# Newsletter

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volume 23, issue 3
December 2016

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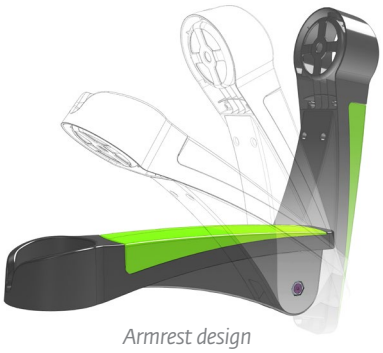
## *Cinema chair; from sketch to reality*

**For over 90 years, North American company Seating Concepts designs, sells and produces high quality auditorium seating. Their products include seating for cinemas, theatres, churches, educational institutions, stadiums and so on. BPO developed a new version of the BG800 cinema seat for Seating Concepts, starting with an analysis and first idea sketches, followed by concept development in 3D CAD, engineering, finite element simulations, 2D documentation and serial tooling part validation.**



*Armrest design*

*Sketch, presentation drawing and 3D CAD model*

The goal of the project was twofold: a reduced unit price and a modernised design. The project started with a thorough analysis of the existing cinema chair. The parts, configuration, design and assembly of the product was reviewed and ideas for the integration of parts and for a reduction of assembly time were presented. The analysis showed that significant cost savings could be achieved by a redesign of the seat and the armrest. Therefore, these two parts were completely redesigned by BPO.

In order to achieve a modern and integrated appearance, BPO redesigned the material, shape and colour of the entire chair. First, guidelines for the new design were defined using mood boards, market research and ergonomic data. Thereafter concepts were developed by means of idea sketches and visualisation in 3D CAD. The result was an optimised, ergonomically shaped chair, combined with a range of options for material and colour variations.

The ergonomics and style were important focus points for both the design of the foam parts and the design of the seat and the armrest. The parts were developed in such a way that they are comfortable for a wide range of users, and, in addition, adaptable in terms of styling, depending on the wishes of the clients. This means that each theatre or cinema can compose their own, unique style.

The geometry of seat, tilt-up mechanism and armrest was extensively analysed for strength, stiffness and durability by means of finite element analyses. The relevant industry standards were used as guideline for optimisation. The producibility of the parts was verified by means of moldflow simulations and assembly tests. BPO delivered mould-ready CAD-files to the mould maker and provided support during mould making and during the assessment of the "First of Tools".

Seating Concepts recently presented the new BG800 cinema chair on various tradeshows in North America. For more information about Seating Concepts, please visit their website: www.seatingconcepts.com.

On behalf of the BPO team, we wish you pleasant Holidays and a successful and healthy **2017!**

**BPO Nederland b.v.**
Scheepmakerij 11
2628 AA Delft
the Netherlands
+31 (0) 15 362 0000
info@bpo.nl
www.bpo.nl

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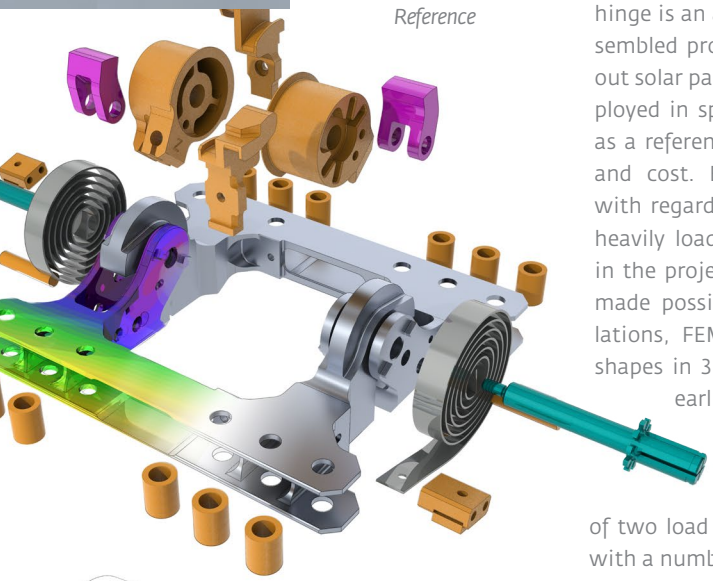
## *Design of a titanium hinge for Additive Manufacturing*

**BPO has researched the possibilities for using Additive Manufacturing (AM) in high tech production parts for space applications in a joint research project with *Airbus Defence and Space Netherlands* and the *Netherlands Aerospace Centre* (NLR).**

