OBJECTIVES

APIP is a national non profit association whose main goals are to promote and support the Plastic Industry as well as defending its economic, social and associative interests towards national entities and international organizations.
MEMBERS

TOTAL: 115

Sector:
• Converters
• Recyclers
• Companies directly linked to this industrial sector

Companies: Mainly Small or Medium sized

Market: +/- 60% of the national plastic market

Employment: around 10,000 workers

MAIN ACTIVITY SECTORS

- Electrical and electronic appliances
- Technical, industrial and automotive components
- Agriculture and Household
- Medical and Healthcare
- Construction products
- Automation and Transport
- Thermal insulation
- Packaging
- Recycling
MAIN SECTORS OF ACTIVITY OF THE MEME

- Packaging: 32%
- Technical parts: 18%
- Pipes: 12%
- GRP: 6%
- Medical & Healthcare: 1%
- Automotive & Electrical Industry: 2%
- Recycling: 2%
- Advertisement: 2%
- Household goods: 6%
- Shoes & Clothes: 3%
- Caps & Lids: 3%
- Components: 1%
- Compounds: 3%
- Foams: 2%
- Insulating: 1%
- Building Construction: 3%
- Electrical, Sound & Photo: 1%
- Furniture: 1%
- Automation & Transport: 3%
- Injection Comp.: 1%
SERVICES RENDERED TO MEMBERS

APIP has Economical, Technical and Juridical Departments to advise its members

JURIDICAL DEPARTMENT

- Collective Agreement for Chemistry
  - Industry

- Regular advice to Members on questions related to legal and labor subjects

- Dissemination of knowledge concerning labor and fiscal regulations, tax proceedings and litigation, accounting...

TRAINING

APIP participates intensively in developing Training Programs for the employees of the companies of this sector as well as for young people who are interested in working in this sector of activity.

The Training Programs are developed by experts of the plastics industry and emphasize industry standards and best-practices.

Areas:

- Basic Injection Moulding
- Maintenance
- Plastic Materials
- Moulded part Defects
- Health and Safety...
APIP AS SECTORIAL STANDARDIZATION BODY

Since 1988 APIP is recognised by Portuguese Institute for Quality, the National Body, as a Standardisation Body (ONS) in the field of Plastics and are represented and working at International (ISO) and European (CEN) levels.

MONITORIZATION:
of all information of the European Committees of Standardization (CEN) and International Organization for Standardization (ISO)

RESPONSIBILITY:
for the management of the National Technical Committees:
CT 58 - plastic pipes and ducting systems
CT 161 - plastic pipes and fittings and valves for the supply of gaseous fuels

COOPERATION:
with other national committees, such as:
CT 42 - Health and Safety at Work
CT 60 – Packaging
CT 142 - Greenhouses
APIP AND THE MAIN AREAS OF ACTION

Through its Technical Staff acts in these issues as partner in dialogue with National and EU Authorities; draw up opinions and make recommendations, provide support and clarifications as required.
NACIONAL AND INTERNACIONAL AFFILIATIONS

IPAD
International Plastics Association Directors

PlasticsEurope
Association of Plastics Manufacturers

Nacional

teppfa
European Plastics Converters

EuPC
European Plastics Converters

piep
Confederação Empresarial de Portugal
PROTOCOLS
The “Plastic Seminar” takes place every year and is considered the most important meeting point of the professionals of the sector.
NanoSafePACK
Development of a Best Practices Guide for the Safe Handling and Use of Nanoparticles in Packaging Industries

Research for SMEs Associations
CALL FP7-SME-2011-BSG

1st National Meeting on Nanotechnology: “Regulate to Compete” - 3 April 2014
INDEX
1. Problem to be solved. Why this project?
2. Why Nanocomposite Industry
3. Objectives
4. Concept of the project
5. Consortium
6. Benefits to the participants
7. Main Tasks and Responsibilities
8. Main Impacts of the Project
9. Expected Results
10. Important Aspects
PROBLEM - NEED

- The manufacture of Nanocomposite brings new opportunities to the European packaging industry in general, nonetheless, the safety issues related to workers and consumers have to be faced prior to the investment in new resources from the SMEs.

