Project No.: 147426

Project acronym: TANOCOMP

Project title:

Training on the nANOtechnology aspects of plastic COMPosites with enhanced properties for use in high-strength applications

Work Package 4: Definition and Development of Didactic Content

Result 04

E-LEARING METHODOLOGY

TANOCOMP e-learning training on nanotechnology for the plastics industry

Lifelong Learning Programme

Content

1 Introduction

The present document constitutes Result 04 in the framework of the TANOCOMP project titled "Training on the nANOtechnology aspects of plastic COMPosites with enhanced properties for use in high-strength applications" (Project Acronym: TANOCOMP; Contract No.: 147426).

The document is the result of activities performed within the framework of WP4 "Definition and Development of Didactic Content", and more specifically of Task 4.3 "Identification of e-Learning modules and development of e-Learning methodology concerning the development of the e-Learning contents to the special needs of the plastics sector. Drafting of the e-Learning methodology".

General Overview

TANCOMP approaches the urgent need of facilitating the technology transfer in innovative technologies to European countries. Specifically, the subject of nanotechnology (especially carbon nanotubes, CNTs) will be introduced to the plastics sector, where the use of nanomaterials can yield to improved results and products of a higher quality and better performance. The use of CNTs in plastics is of high relevance:

- plastics enriched with CNTs improve mechanical properties, final products are:
  - high-strength
  - lighter
  - show improved surface quality
- CNTs lead to electrical conductivity in plastics
- CNTs lead to thermal conductivity in plastics

With these properties, plastics may support the substitution of raw materials in products and applications and therefore meeting an emerging need. However, not in all European countries the level of awareness on the benefits of plastics nanocomposites with CNTs is very high and to many plastics compounders and processors the potential of enriching plastics with CNTs is yet unknown. Hence, TANOCOMP addresses the plastics sector in its partner countries Germany, Spain, Greece and Cyprus to transfer the technology of enriching plastics with CNTs. The method used will be an e-Learning training that is going to be offered in all partner languages: German, Greek and Spanish as well as English as it represents the partner's common language.

The benefits of the e-Learning training are that a large audience can easily access to the training without any attendance at any training location. Each TANOCOMP learner will profit of the training by getting trained on an innovative technology and therefore improving his/hers own qualifications by gaining specific knowledge on the topics approached. The skills and knowledge gained are expected to contribute to improve the company's products and ultimately, lead to higher turnovers. TANOCOMP e-Learning training will have an added value to Europe's economy as it is maximizing the industry's valorization in all four countries.

2 Draw-up of TANOCOMP methodology: structure and sources of information

The draw-up of the e-Learning methodology of the TANOCOMP e-Learning training has been conceived to match the special and specific needs of the identified TANOCOMP target group. The e-Learning methodology for each of the TANOCOMP e-Learning units is based on the following pillars:

a) learning objective

Learning objectives sum up the overall learning outcome of a learning unit.

b) learning outcomes

Learning outcomes are statements of what a learner knows, understands and is able to do on completion of a learning process defined in terms of knowledge, skills and competence.

c) the specific qualifications gained with each learning outcome split up into

Knowledge: The outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that are related to a field of work or study.

Skills: The ability to apply knowledge and use know-how to complete tasks and solve problems.

Competences: The proven ability to use knowledge, skills and personal, social and/or methodological abilities in work or study situations and in professional and personal development.

Questionnaires and Validation Workshops

Moreover, the TANOCOMP e-Learning methodology entails the evaluation of questionnaires among stakeholders and two content validation workshops. The questionnaires have been implemented between M6 and M8 of the project among TANOCOMP stakeholders in all countries.

A first version of the e-Learning units was presented in the first content validation workshop on 30th October in Stuttgart, Germany. Afterwards, the content was adapted to the feedback participants had given. A second version of the e-Learning units was presented to the Spanish stakeholders on 11 December 2012 in Zaragoza, Spain in the framework of the second content validation workshop. The content of the e-Learning training has again been adapted to the feedback of the Spanish stakeholders.