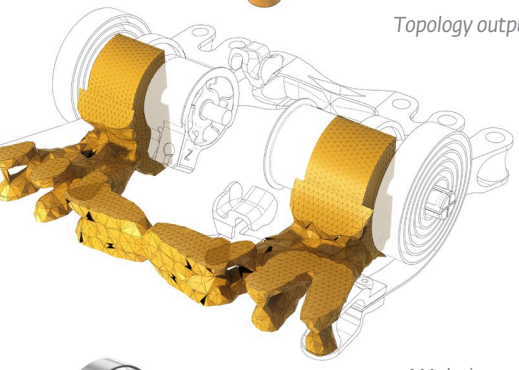
Additive Manufacturing is a term used for all techniques that are used to build parts in thin layers of material. In this project the process *selective laser melting* for metals was used. *Airbus Defence and Space Netherlands* develops and produces parts for the space industry, like solar panels, satellite instruments and rocket structures. NLR is the *Netherlands Aerospace Centre* for identifying, developing and applying advanced technological knowledge in the area of aerospace. It has the facilities to produce metal parts using Additive Manufacturing techniques.

In this research project, BPO reworked the current hinge design of *Airbus Defence and Space Netherlands* by using the unique characteristics of Additive Manufacturing. The newly designed hinge is an alternative for the complex and assembled product that is now used for folding out solar panels of satellites that have been deployed in space. The existing hinge was used as a reference regarding performance, weight and cost. BPO's knowledge and experience with regards to the development of complex, heavily loaded parts could be used optimally in the project. The redesign of the hinge was made possible by combining topology simulations, FEM analyses, modeling of complex shapes in 3D CAD and BPO's experience from earlier research projects like *DirectSpare* and *Custom Fit*.

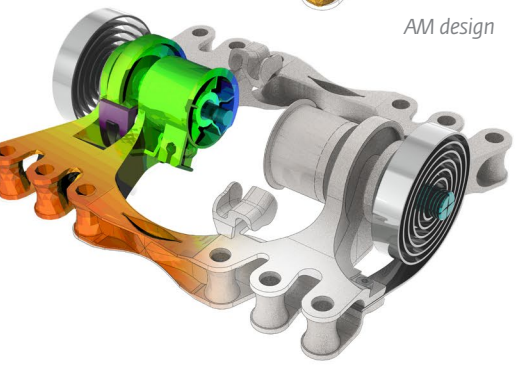
*Reference*



*Topology output*



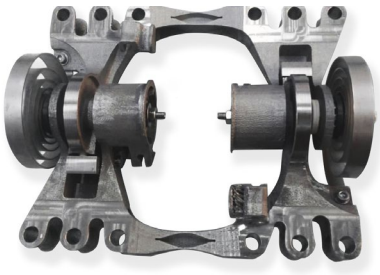
*AM design*



The reference hinge consists of two load carrying parts that are assembled with a number of axes, bearings, bushings, torsion springs and two pulleys. The load bearing parts of the current hinge are made by machining aluminium. The redesign of the hinge as proposed by BPO is made of titanium and has significantly less parts and uses less material.

At the start of the project, the performance of the current hinge was quantified using finite element simulations (FEM) for different loading directions. The resulting deformations were then used as input for topology simulations. These analyses are used to calculate how a similar stiffness can be achieved within the available design space with a minimal deployment of material. This often results in organic shapes that cannot be produced with traditional production methods. The shape that resulted from these simulations was used in the design, together with the smart integration of parts that have to be separately assembled in the current design. During further development, the design was checked for its strength and stiffness using FEM simulations in a number of iterations.

*AM design on building platform*



*AM design - result*

At the moment of writing, the parts have been produced, assembled and tested successfully. With the successful conclusion of this project a major step has been taken in the designing of products that are to be made using Additive Manufacturing. For a commercial application of the redesigned titanium hinge the unit cost and a strict qualification and certification process are the next hurdles to be taken.

The application of Additive Manufacturing creates possibilities for weight reduction as well as functional solutions that were not feasible before. The designing for Additive Manufacturing requires a different approach than designing for traditional production techniques. Do not hesitate to contact us if you have questions about the possibilities of Additive Manufacturing for your products.

**THIN WALL PACKAGING 2016**

This autumn, BPO is present at the "**Thin Wall packaging**" conference, an international conference on market trends and developments in plastics tubs, cups and tray packaging. For more information, please visit: www.amiplastics.com.