FLAME NEWSLETTER

in this number

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Project presentation @ MATERIALICA fair

On **October the 20th,** the FLAME project was officially presented during a promotion conference at MATERIALICA fair. For two hours in the main hall of the fair, companies, research centers and the general public, was acknowledged of the FLAME project. During the presentation, Ms Tumiati, project manager at the Chamber of Commerce of Milan – Innovhub, which is responsible of the communication of the FLAME project, outlined the objectives, activities and generally presented the whole FLAME network.

For several reasons, Materialca fair was the ideal place where to present the FLAME project: first of all, the fair was attended by all main targets groups and beneficiaries of FLAME activities: SMEs, research and academic players, and policy makers within the MS&E. Materialica, which is the only event in Europe that has committed itself exclusively to the topic of material supply, brings together all these groups. The 2010 edition was attended by more than 280 exhibitors and more than 10.600 visitors.

Moreover the location was meaningful to FLAME project partners. The event was hosted in Munich, Bavaria, in the center of Central Europe region. Central Europe is an area that represents approximately a fifth of the EU landmass covering about 1,050,00 square kilometers, where are living about 148 million citizens (28 % of the EU population).

FLAME aims at reducing differences among Central Europe regions in the MS&E sector

The economy of Central Europe regions shows high disparities with regard to income and living standards: besides encompassing some of Europe's richest regions, the area also includes some of Europe's poorest ones. The FLAME project aims to contribute to reducing these differences in regards of the material science sector, by enhancing cooperation between regions and strengthening their overall competitiveness.

CENTRAL EUROPE COOPERATING FOR SUCCESS.

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

THE PROJECT: *IMPLEMENTATION STRATEGY AND NEXT ACTIVITIES*

The last project meeting, held in **Nuremberg on the 30th September – 1st October**, all 11 partners have hardly worked to design future activities within the project. They outlined a exiting strategy for ensuring in-novation in materials by fos-tering co-operation between SMEs and R&D-actors, which is declined in four main steps:

First of all, partners are on their way to finalize a **"map of competencies"** on material sciences and engineering in each region. The map is aimed to highlight the best 10 best practices (**yardsticks**) of collaboration between the industrial and the academic world. Partners are currently in the mapping process: a questionnaire has been sent to all relevant MS&E actors in each region, aimed at providing a detailed map of competences and of applications within the Material science industry and academic environment. This process is also the occasion for partners to build a strong database of contacts in the field, which are going to be the direct beneficiaries of all FLAME future activities. The questionnaire is actually available on the website.

The successive step is the realization of the "**Train the coaches**" programme, where sections will be organized with the aim of training facilitators to ease relationships amongs SMEs, research centers and universities with the objective to intensify their relations and interactions. Partners are currently in the process of conducting the so called "**stakeholders dialogue**", through which they interview relevant policy makers, or important actors in the filed of material science, in order to clarify the needs of the sector and to shape the profile of the facilitator coach, in a way that it will be relevant to real needs of players.

At the end of the project three so called "**future labs**" will be set up as pilot actions in Italy, Austria and Slovenia. This action will lead to a concrete collaboration between actors from business and science with different aims such as bringing products to market, integrating innovations into SMEs' value chain, commercialization of products/innovation, exchange of know-how.

the FLAME team

The project will also be the main tool to collect a set of recommendations to awaken and to influence policy makers of the countries and regions involved on the needs of this particular sector. Being one of the most relevant target groups the project will focus on, decision makers will be contacted to include recommendations, results, implications into their regional and national innovation strategies.

To have more information on next activities, please go to our website www.flameurope.eu , where you can find also contacts of the project partner in your region.

VIS-À-VIS DIALOGUE WITH THOMAS DREYKORN

Mr. Thomas Dreykorn, the referent for economics of the city of Fuerth in Germany, has a great experience in supporting regional MS&E companies. His support and advice concerning subsidies request is much appreciated from many companies and research institutions. He also bears a famous name as mediator for science and commerce. Mr. Dreykorn was interviewed by Mr. Manfred Rehinart, representing the Chamber of Commerce and Industry for Nuremberg and Central Franconia.In the first session of the interview, dedicated to the assess the knowledge and the involvement in the **Central Europe program**, Mr. Dreykorn showed to now about the existence of current EC programs, and specifically about the Interreg- and the Central Europe programs. Although his department within the city of Fuerth is not directly involved in any project funded by the program, he believes that transnational cooperation among regions of Central Europe is *something absolutely necessary"*.