The version of the e-Learning methodology presented has been created on the basis of the e-Learning content after incorporating the feedback of the second content validation workshop in Spain.

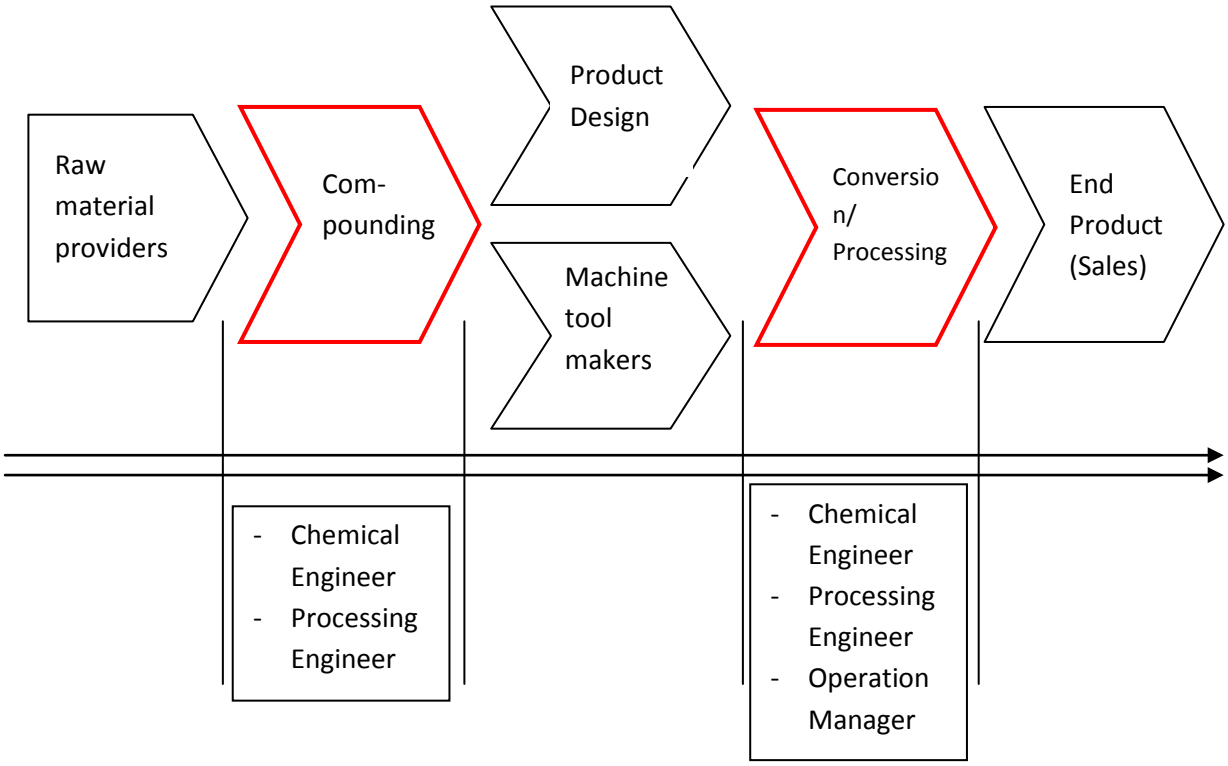
3 Target Audience

3.1 Target Sectors and Value Chain

The target audience in the project had initially been defined as companies active in the production of plastics and plastics products for sectors that can be found in all countries part of the consortium. Within the first partner meeting, these sectors have been defined more precisely as:

- Transport.
- Electronics.
- Photonics.
- Packaging.
- Agriculture.
- Sports equipment.

