Newsletter

Issue 09 – Nov & Dec 2008

Welcome to the ninth issue of the Custom-Fit newsletter.

This newsletter will introduce you to the customisation process for a new product conceived by the first runner up of the CF Product Design Competition and information on the development of Biocompatible Materials for Rapid Prototyping as well. To finish we will give you information on the implementation of a Total Quality Management (TQM) system for Rapid Manufacturing processes. As always, we will provide you with information about the upcoming events.

We really hope you enjoy reading this.

New Cases of Customisation: Pointe Shoes

During the month of September, the First International Custom-Fit Summer School was held, in the frame of ICAT 2008. Four finalists of the Product Student Competition presented their ideas.

In this newsletter, we will show you the idea conceived by student Hanna Rogers from the University York Saint John, who was the first runner-up in the competition.

Customisation of inserts for Pointe shoes

The construction of the modern pointe shoe is often attributed to the early 20th Century Russian ballerina, Anna Pavlova. Pavlova had particularly high arched insteps, which left her vulnerable to injury when dancing en pointe. She also had slender, tapered feet, resulting in extra pressure applied to the big toe. As a result, she would insert toughened leather soles into her shoes for extra support and would flatten and harden the toe area to form a 'box'. Dancers now use satin or Canvas pointe shoes with a hard but pliable shank and a box made up of layers of canvas, burlap, paper and glue. Because the shoes are very hard when new, most dancers develop idiosyncratic methods to break in their pointe shoes, including pounding the shoes against cement, hitting them with blunt objects, wetting the box then wearing them to class, bending them on a door frame, or simply massaging the shoe with their hands. The need to break in pointe shoes is to maintain sufficient rigidity in the shoe to ensure support yet have the flexibility to allow fluent movement.

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If a dancer builds up enough strength in their foot, they often have a chance to start dancing en pointe. To provide comfort in a pointe shoe, the ballet dancer relies on a gel pad or lambs wool to absorb the impact on the foot as they go onto points, whilst Professional dancers spend years trying to harden and strength their feet to cope with these stresses. It is not rare to hear that a dancer has developed tendonitis. Many dancers will complain of pain behind their heel and ankle. This is where the Achilles Tendon is located. Each movement in dance, requires the use of many muscles and tendons in the foot and ankle – this area is taxed especially with pointe work. The tendons tend to strain and can become inflamed if not properly taken care of. Other injuries that can be seen in dancers that have been on pointe are fractures of the third tendon, skin wounds and the onset of arthritis later in life.

The current supports to fit within pointe shoes are pads made from materials such as polymer gel and wool that mould around a dancers foot. These products do provide comfort, however they also rely on a dancer being on pointe for the period of time it takes to mould these substances to their feet, without adequate support. Many dancers are also forced to buy pointe shoes that are too wide for their feet in order to fit the supports in the end of their shoe. By creating a custom-made insert, a foot could be instantly supported when on pointe, and the excess material sometimes found around the foot could be reduced.

The opportunity here is to exploit the Custom-Fit programme so that bespoke inserts can be produced for an individuals feet, that will help transfer the weight and forces generated during dance through the leg and foot to the pointe shoe. The challenge will be to scan and model the shape of the foot through the different stages of dance, and then to construct a suitable insert that is available for all ages and markets.

Biocompatible Materials for Rapid Prototyping

The implantation of integrated biomedical devices into the human body provides challenges for engineering materials science and biology. The demand for metallic and polymeric biomaterials is increasing greatly because of the rapid growth of the world's population, the increasing proportion of older people and the high functional requirements of younger people.

A Custom-Fit partner, DSM from the Netherlands, has been developing new bio-compatible materials which can be printed using manufacturing techniques developed within the project framework. These newly developed techniques can manufacture pieces using graded materials. DSM has achieved the development of photo-curable resins, based on either bio-stable or biodegradable oligomers. These materials can be readily processed on commercial RP machines, yielding high quality, biocompatible polymers, and they demonstrate the versatility and prospects of RP as the method of choice for the fabrication of biomedical devices.

The bio-stable resins comprised of polyester/polyether oligomers have acrylate or methacrylate functions while the biodegradable composites have been prepared from methacrylate-functionalised, biocompatible polyesters. The chemical composition, purity and molecular weight distribution of these synthesized oligomers were all proven.

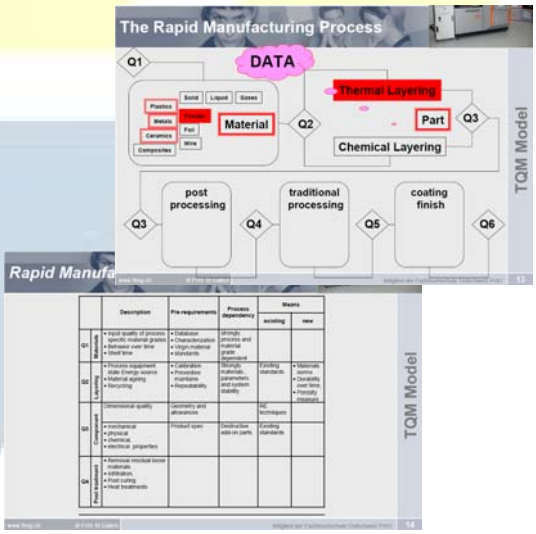
This finding is also supported by the toxicological studies on the cured material where no harmful extracts were found. The tested material meets the requirements of the Intracutaneous Test according ISO 10993-10 guidelines.

Implementation of TQM for Rapid Manufacturing Processes

The Institute for Rapid Product Development in Saint Gallen is an 'institution' in Rapid Manufacturing Processes. They have developed a method to apply a system of Total Quality Management (TQM) to RM processes, as products built with this system must be very durable.

With this idea in mind the first thing they did was to define the RM Process. Using this, they made a chart to establish and analyse quality conditions in blocks (materials, layering, components and post treatment), the description that each of the conditions must accomplish and the means available to achieve these conditions.

With these generic and straight forward verification methods, that are based on specific scientific and experimental data as well as on known standards, procedures can be defined.



Information extracted from the RM Platform at: http://www.rm-platform.com, Gideon Levi et al, *SLS TQM for RM, Euro-uRapid*

Upcoming Events

- 1st European Conference on Software Services and SOKU technologies, Brussels, Belgium, January, 13th – 14th, 2009.
- LOGOS Open Conference on strengthening the integration of ICT research efforts, Budapest, Hungary, January, 19th – 20th, 2009
- ICT FOR A GLOBAL SUSTAINABLE FUTURE, Brussels, Belgium, January 22nd – 23rd, 2009
- Plast 2009, Milan, Italy, March, 24th to 29th
- More: http://www.custom-fit.org/index.php/events/