SOLUTION

Development of a Best Practices GUIDE to allow the safe handling and use of Nanoparticles in Packaging Industries, considering integrated strategies to control the exposure to Nanoparticles in industrial settings and provide the necessary data to minimize and control the potential release of Nanoparticles from the Nanocomposites placed on the market.

PROBLEM - NEED

- Significant regulatory concerns from the European Commission have arisen about unforeseen risks likely to arise from Nanocomposites, so that, several legal requirements have been published:
  - Regulation EC/1935/2004 (contact with foodstuffs)
  - Regulation (EC) 450/2009 (NPs included)
  - Regulation (EC) 282/2008 on recycled plastic mat. / articles
  - REACH Regulation
Origin of the idea

The idea of NanoSafePACK arises from the consideration of the following issues:

- One of the most extended applications of the Nanotechnology is the development of Nanocomposites, polymers reinforced with engineered Nanoparticles that improve the properties of the original material.

- The novel properties that make engineered Nanomaterials benefic for new composites and packaging materials may also raise new questions about the possible risk to the human health and the environment.

- Evident lack of knowledge about the behavior of the Nanoparticles once they are in the Nanocomposite placed on the market.

- New regulatory actions restricting the commercialization of this kind of products, and more even in the case of the food packaging.
Why Nanocomposite Industry?

Due to the new properties addressed by the use of Nanomaterials in packaging materials, the Nanocomposites Industry is one of the fastest growing segment in the polymer composite market and are estimated to more than double in size in the next four years.

It’s expected that the Packaging Sector become the leader application of the Nanocomposites, therefore, a better understanding of the nanofillers properties and applications in polymeric matrix, health, safety and environmental protection and safety regulatory requirements are all key aspects to promote the use of nanotechnologies in the European SMEs.
The main objective of NanoSafePACK Project is to develop a Best Practices GUIDE to allow the safe handling and use of Nanoparticles as Nanofillers in packaging industries and specifically:

- To characterize physicochemical properties, toxicological and ecotoxicological profile of the specific NPs employed in the packaging industry.
- To Characterize the NP migration potential
- To assess the toxicity of the Nanocomposites as such
- To characterize the exposure to Nanoparticles (life cycle approach)
- To improve the effectiveness of the risk management measures
- To develop a cost effective strategy to improve the safety during Nanocomposites production, use and disposal.
- To characterize the regulatory aspects concerning the use of NPs
- To disseminate the research results for a large community of SMEs
In summary, the use of Nanoparticles in new packaging materials have a great potential for new applications, leading to products with new or enhanced properties, and opening new market opportunities.

The Nanoparticle panel will be focused on those Nanoparticles employed in large scale by packaging industries, contained in the list published by the WPMN – Working Party on Manufactured Nanomaterials (OECD) and recommended by the Project partners:

- Silver Nanoparticles & FexOy Nanoparticles
- Silicon Nanoparticles (SiO₂)
- Zinc Oxide Nanoparticles (ZnO)
- Titanium Oxide (TiO₂)
- Cerium Oxide (CeO₂)
- Aluminium Oxide (Al₂O₃)
- Nickel Nanoparticles
- Carbon Nanotubes (CNT)
- Nanoclays
- Nanocellulose
### Applications of ENMS to the Polymer Composite Industry

<table>
<thead>
<tr>
<th>NANOPARTICLES</th>
<th>POLYMER MATRIX</th>
<th>ENHANCED PROPERTIES</th>
<th>PACKAGING SECTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nanoclays (MMT)</td>
<td>PLA, PP</td>
<td>• Mechanical</td>
<td>Food and Beverage</td>
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<tr>
<td></td>
<td></td>
<td>• Thermal</td>
<td>Cosmetics</td>
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<td>• Barrier</td>
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<tr>
<td>Functionalized with</td>
<td>PLA</td>
<td></td>
<td></td>
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<td>methyl ammonium</td>
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<tr>
<td>Functionalized with</td>
<td>PET</td>
<td></td>
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<tr>
<td>acetylcholine</td>
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<tr>
<td>Silver - Ag</td>
<td>PE, PP</td>
<td>Antimicrobial</td>
<td>Food and beverage</td>
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<td></td>
<td>LDPE</td>
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<tr>
<td>Zinc oxide - ZnO</td>
<td>PE, PP</td>
<td>Antimicrobial</td>
<td>Food and beverage</td>
</tr>
</tbody>
</table>
# Applications of ENMS to the Polymer Composite Industry