Also, within the second partner meeting the initial selection was evaluated and compared against the different actors involved in the plastics production value chain. Thus, it was decided to focus in the training to the specific needs of thermoplastic producers and processors. Afterwards, the most relevant job profiles were evaluated and identified corresponding to the main professions in the value chain. After analysing and comparing the job profiles, TANOCOMP project partners decided to focus on: processing engineers, chemical engineers and operation managers. The following chart provides the value chain including the professions chose to be the target audience of TANOCOMP e-Learning training:



3.2 Target Audience – Job Profiles

TANOCOMP training is supposed to focus on the specific requirements of thermoplastics compounders and processors, on which the influence of the incorporation of CNTs in plastics has the main influence. In this way, it is allowed to let the training cover only their interests on the aspects of the incorporation of CNTs. The three job profiles of the "chemical engineer", "processing engineer" and "operations manager" were selected due to their common and overlapping qualifications. All of professions require a technical university degree and in the company's persons acting as them hold positions that involve decision-making on processes, research on materials, supervising employees and advanced knowledge in the technologies used in the companies.

The job profiles of the "chemical engineer" as well as the "processing engineer" can be found in both parts of the value chain and they also need very similar information.

The specific job profiles of the main target group can be found below:

JOB TITLE	CHEMICAL ENGINEER
RESPONSABILITIES AND DAILY TASKS	
• conducting research and advising on, and developing commercial-plastic processes, and to produce substances and items, or synthetic materials; • specifying plastic production methods, materials and quality standards and ensuring that they conform to specifications; • establishing control standards and procedures to ensure safety and efficiency of plastic production operations and safety of workers operating equipment or working in close proximity to on-going chemical reactions; • designing plastic plant equipment and devising processes for manufacturing products; • performing tests throughout stages of production to determine degree of control over variables, including temperature, density, specific gravity, and pressure; • developing safety procedures to be employed; • preparing estimates of production costs and production progress reports for management; • performing laboratory studies of steps in manufacture of new products and testing proposed process in small scale operation such as a pilot plant.	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Chemical Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of three years experience	

JOB TITLE	PROCESSING ENGINEER
RESPONSABILITIES AND DAILY TASKS	
• Direct contact with companies that require industrialization services • Advice and development of industrial processes • Track projects, moulds, tools, production processes and ensure they comply the performance requirements, time and cost of the customer • See problematic mould or plastic processes and emit solutions and ensure that they are implemented • Budgeting and monitoring them • Coordinate resources depending on the tasks • Organization and planning of work in the short and medium term • Advanced knowledge of technologies and contribution of improvement ideas • Surveillance technology in new manufacturing technologies	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Industrial/Chemical Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of five years experience	

JOB TITLE	OPERATIONS MANAGER
RESPONSABILITIES AND DAILY TASKS	
• determining, implementing and monitoring production strategies, policies and plans • planning details of production activities in terms of output quality and quantity, cost, time available and labour requirements; • controlling the operation of production plant and quality procedures through planning of maintenance, designation of operating hours and supply of parts and tools; • establishing and managing budgets, monitoring production output and costs, and adjusting processes and resources to minimize costs; • consulting with and informing other managers about production matters; • overseeing the acquisition and installation of new plant and equipment; • controlling the preparation of production records and reports; • coordinating the implementation of occupational health and safety requirements; • identifying business opportunities and determining products to be manufactured;	

• researching and implementing regulatory and statutory requirements affecting manufacturing operations and the environment; • overseeing the provision of quotes for the manufacture of specialized goods and establishing contracts with customers and suppliers; • overseeing the selection, training and performance of staff.
REQUIRED COMPETENCIES
EDUCATIONAL BACKGROUND:
Engineering Degree
EXPERIENCE REQUIRED:
Minimum of three years experience

4 Learning Units

Considering the questionnaire evaluation, the report on the stakeholders needs (TANOCOMP Result 20), the defined target audiences and the validation workshops the present training contents were updated to the current form. This includes the definitions of the learning objectives of each of the four learning units, the definition of the learning outcomes and their categorization in “knowledge”, “skills” and “competencies”.