The interview then went into details of the **Material Science and Engineering sector**, that Mr. Dreykorn judge very important for the economy of the city. He believes that *"new materials enable new products and the improvement of existing ones"*. He also assessed the importance for the MS&E sector to act more as a cluster and to integrate synergies between academia and industry within the sector.

Even though, in the region of Furth there are different clusters aiming **at bridging research and business actors** in the MS&E and arranging regional and structural funds, Mr. Dreykorn, thinks that the interaction among scientific and the business actors can be upgradeable, and that, even if he couldn't specify exactly how, it should be forced.

Concerning competitiveness and regional cooperation, Mr. Dreykorn assess the level of **internationalization** in the Franconia region as quite high due to high export quotes, and to the number of research institutions and international congresses. The region has also frequent contacts with other EC countries and particularly, in France, with the region of Limoges. Mr. Dreykorn also affirmed that the Franconia region is open to learn process and best practices from other Central Europe regions.

With a special focus on the **Flame project**, Mr. Dreykorn sees a positive impact of the project on its organization, that can lead to a better understanding for international programs, and consequently an enforcement in the competitiveness of the region. Also the MS&E sector as a whole can have benefits form the FLAME project, especially through the improvement of international cooperation of the region and a better capability for innovations.

At the end of the interview, both sides agreed close cooperativeness for the FLAME project as well as in general on MS&E.

The interview was held in Fuerth, City Hall

On October 18th 2010

DIGITAL PROTOTYPE IN PLASTICS INJECTION MOLDING

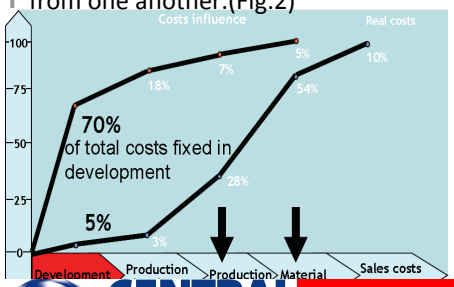
PETR HALAŠKASMARTPLAST S.R.O.

Production Costs Saving in Development Stage

In common way of plastic part design the essential factor for a part and mold designer is their experience. Quality of design of the part and mold cannot be evaluated until the mold is manufactured and testing parts molded. This is also true for setting injection process parameters which usually follows from the technologist's experience.

Cost of an injected part is mostly a sum of the following costs: a mold cost, cost of plastic, weight of a molded part including runners and length of the injection cycle. Amount of these costs is mainly affected in the stage of design of the plastic part, the mold and technological preparation of production, i.e. setting technological conditions of the injection molding process. There are 70% of total production costs fixed in development stage while the development stage represents only 5% of total production costs. This definitely is a reason why to pay high attention to the development stage. We can save tens of percent of total production costs with an amount equal to 5% of production costs. (Fig.1) This fact leads us to the demand of crisis budgets: extreme reduction of production costs which does not have to result in reduction of profitability. First let us look at how development and production preparation are divided in global market environment:

In the world of global market environment there are teams who solve design of a part, tool design and production technology thousands of kilometers and several time zones far from one another.(Fig.2)

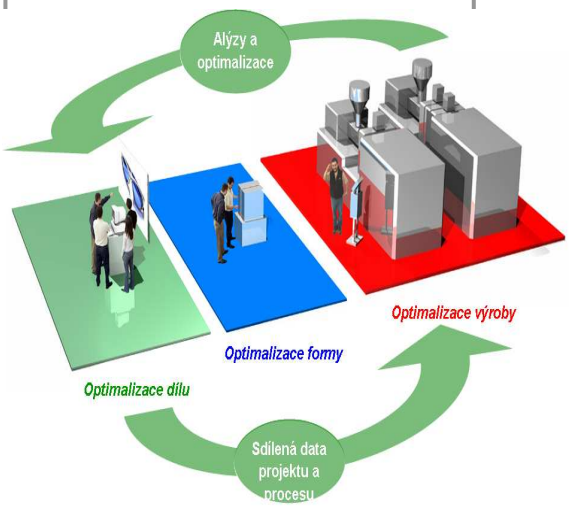


If those teams do not have exact values describing design, tool and technology available, their communication can be very complicated or even conflictful and mainly it leads to increase of number of mistakes, costs and time to market launch is longer.