<table>
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<tr>
<th>NANOPARTICLES</th>
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<th>PACKAGING SECTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon oxide - SiO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>PET</td>
<td>• Thermal stability</td>
<td>Food and beverage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Antimicrobial</td>
<td></td>
</tr>
<tr>
<td>Titanium dioxide – TiO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>PET, PLA</td>
<td>• Antimicrobial</td>
<td>Food and beverage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• UV Protection</td>
<td></td>
</tr>
<tr>
<td>Carbon Nanotubes</td>
<td>PE, PP, Polyvinyl alcohol fibers</td>
<td>• Tensile strength</td>
<td>Electronics</td>
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<tr>
<td></td>
<td></td>
<td>• Modulus</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>• Mechanical</td>
<td></td>
</tr>
<tr>
<td>Precipitated Calcium Carbonate- CaCO&lt;sub&gt;3&lt;/sub&gt;</td>
<td>PE, PP, PET, PLA</td>
<td>• Viscosity</td>
<td>Food and Beverage, Cosmetics, Chemicals</td>
</tr>
</tbody>
</table>
The **NanoSafePACK Project** is focused in the development of a Best Practices GUIDE to ensure the safety use of nanofillers in the packaging industry by means of the following activities:

1. Selection / Characterization of NP Panel
2. Toxicity assessment (NPs and functional products)
3. Exposure assessment to Nanoparticles released (industrial use and service life)
4. Migration studies under use conditions
5. Regulatory aspects compliance
CONCEPT OF THE PROJECT

**Task Needed**
- Exposure assessment during the whole life cycle
- Evaluation of the effectiveness of the risk management measures
- Migration studies
  - Characterization of the release potential
- Toxicity Assessment of selected Nanoparticles
  - Toxicity Assessment of Nanocomposites

**Innovations**
- Development of exposure scenarios in specific industrial settings
- Characterization of risks management measures
- New knowledge about migration and interaction with the polymeric matrix
- Improvement the knowledge about the toxicity profile of Nanocomposites as a complex matrix

**Technical progress**
- Cost effective risk management measures
  - Design of engineering controls and risk management controls adapted to specific Nanoparticles
- Control of migration patterns of NPs in relation to their physicochemical properties and the kind of the polymeric matrix
- Scientific data about the risk of the polymer Nanocomposites as such

**Final Results**
- Controlling and prevent the worker exposure to Nanoparticles
- Providing new knowledge about the toxicity of the composites reinforced with Nanoparticles
- Predicting the release pattern to minimize the migration potential
- Preventing the release of Nanoparticles to the consumer
- Complying with the regulation

**Best Practices Guide**
<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Ref</th>
<th>Type</th>
<th>Country</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1  | Centro Español de Plásticos              | C.E.P. | SME-AG   | Spain       | - C.E.P. is the Coordinating Association, overseeing all project activities and collating all deliverables and milestones report  
- Training and dissemination activities |
| 2  | European Plastic Converters              | EuPC  | SME-AG   | Belgium     | - EuPC will exercise the role of dissemination and exploitation manager, being responsible of the dissemination and exploitation activities |
| 3  | The Portuguese Association of Plastic Industry | APIP | SME-AG   | Portugal    | - Dissemination and training activities in the Portuguese Nanocomposite industry |
| 4  | Instituto Tecnológico del Embalaje, Transporte y Logística | ITENE | RTD      | Spain       | - Research and development activities: Nanocomposite characterization, migration studies, risk assessment (RMM) |
| 5  | Institute of Occupational Medicine       | IOM   | RTD      | UK          | - Research and development activities: nanocomposite characterization, migration studies, risk assessment (Exposure Scenario) |
| 6  | Tecni-Plasper, S.L.                      | Plasper | SME     | Spain       | - SME dedicated to the manufacture of the nanoplastics compounds: validation studies |
| 7  | Tec-Star, S.r.l.                         | Tec-Star | SME     | Italy       | - Technological SME dedicated to the manufacture of NPs: validation studies |
NanoSafePACK CONSORTIUM