Length and duration of the units

Each learning unit consists of approximately 30-40 (animated and non-animated) slides. According to the partners’ experience it was evaluated by the partners in the third partner meeting that it will take the learner about 5 minutes in average to read, understand the content of a slide and acquire the presented knowledge. This means, the learner will be able to manage 12 slides per hour.

Unit length

	Technical contents	**Exercise**
Units 1- 3	40 slides/unit	10 slides/unit
Unit 4	30 slides/unit	5 slides/unit
TOTAL	175 slides in total	
Duration (5min/slides) Average 12 slides per hour	M1: 4.2h M2: 4.2h M3: 4.2h M4: 2,8h **Total: 15.4h >> 2 days training**	

The following tables show the outcomes for each of the four TANOCOMP learning units:

Learning Unit 1: Basics

Learning Objective: Establishing a common knowledge base on nanotechnology in plastics for all learners

Learning Outcomes	Knowledge	Skills	Competences
Get familiar to nanotechnology terms, definitions, history and research trends	nanotechnology aspects (definition, terms, history) future research development paths	ability to understand the impact of nanotechnology in different applications and sectors	embedding nanotechnology into technological applications evaluation of the improvement of plastic products with nanotechnology
Introduction to the concept of thermoplastic material and its main processing methods	thermoplastics (history, composition, types of thermoplastics, applications) thermoplastics production methods (injection moulding, extrusion)	ability to: understand thermoplastic production distinguish between different thermoplastic production methods distinguish between different thermoplastics	taking the decision on suitable thermoplastic for final product evaluating different thermoplastic production parameters
Get acquainted to application fields of CNTs and nanotechnology in plastics	application sectors functional improvements on final products	ability to: understand the impact of CNTs in plastics acknowledge the physical properties and improvement of plastics products with CNTs	evaluating the potential improvement of plastic products with CNTs

Learning Unit 2: Carbon Nanotubes (CNTs) and their use in the plastics sector

Learning Objective: Get acquainted to CNTs and their benefits to the plastics industry

Learning Outcomes	Knowledge	Skills	Competences
Gain an insight on CNTs production method	main CNTs production methods	ability to: understand the differences between CNT production methods distinguish main advantages of different CNT production methods	choosing of better fitting CNTs
Gain clear understanding on CNTs properties	basic theoretical foundations (physical, chemical, mechanical) on CNTs	ability to differentiate among CNTs parameters and their interrelation	evaluating the effects of CNTs in products
Getting aware on the benefits of CNTs to the plastics industry	tangible benefits of CNTs in the plastics industry based on market product examples	ability to: differentiate various benefits of CNTs in plastic products better determine the differences between plastic products with or without CNTs	capable to identify and evaluate potential benefits of incorporating CNTs in plastic products better decision-making ability to evaluate the possibility of using CNTs in existing company's product portfolio

Learning Unit 3: Extrusion & Injection Moulding and incorporation of CNTs

Learning Objective: Getting acquainted to the production chain of thermoplastics with CNTs

Learning Outcomes	Knowledge	Skills	Competences
Get acquainted to general aspects related to masterbatches with CNTs (Definition, costs, production, parameters)	Masterbatch formulation and composition estimated costs and benefits production of masterbatches: compounding and pelleting	understanding the impact of masterbatches on thermoplastics production evaluating the costs of masterbatches understanding the parameter settings on the compounding and pelleting of masterbatches with CNTs	Decision on optimal masterbatches composition in correlation to costs comparing production costs of thermoplastics with and without masterbatches containing CNTs producing masterbatches with CNTs
Gaining an overview of extrusion process parameters for processing thermoplastics with CNTs	Influence of: - rotation speed of screw on CNTs dispersion - screw rotation speed on CNTs conductivity - temperature	understanding the parameters needed for extrusion of thermoplastics with CNTs	setting up the parameters for extrusion of thermoplastics with CNTs optimizing quality of produced thermoplastics with CNTs
Gaining an overview of injection moulding process parameters for processing thermoplastics with CNTs	Influence of: - electrical conductivity - mechanical properties - surface resistivity - surface quality	understanding the parameters needed for injection moulding with thermoplastics with CNTs	setting up the parameters for injection moulding with thermoplastics with CNTs optimizing quality of produced thermoplastics with CNTs
Gaining a general understanding on the challenges of CNT properties and thermoplastic production	Challenges of: - materials with nanocomposites - purity of CNTs - dispersion of CNTs in thermoplastics	ability to optimize thermoplastics based on risen awareness on the critical parameters of CNTs and thermoplastics composition	choosing CNTs of adequate quality for the thermoplastic production process (with CNTs) achieving proper CNTs matrix in the thermoplastics mix