Digital Prototype

Digital prototype is an expression used very frequently nowadays that has rather dim and overall meaning. However, a software developer who does not use this expression is as if he did not exist. As Wikipedia says digital prototype "gives conceptual design, engineering, manufacturing, and sales and marketing departments the ability to virtually explore a complete product before it's built. Industrial designers, manufacturers, and engineers use Digital Prototyping to design, iterate, optimize, validate, and visualize their products digitally throughout the product development process. Marketers also use Digital Prototyping to create photorealistic renderings and animations of products prior to manufacturing. Companies often adopt Digital Prototyping with the goal of improving communication between product development stakeholders, getting products to market faster, and facilitating product innovation."

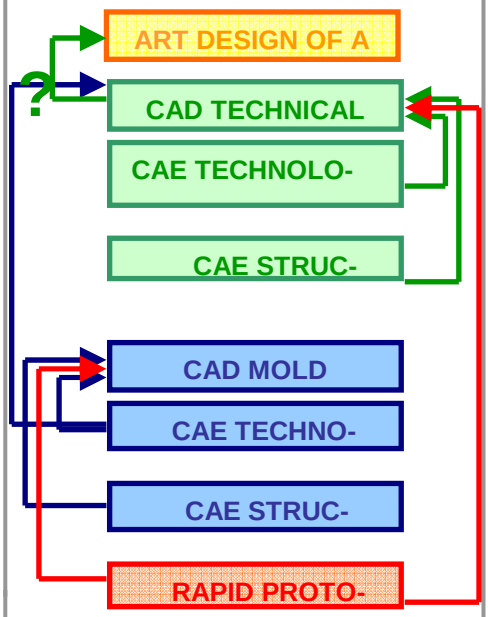
Therefore it is a tool providing connection of teams working on development, technology, production and even marketing and advertising by data and mainly by visualizations and simulations during the process when the product is created. What is the most important is the fact that all is done in virtual reality of computers without using real material or machine. In this way the product is made as a photorealistic computer model and there can be done e.g. a market research while production is prepared and design can be adjusted to customer demand. In this trend Autodesk offers solution starting with conceptual design and technical design through analyses and simulations, production of manufacturing tools up to perfect photorealistic visualization enabling to introduce the product to a customer. A good example is a 3D film Avatar where Autodesk software Maya was used. However, let us get back to plastics injection molding.



Digital Prototype in Plastics Injection Molding

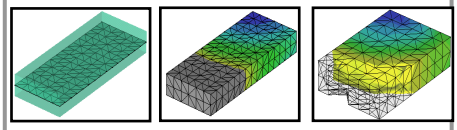
As we said at the beginning there are three teams participating in plastic part production, i.e. designers of a plastic part, design and production of a mold and manufacturing, i.e. plastic part injection. Let us leave marketing and advertising apart in this article. As for design, we must distinguish between art or conceptual design and technical design. An art designer creates a customer side of a product, which is the outer side of the product that gives it a distinctive shape and ergonomics that sell the product. An art designer works mainly with sketches and freely created planes. A technical designer deals with the inner side of the product that must meet mainly demands on assembly and incorporation of inner mechanic or electronic parts and it works with volume elements called solids. Technical design must meet technological demands on economic manufacturability and environmental load so that it sustains stress and

loading in the environment where it will be used. For example there are different demands on a keyboard used in an office and a keyboard used in industrial environment.
Tools used to create a model of a part design or assembly of parts belong to CAD software (Computer Aided Design).



Autodesk offers a designing tool Alias to an art designer and Inventor to a technical designer. A part or assembly of parts are created in a form of a solid, i.e. volume which has a defined basic physical property – specific gravity. The model of the part is made in parametric way and therefore formation of its geometry is described in single steps by dimensions in a history tree. The history tree enables changes of any dimension of the model. A group of parts makes an assembly. The assembly is described by assembling relations and if the assembly is moving, motion of single parts is described by kinematic relations. We can make such an assembly moving and as we set speed of movement and the parts are made of solids whose dimensions, volume, specific gravity and centre of gravity we know, we can find out dynamic strengths that affect single parts of the assembly.
This gets us to the other part of virtual prototype which is analysis.

