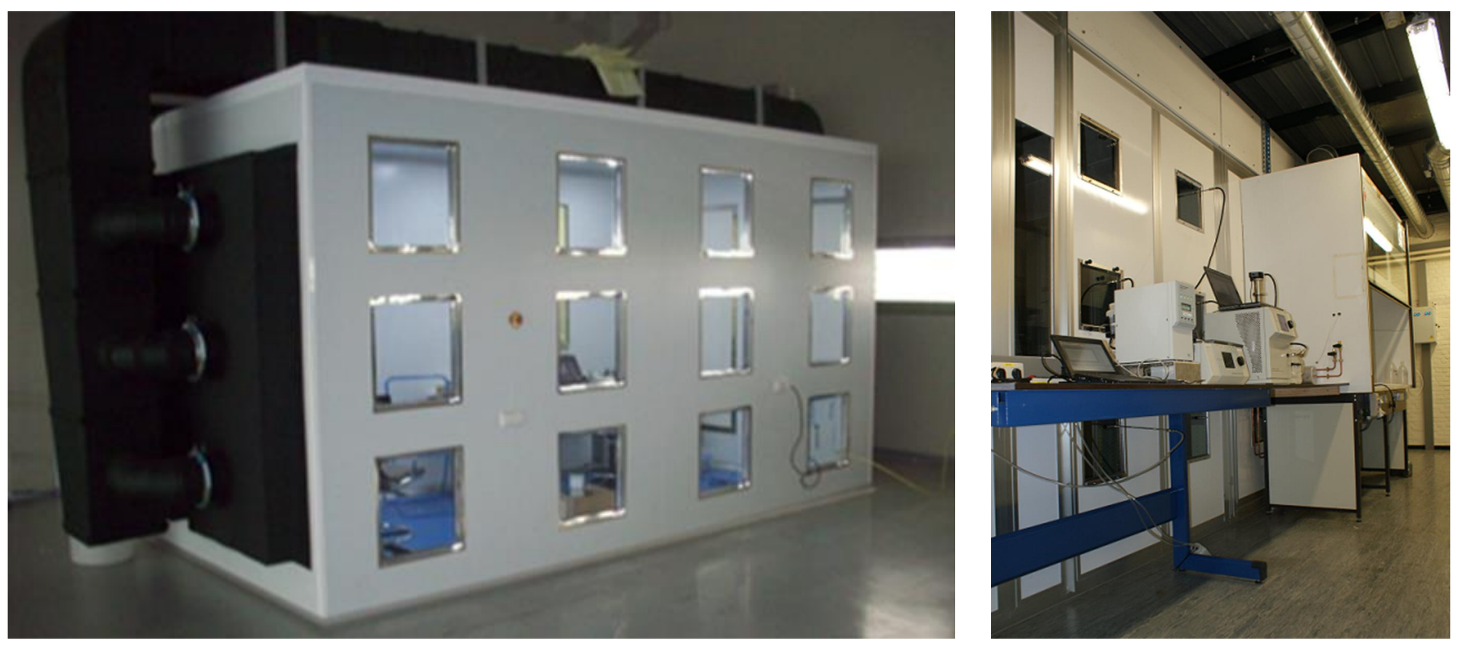


Figure 1 left: Developed test chamber at ITENE, right: Test chamber at VITO

The main objective of the project is to evaluate the **effectiveness of Risk Management Measures (RMMs)** to prevent or minimize exposure to engineered nanomaterials (ENMs) during specific workplace situations in the nano composite industry.

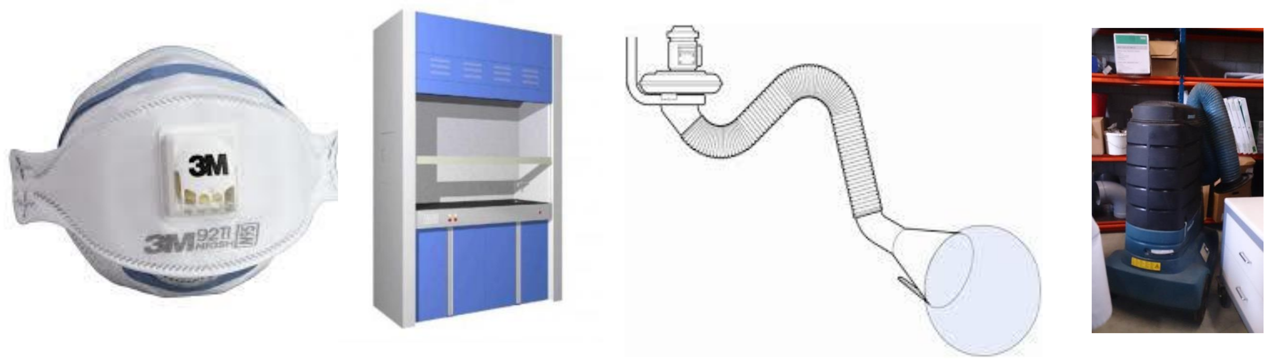
Specific project objectives are:

- Compile and **evaluate literature** regarding the effectiveness of Personal Protective Equipment (PPE) and Engineering Controls (ECs) to prevent or minimize exposure to engineered nanomaterials (ENMs)
- **Optimize/develop test protocols** and support standardization activities concerning nanoparticle efficiency testing of PPE and ECs.
- **Evaluate test protocols** under controlled conditions in two nano aerosol test chambers at ITENE and VITO (figure 1)
- **Evaluate effectiveness** of the risk management measures **during simulation** of nanoparticle emitting activities inside the test chambers
- Support **RMM library (CEFIC)** with quantified data on nanoparticle efficiency of PPE and ECs.
- **Implementation of RMMs in two industrial case studies** including pre- and post-implementation exposure monitoring

## Some results of the first year

**Development of nano aerosol test chamber at ITENE with VITO's nano aerosol test chamber taken as an example (figure 1)**

- Dimensions of compartments
  - SAS (L) 1800 (W) 2400 x (H) 2500 mm
  - Wet test room (L) 1800 (W) 1750 x (H) 2500 mm
  - Laminar flow room (L) 2400 (W) 4150 x (H) 2500 mm
- Interior sandwich panels (UNE-EN 14509:2006/AC:2009) covered with antistatic resin
- Negative pressure (- 60 Pa Laminar flow, -10 Pa Wet);
- HEPA filtered inlet and exhaust;
- Polycarbonate windows perpendicular to the flow for injecting generated aerosol (generation inside fume cupboard) and guiding through sample inlet tubes;
- Temperature, humidity and pressure monitoring and logging.



**Description of protocols for RMMs effectiveness testing** covering

Ventilation control
- Partial enclosures (fume hood)
- Capture hood

Personal protective equipment
- Body protection (suits, footwear)
- Hand protection (gloves)
- Respiratory protection (disposable, reusable, powered)
- Face/Eye protection (goggles)

**Optimization/Development of (draft) standards**

- Nanoparticle capture efficiency of a capture hood
  *Generating nanoparticle tracer and release through several diffuser pipes at the work surface and measure particle concentrations in the duct and compare with 100% aerosol capture* (Ellenbecker et al 1986);
- Containment effectiveness of a nanomaterial fume cupboard
  *Containment test with and without manikin, robustness test, nanoparticle handling test method, common worker maneuvers test method using a nanoparticle tracer (EN 14175:2003; Dunn 2013; Tsai et al 2009);*
- Disposable Half Masks & Half Masks with particulate filter — Determination of the penetration factor (Ps), most penetrating particle size (MPPS) and total inward leakage (TIL) for nanoparticles
  *Ps/MPPS: half mask shall be fitted in a leak-tight manner to a dummy head, and will be placed in a sealed enclosure. Through this enclosure flows a constant concentration of nano aerosol (MPPS: certain size). Air shall be supplied to and from the dummy head from a breathing machine. Inhaled air is sampled and analyzed to determine nano aerosol concentration. TIL: half mask shall be fitted to a dummy head but not in a leak-tight manner.(EN 149:2001, EN 13274-7:2008, EN1827:1999, Rengasamy et al 2011)*

**References**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## Short term developments

- Further development of draft standards
- Experimental evaluation test protocols/draft standards inside test chambers

**Co-ordinator** ITENE

**Partners** avanzare, vito, CRP, INSTITUTO NACIONAL DE SEGURIDAD E HIGIENE EN EL TRABAJO, INVASSAT Institut Valencià de Seguretat i Salut en el Treball

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