Learning Unit 4: Carbon nanotubes: Safety, health and environmental issues

Learning Objective: Providing an overview on safety, health and environmental issues on the handling of nanotechnology

Learning Outcomes	Knowledge	Skills	Competences
Getting familiar with toxicity aspects of CNTs	Knowledge about bout toxicity of CNTs on animal cells and organs scientific data on long-term and short-term cell viability and animal survival imprisoned in CNTs	ability to understand the possible interaction of CNTs in cells or animal bodies	determining the potential of toxic effects of CNTs for humans
Getting acquainted with safety aspects of handling CNTs during synthesis and production of thermoplastics	suitable exhaust systems and personal protective equipment (PPE) measures taken for different production steps of thermoplastic composites with CNTs costs of safety equipment spatial safety aspects in production steps	ability to: safely produce thermoplastics with CNTs decide on correct safety equipment and clothing acknowledge the importance of the use of safety equipment mandatory when dealing with CNTs	ensuring a safe environment during the production of thermoplastics with CNTs establishing standardized safety procedures during the production of thermoplastics with CNTs
Gaining awareness of good practice in CNT handling	good practice	ability to instruct co-workers on safe handling of CNTs	training co-workers on the safe handling of CNTs while producing thermoplastics with CNTs
Gaining an overview of national and European regulations of handling CNTs	existing nanosafety projects that already exist national and European legal framework information on nanosafety resources	ability to: refer to the legal framework fulfil compulsory legal requirements	implementing a production line in accordance to national and European legal framework implementing declarations according to national regulations

5 Exercises / Evaluation Method

Within TANCOCOMP training, all learning units will end with exercises to test the learner's comprehension of the training units' content. The successful completion of the exercises is mandatory in order to proceed to the next unit. In average, 10 exercises will be provided at the end of each unit and of those at least 80% have to be answered correctly. Once a learner has completed the content of a learning unit, it will not be possible for the learner to return to the contents. This way, cheating is avoided and the learner's gained knowledge can be objectively evaluated in the exercises. Unit 4 (Carbon nanotubes: Safety, health and environmental issues) will only consist of approximately 30 slides, which is the reason that there are only five questions going to be provided.

If a learner is not able to answer 80% of the exercises correctly, he/she will have to repeat the course of the content slides. Since more than ten (five) exercises will have been prepared in advance, the learner will see a different set of ten (five) exercises or at least some new exercises in a random order.

The exercises will mostly consist of questions with different response patterns. They may be:

- True or false
- One answer correct (multiple choice)
- Several answers correct
- Finishing of conclusions (e.g. if x rises, y will…)

Another possibility will be drag-and-drop exercises, where the learner will have to

- Put terminology into the correct order (e.g. value chain)
- Match different terminology to their corresponding definition
- One terminology and various definitions offered →match terminology with correct definition
- Match terminology with a photo

Furthermore, puzzle exercises are an option, too (decision to be made). They serve to test if the learner is familiar with the different parts of a complex piece (e.g. a machine, MWCNT).

Example exercises for Unit 1:

#1

When were nanomaterials invented?