Software tools for structural and technological analysis belong to CAE group (Computer Aided Engineering). For an injected part a technological analysis is necessary (Fig. 3).
Autodesk has strongly concentrated on injection molding in last years and it has developed Inventor Tooling that enables a very simple analysis of an injected part. A specialized tool for technological analyses is Autodesk Moldflow Adviser – an expert tool mainly for part and mold designers for quick analysis in successive stages of the design or for technologists to verify setting of process parameters and calculate cost of the injected part. This tool can run in the background of CAD software and the designer can make analysis in any stage of a part or mold design. He gets an exact result with a simple description of the problem and possibilities how to solve it. That means that this expert tool does not need deep knowledge of injection process, rheology and polymer physics.
It works on basis of finite elements method and it enables calculation with both Dual Domain and 3D meshes (Fig.4).
A flagship of technological analyses of plastics injection molding is Autodesk Moldflow Insight – a tool for deep analysis of injection process. It provides uncontested generating and editing of finite element mesh and many solvers. First generators of a finite element mesh in AMI enable to make calculations on a midplane mesh, dual domain mesh and volumetric mesh using TETRA 4 and TETRA 10 elements (Fig.4). The calculation modules are for complex analysis of the injection process including DOE optimization, two-component injection, inserts, analysis with Dynamic Feed system, GIT injection, thermoset injection.
We can also analyze core deflection and change of wall thickness of a part and make a complex mechanical analysis on the midplane mesh. Inventor Tooling, Moldflow Adviser and Insight contain a unique database of polymer materials where there are about 9 000 types of thermoplastics with values of technological conditions, rheologic properties, PVT properties, temperature data, mechanic data and shrinkage values that enable optimization of design of the part, tool and production. Autodesk Moldflow Database contains also unique CRIMS data (Correct Residual In-mold Stress) of a model that includes in calculation also rise of crystalline stage and its affect on shrinkage and also affect of orientation of molecules on shrinkage in flow direction and direction perpendicular to the melt flow. Shrinkage values for CRIMS model are measured in a testing mold. Deep technological analysis of an injected part enables to optimize its shape and mainly wall thickness. This optimization has essential influence on part weight and therefore material consumption and cycle length. Cooling time concerns not only mold cooling but mainly part wall thickness as heat conductivity of plastics is lower than steel heat conductivity by two figure orders. Technical design of a part also considerably affects warpage and shrinkage of a part after it is ejected from a mold. When we consider that plastics shrinkage is from 0.4 to 2.5% (except LCP polymers) according to a type and filling and common tolerances for technical parts are ± 0.05 mm then knowledge of warpage between mold design and manufacture is absolutely necessary.



The next part of digital prototype is structural analysis of a part (Fig.3). Structural analysis of a part includes its behavior under stress and load in work environment. This analysis also uses the finite element method. One type of part loading can be dynamic stress if the part is incorporated in a motion chain.

Then we obtain dynamic strengths from an assembly as stated above. A part can be stressed by outer static, dynamic and temperature loads. Static calculations can be done in Autodesk Inventor for a quick design analysis. Deep calculations with static, dynamic and temperature stresses and their combinations can be done by a special software tool Autodesk Algor. For good quality of calculation not only calculation model is important but also good quality of input material properties is essential. In this sense a combination of Autodesk Moldflow and Autodesk Algor software tool offers top possibilities of calculations.

In Autodesk Moldflow we calculate inner stress of a part in form of residual stresses that can affect behavior of a part under load. We can also calculate inhomogeneities caused by fiber orientation of fillers, weld lines or luncres (inner cavities originated in mold in consequence of nonhomogenous wall thickness of a part). Most of these inner stresses and inhomogeneities can be transmitted to structural analysis in Autodesk Algor.

After technological and structural analyses the model of the part can be very quickly changed upon obtained results in direction of feedback arrows (Fig. 3). Question marks at feedback arrows of art design (Fig.3) should be understood as a question whether a technician or technologist should affect creativity of an art designer who creates art value and ergonomics of a product.

The second part of article will contine in two weeks. If you are interested in more information, please visit our website www.smartplast.com