Company distributing nanocomposite based products
PLASPER

Thermoforming Company
PLASPER

Compounding processor
PLASPER

Raw materials supplier
PLASPER

Nanoparticle Supplier
TEC-STAR

SMEs

ITENE
RTD 1
Risk Management and Polymer Nanocomposites processing

EuPC
European SME Association
Dissemination and training

CEP
National SME Association 1
Dissemination and training

IOM
RTD 2
Hazard & Exposure Assessment

APIP
National SME Association 2
Dissemination and training
BENEFITS OF THE PROJECT TO THE SME-AG / SMEs

- SMEs Associations will improve their activity and image, supporting their partners with new solutions
- SMEs will open new markets, ensuring the regulation fulfillment
- Competitive differentiation of non European Markets
- Direct exploitation of the project results

- Compliance with occupational safety regulations
  - REACH regulation
  - Ocupacional Hygiene
  - Environmental protection

- Social Benefits
  - Promotion of advanced products
  - Satisfaction of consumers’ demands for new products based on nanoparticles
  - Increased demand of nanocomposite materials will lead to improve the wellness of the citizens
Main Task and Responsibilities

The activities, related workpackages and responsibilities are explained below:

1. Scientific and Technological Development

a) Characterization of Nanofillers (WP1)

These tasks will be carried out mostly by EuPC, who has the expertise in this area. Both ITENE and IOM will support each task. In this sense. ITENE will support the identification and selection of nanometer-sized particles, studying the Nanocomposites placed on the market and consulting specialized associations. On the other hand, IOM will help with the full characterization of some of the Nanoparticles selected using their own instruments in order to compare and validate the results.

b) Hazard Assessment (WP2)

This task is lead by IOM, who is a recognized leader in this field. The experiments will be conducted by IOM in their product safety and toxicology laboratories. ITENE and EuPC will support the particle migration studies, reproducing the experiments and comparing the results in order to analyze and validate the results of this task.
c) Development of Exposure Scenarios (WP3)

**IOM** will lead this task due to their accredited experience in occupational hygiene, workplace exposure sampling and simulation, assessment of control methods and risk assessment.

**ITENE** will support the exposure measurements and the evaluation of the effectiveness of the risk management measures due to their experience in field surveys and chemical safety.

Both IOM and ITENE will cooperate to conduct all the exposure assessments.

The Nanoparticles and Nanocomposites will be provided by **TecStar** and **Plasper** respectively, enabling the assessment of materials that can be potentially on the market.

d) Environmental impact of Nanocomposites for Packaging (WP4)

This task will be carried out mostly by the sustainability department of **ITENE** which has conducted several LCAs involving Nanoparticles and polymer composites.

On the other hand, the analysis of environmental aspects involving the use of ecotoxicological properties will be supported by **IOM**.
e) Development of the Best Practices GUIDE (WP 5)

The development of the guide will be conducted mostly by EuPC with the support of a technical reviewer from ITENE.

In a second stage, the draft of the Best Practices GUIDE will be reviewed by the SME Associations – CEP and APIP, whom must critically appraise and make comment on the guide contents. Last, once the contents had been reviewed by the Associations, EuPC the workpackage leader will complete the first edition of the guide.

2. Validation Activities (WP 6)

The scientific and technological activities conducted within the previous task will be carried out with the support of the industrial partners in order to validate the results and ensure the applicability of the project results.

This workpackage will be headed by ITENE, who will coordinate each sampling in collaboration with the SMEs. IOM will support the posterior data analysis, supporting ITENE and the SMEs in the interpretation of the analytical data.
3. Project Management (WP 7)
This work includes the tasks to be completed by the Project Coordinator and contains the tasks required to successfully manage the Project.