☐ **During the 50s**

☐ They always have existed

☐ At the middle ages in the production of medieval stained glasses

☐ Recently as the concept is relatively new

#2

Join each application with their corresponding sector

a) Energy	1) Genomics
b) Biotechnology	2) AFM
c) Electronics	3) Fuel Cell
d) Devices	4) Q-dot

Example exercises for Unit 2:

#1

Which are the main categories of carbon nanotubes?

- ☐ Multi-wall CNTs and double-wall CNTs
- ☐ Multi-wall CNTs and single-wall CNTs
- ☐ Single-wall CNTs and double-wall CNTs
- ☐ Triple-wall CNTs and multi-wall CNTs

#2

Why are CNTs functionalized?

- ☐ For minimizing health risks of CNTs

☐ For improving the CNTs dispersion in polymers or other materials

- ☐ For reducing the process time of the composites preparation

☐ Other (Explain: _____)

Example exercises for Unit 3:

#1

Indicate benefits associated with the use of masterbatches (several answers are possible)

☐ **Better dispersion**

☐ **Higher material stock, as there are many suppliers**

☐ **Lower health risks**

☐ **Reducing of cleaning costs**

#2

Join each defect with their corresponding cause:

a) Bubbles	**1) Tensile strengths**
b) Porosity	**2) Low discharge temperature**
c) Opaque surface	**3) Humidity**
d) Sharkskin	**4) Gases trapped**

Example exercises for Unit 4:

#1

Which characteristics of CNTs can affect their toxicity? (multiple answers may apply)

☐ **Surface area**

☐ **Impurities**

☐ **Density**

☐ **Diameter**

#2

What is the maximum length that CNTs should have prior to their introduction into an organism in order to be easily eliminated or expelled?

☐ **300 nm**

☐ **1000 nm**

☐ **400 nm**

☐ **1.5 µm**

The final choice of the exercises that are going to be incorporated into the training and on how they will be animated will be made early February 2013 (M17), once the development of the e-Learning tool has started.

6 Certificate of participation

Once the learner has completed successfully all modules and exercises, a certificate of participation is handed out to him/her. The certificate will contain the official stamps of all partners and a precise description of the learning units and outcomes achieved through TANOCOMP. With this certificate, the learner will be able to prove that he/she has attended a 15h e-Learning training on the theoretical aspects of the use of CNTs in thermoplastics and has successfully completed the training exercises.

The development of a more formal or official accreditation tool is not possible in the course of TANOCOMP project, due to its limited size, duration, capacities and more importantly, due to the nature of its content. Indeed, the validation of knowledge related to nanomaterials handling needs also a practical approach which cannot be developed in TANOCOMP e-learning units.

7 Next Steps

Taking into account the status of the project of January 2013, next steps will include:

- Final adaption of the e-Learning content (late January 2013)
- Finalization of exercises (early February 2013)
- Sub-contractor: development of e-Learning tools (February 2013 – mid March 2013, finalization after translation in May/June 2013)
- Agenda-setting and sending of invitations for first seminar for the validation of e-Learning modules (early February 2013)
- Agenda-setting and sending of invitations for second seminar for the validation of e-Learning modules (early March 2013)

ANNEX

Job Profiles

JOB TITLE	CHEMICAL ENGINEER
RESPONSABILITIES AND DAILY TASKS	
• conducting research and advising on, and developing commercial-plastic processes, and to produce substances and items, or synthetic materials; • specifying plastic production methods, materials and quality standards and ensuring that they conform to specifications; • establishing control standards and procedures to ensure safety and efficiency of plastic production operations and safety of workers operating equipment or working in close proximity to on-going chemical reactions; • designing plastic plant equipment and devising processes for manufacturing products; • performing tests throughout stages of production to determine degree of control over variables, including temperature, density, specific gravity, and pressure; • developing safety procedures to be employed; • preparing estimates of production costs and production progress reports for management; • performing laboratory studies of steps in manufacture of new products and testing proposed process in small scale operation such as a pilot plant.	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Chemical Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of three years experience	