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RESEARCH PROGRAMME

THOMAS BATA UNIVERSITY IN ZLIN (CZECH REPUBBLIC) FACULTY OF TECHNOLOGY — THE POLYMER CENTRE

Research program of the Polymer Centre, Faculty of Technology (Tomas Bata University in Zlin) is oriented to the implementation of **HI-TECH processes to the industry in the Czech Republic** with the aim to **increase competitiveness of the Czech industry within the EU frame**. Technology fulfilling requirements on renovation and optimization of traditional production techniques, efficiency increase and environmental protection (sustainability and sources' savings) is **Powder Injection Moulding (PIM).**
PIM is a multidisciplinary method, where polymer processing know-how is combined with metallurgy to produce the parts for automotive, medical, electronic and other sectors. It is a state-of-art process for making metallic and ceramic items using forming method for thermoplastics – injection moulding. This method allows the large-number production of relatively small (corresponding to a weight of around 100 grams) parts of complex shapes with reduced cost and increased efficiency by avoiding the use of extra processes.
During the production of PIM-parts the powder is mixed with an organic (polymeric) binder into a homogeneous compound. In the next step, the compound is formed by injection moulding into the final shape. After accomplishing its primary role – dispersion with powder into compound with a viscosity suitable for injection moulding - the binder is thermally or chemically removed (debind) from the feedstock. Finally, the compact is sintered to obtain metallic or ceramic item of a density about 97% of the theoretical.

Ongoing research in the field of PIM is directly connected to the applications at the simultaneous preservation of a competitive strength via worldwide established quantities for an accuracy, quality, safety (REACH), economy and ecology. Therefore, it is possible to effectively predict new trends in the R&D from the knowledge of recent industrial applications. Based on analyses of appearing patens, research projects, industrial and scientific papers it is evident that the research concerning PIM processing nowadays moves from the standard materials, design and applications to the simulation programs of the particular PIM steps and the production of micro parts made from materials with many technological and price barriers (titanium and its alloys, nanopowders). At the Polymer Centre TBU in Zlin the research in PIM area is oriented to the rheological characterization of feedstocks in both steady state and dynamic shear flows as a necessary approach to optimize moulding step of the process. A fundamental quality influencing issue is the flow of PIM feedstocks into a mould cavity during injection moulding, where separation of binder and feedstock might occur.

A lot of effort has been paid to describe the powder-binder separation during the flow through the mould channels in the quantitative way. In order to understand the mechanism of phase separation and its influence on the shape retention during debinding and sintering, the testing mould should include inner and outer corners, radical thickness changes, weld lines and a thin film part. Such testing mould geometry was developed in cooperation with IFAM, Bremen, and currently is available for analyses of disposition of PIM feedstocks to phase separation. Further, the Centre is equipped to provide the evaluation of the transition temperatures, thermal conductivity, heat capacity, and pvT characteristics of feedstocks to collect data required for the simulation of the injection moulding step of PIM process.

FLAME AGENDA IMPORTANT EVENTS IN EUROPE

NOVEMBER

17-18—**NANOITALTEX 2010**—innovation in textile materials. Milan, Grand Hotel Villa Torretta, **Italy**. Click here to go to the event webpage.

23-24—**Central Europe annual event**, Prague. Click here to go to the event web page .

23-25— **The Future of Reference Materials – Science and Innovation**, Geel, **Belgium**. JRC-IRMM (Joint Research Centre
Institute for Reference Materials and Measurements). Click ere to go to the event web page.

DECEMBER

1-4—**EUROMOLD** – World Fair for Moldmaking and Tooling, Design and Application Development, Frankfurt / Main, Germany. Click ere to go to the event web page.

1-2— **Plastics Caps & Closures Conference 2010**, Marriott Brussels Hotel, Parnassusstraat 15, 1050 Ixelles, **Belgium**. Click ere to go to the event web page.

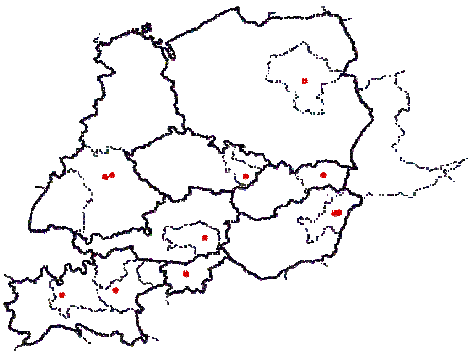
2– 3—**Conference on Property Law**, at ERA Conference Center: Metzer Allee 4, 54295 Trier, Bundesrepublik **Deutschland**. Click ere to go to the event web page.

6-8—**The 15th Annual Conference: Pulp and Paper in Russia and The CIS**, at Vienna Marriott Hotel, Parkring 12a, 1010 Vienna, **Austria.** Click ere to go to the event web page.

9-10—**Naval Affordability, Sustainability and Efficiency,** at Le Méridien Piccadilly , 21 Piccadilly, Westminster, London W1J 9, **UK** . Link to the event.

CONTACTS

Find the FLAME contact in your region!



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