The coordination activities will be undertaken by the Spanish Plastic Center - C.E.P. In this sense, C.E.P. will manage the technical development of the project and the partners’ obligations compliance. At the same time, each partner will support the project management, collaborating with their assigned task in an appropriate and timely manner.

4. Dissemination Related Activities (WP 8)
In order to achieve an optimal use of the Project across the EU, dissemination, training and exploitation are essential to the success of the NanoSafePACK Project.

These tasks will be managed by the European Association EuPC with the support of the National Associations - CEP and APIP - in relation to the training activities and dissemination of the project results to other SMEs and stakeholders. The RTD partners will organize technological conferences in cooperation with the SMEs, enabling a better understanding of the best practices guide and its implementation.
IMPACTS OF THE PROJECT

- **Human Health**
  - NanoSafePACK will guarantee the safety of consumers and workers.
  - Less hazardous Nanocomposites will have a potential impact not only on worker protection but also on human health, **avoiding diseases** resulting from direct contact with the Nanoparticles at consumer level.

- **Environment**
  - It will **minimize the release of Nanoparticles** from the manufacturing process and consumer stage, considering the emission via air, water and soil.
  - LCA will provide a **better understanding of the fate of the engineered Nanoparticles in their service life**, evaluating at the same time the potential release of Nanoparticles during the their use and disposal.
  - NanoSafePACK will provide **new knowledge to the development of new Best Available Techniques (BATs)** to prevent pollution.
IMPACTS OF THE PROJECT

Technological

- NanoSafePACK project will take into account the applications emerging nowadays, that will be massively employed in the nearest future, providing a strong basis for the future development of the nanocomposite industry.

- New nanotechnology based composites will increase the development of new and innovative products, improving the technological level of the European industry.

Economic

- The promotion of new and advanced Nanocomposites will improve the business opportunities of the European composites industry.

Social

- NanoSafePACK will improve the approbation of this kind of products into the society as well as a better image of the new technologies, ensuring the commercialization in the near future.
The main outcome of the project will be a best practices guide for the safe handling and use of nanofillers in packaging industries, including a compendium of proven and technically feasible handling procedures and protection measures able to guarantee the safety of workers dealing with Nanoparticles.

In the consumer stage, we expect to generate reliable data on the hazard properties of the most common nanofillers, defining a list of nanofillers and polymeric matrices that can be considered safer on the basis of the tested toxicological and migration potential.

It's foreseen a high socio-economic impact derived from the improvement of the consumer acceptance of novel technologies aimed at developing new advanced products containing ENMs, the promotion of the business opportunities and the sustainable development of the Nanocomposites industry.
EXPECTED RESULTS

In detail, it's expected to produce the following final results:

- Edition of the **NanoSafePACK Best Practices GUIDE by 2015** in English, Spanish and Portuguese, including the publication in paper and PDF version.
- A complete **description of the adverse effects posed by the use of nanofillers** based on the migration potential and the physicochemical, toxicological and ecotoxicological properties of the most common nanofillers for packaging applications.
- A **complete description of the current exposure scenarios across the Nanocomposites life cycle**.
- New **information on the release rates** to air, surface fresh and marine water, waste water and soil for each relevant stage on the life cycle.
- New **knowledge on the airborne behavior of the target NMs**, including new data on their aggregation/agglomeration patterns and deposition factors under the specific operative and environmental conditions of use presented in the Nanocomposites production facilities.
- A set of **informative material to disseminate the project actions** at a Regional, National and European level.
The following points must be given prime consideration:

- We must demonstrate that the Nanoparticles are can be processed
- We have to Ensure the safety of Nanofillers / Nanocomposites
- Starting up a committee to avoid duplicity with other on going research projects
- Our results must be easy to implement by industrial partners (LE – SMEs)
- Quantify the economic costs of or solution
- Identify the potential risks in each stage of the production process
THANK YOU FOR YOUR ATTENTION