JOB TITLE	CHEMIST
RESPONSABILITIES AND DAILY TASKS	
• conducting research and improving or developing concepts, theories, instrumentation, software and operational methods related to plastic • conducting experiments, tests and analyses on the structure and properties of plastics; • evaluating results of investigations and experiments and expressing conclusions, mainly using mathematical techniques and models; • applying principles, techniques and processes to develop or improve practical applications of the principles and techniques of plastics; • testing, commissioning and evaluating equipment used in applications • observing, analysing and interpreting developing methods, numerical models and techniques to extend knowledge of plastics; • developing, implementing and maintaining standards and protocols for the measurement in industrial plastic applications; • preparing scientific papers and reports.	
REQUIRED COMPETENCIES	

EDUCATIONAL BACKGROUND:
Chemistry Degree
EXPERIENCE REQUIRED:
Minimum of three years experience

JOB TITLE	MOULDS AND TOOLS ASSISTANT
RESPONSABILITIES AND DAILY TASKS	
• Execution of specific work orders • CAD Program Execution • Preparation of pieces before and after manufacture • Assembling parts of a set • Management of specific and auxiliary machine • Order and cleanliness	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Proffesional training or equivalent	
EXPERIENCE REQUIRED:	
Minimum of five years experience	

JOB TITLE	MOULDS AND TOOLS ENGINEER
RESPONSABILITIES AND DAILY TASKS	
• Direct contact with customers and suppliers • Design budgets and monitoring them • Supervision of moulds and tools technician • Planning and organizing projects to develop • Coordinate resources depending on the tasks • Advanced knowledge systems of 2D and 3D design • Organization and planning of short-term work • Advanced knowledge of technologies and improvement contributions of ideas • Manage to make changes in design after trials and tests	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Industrial Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of three years experience Knowledge of design systems 2D and 3D	

JOB TITLE	MOULDS AND TOOLS TECHNICIAN

RESPONSABILITIES AND DAILY TASKS
• Performing 3d designs of pieces • Making designs of moulds, tools, etc. • Development of mechanized paths and summary sheets • Development of 2D planes parts • Making changes in CAD after trials • Making macros adapted to the design process for time reduction
REQUIRED COMPETENCIES
EDUCATIONAL BACKGROUND:
Technical Industrial Engineering
EXPERIENCE REQUIRED:
Minimum of one year experience Knowledge of design systems 2D and 3D

JOB TITLE	OPERATIONS MANAGER
RESPONSABILITIES AND DAILY TASKS	
• determining, implementing and monitoring production strategies, policies and plans • planning details of production activities in terms of output quality and quantity, cost, time available and labour requirements; • controlling the operation of production plant and quality procedures through planning of maintenance, designation of operating hours and supply of parts and tools; • establishing and managing budgets, monitoring production output and costs, and adjusting processes and resources to minimize costs; • consulting with and informing other managers about production matters; • overseeing the acquisition and installation of new plant and equipment; • controlling the preparation of production records and reports; • coordinating the implementation of occupational health and safety requirements; • identifying business opportunities and determining products to be manufactured; • researching and implementing regulatory and statutory requirements affecting manufacturing operations and the environment; • overseeing the provision of quotes for the manufacture of specialized goods and establishing contracts with customers and suppliers; • overseeing the selection, training and performance of staff.	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of three years experience	

JOB TITLE	PROCESSING ENGINEER
RESPONSABILITIES AND DAILY TASKS	
• Direct contact with companies that require industrialization services • Advice and development of industrial processes • Track projects, moulds, tools, production processes and ensure they comply the performance requirements, time and cost of the customer • See problematic mould or plastic processes and emit solutions and ensure that they are implemented • Budgeting and monitoring them • Coordinate resources depending on the tasks • Organization and planning of work in the short and medium term • Advanced knowledge of technologies and contribution of improvement ideas • Surveillance technology in new manufacturing technologies	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Industrial/Chemical Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of five years experience	

JOB TITLE	PROCESSING TECHNICIAN
RESPONSABILITIES AND DAILY TASKS	
• Carry out technical assistance in plastic processes • Perform technical assistance reports with proposals for improvements in products and processes • Moulds defining and reviewing, monitoring and modification of these • Defining and reviewing auxiliary machinery involved in plastics processing • Determine supply needs of production material based on the transformation process to ensure continuity. • Set the program making a product considering the same technical specifications, delivery, lot size and specific customer requirements. • Interpret and apply a quality plan to ensure compliance.	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Technical Industrial Engineering	
EXPERIENCE REQUIRED:	
Minimum of two years experience	

JOB TITLE	PRODUCT ENGINEER
RESPONSABILITIES AND DAILY TASKS	
• Direct contact with companies and customers who need advice or services of the company • Creating work teams to carry out the work and coordinate resources • Coordination of activities between all departments involved • Leading the company's strategic projects • Plan the main priorities of the company in the medium and long term • Propose, develop and lead the internal R+D+i • Surveillance technology sector • Optimization of different processes of the department, establish guidelines for study and proposals for change	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Industrial Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of three years experience	

JOB TITLE	PROJECT ENGINEER
RESPONSABILITIES AND DAILY TASKS	
• Direct contact with companies and customers of the assigned project • Creating work teams to carry out the work and coordinate resources raised • Coordination material and human resources as tasks to be performed • Perform project planning and supervision • Oversee project costs and their evolution • Validation of product control plan • Review of phases with the project team • Making and reviewing the project risk analysis	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Industrial Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of three years experience	

JOB TITLE	PROTOTYPING ASSISTANT
RESPONSABILITIES AND DAILY TASKS	
• Development of manufacturing tools • Execution of specific work for the final piece according to customer specifications • Aesthetic finishes, assembly and adjustment of items • Control of stored material • Activity Log • Order and cleanliness	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Professional/technical training or equivalent	
EXPERIENCE REQUIRED:	
Minimum of three years experience	

JOB TITLE	PROTOTYPING ENGINEER
RESPONSABILITIES AND DAILY TASKS	
• Direct contact with customers and suppliers • Follow-up activities with clients • Budgeting and monitoring them • Issue purchase orders and elaboration of orders of materials • Issuance and execution of specific work orders • Coordinate resources depending on the tasks • Advanced knowledge of applied technologies and providing solutions • Surveillance technology of the sector in new manufacturing technologies	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Industrial Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of two years experience	

JOB TITLE	PROTOTYPING TECHNICIAN
RESPONSABILITIES AND DAILY TASKS	
• Study provisioning needs • Optimization of machines and processes of manufacture of plastics • Verification of work, process and perform • Analysis, verification and validation of parts • Organize, distribute and control the work of support staff. • Activity Log	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Technical Industrial Engineering	
EXPERIENCE REQUIRED:	
Minimum of one year experience	

JOB TITLE	RESEARCH AND DEVELOPMENT MANAGER
RESPONSABILITIES AND DAILY TASKS	
• planning, directing and coordinating research and development activities, in-house or commissioned from external research organizations, to develop new or improved technical processes, products, knowledge, or utilization of materials; • planning the overall research and development programme of an enterprise or organization, specifying goals and budgetary requirements; • leading and managing the activities of research and development staff; • establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources; • establishing and directing operational and administrative procedures; • planning and directing daily operations; • overseeing the selection, training and performance of staff; • representing the enterprise or organization at conventions, seminars and conferences. • Technological vigilance	
REQUIRED COMPETENCIES	
EDUCATIONAL BACKGROUND:	
Engineering Degree	
EXPERIENCE REQUIRED:	
Minimum of three years experience	