Interior Concept with Light Centre Console

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Dräxlmaier Group's new X² centre console architecture opens up great potential for lightweight design. Thanks to its integral design, this innovative product weighs 30 % less than typical centre consoles generally installed in mid-size vehicles today. Numerous studies confirming series production readiness have already been completed.

COMBINATION OF TWO ARCHITECTURES

Companies today face wide-ranging challenges in the area of sustainability. Car makers and automotive suppliers operate within a complex environment with high expectations regarding social responsibility that opens up new potential, economic aspects such as rising fuel prices and increasing resource scarcity, and strict statutory requirements for the reduction of CO_2 emissions. Products with low environmental impact and reduced weight make an important contribution to overcoming these challenges.

Against this backdrop, the Dräxlmaier Group spent three years developing a centre console that opens up new potentials in lightweight design thanks to the combination of two typical architectures [1]. Thus, the new X² centre console combines a shell design with a support element design, resulting in a noticeable reduction in weight.

THE STATUS QUO

Two centre console architectures currently dominate the market: the shell design and the support element design. With regard to the former, the outer skin is largely formed by the shell itself (shown in red), which is generally manufactured with a grain texture or painted, FIGURE 1. Reinforcing interior elements provide additional support for loads. Thus, the disadvantage is that the strength required of the centre console has to be provided by separate internal structural components. These must be manufactured in addition and installed, leading to more processes and increased investment in tooling. Additionally, the injection moulding production process allows for only slightly contoured, plain console sides, placing limits on styling options such as patterns or ornaments.

The support element design offers greater design freedom, but this is achieved with numerous panels that enclose the structural component – shown here in red, **FIGURE 2**. The large number of panels in different shapes need to be manufactured separately as well as requiring many assembly steps, since the panels must be fastened using screws, clips or other joining methods.

ADVANTAGES OF THE NEW INTEGRAL DESIGN

The "integral design" described here refers to the supporting, structure integrated into the console sides. This new X² centre console, **FIGURE 3**, combines the two typical centre console architectures, improving their common advantages while largely dispensing with their disadvantages. Of particular note is the lightweight design: The integral design and the centrally divided support element both significantly reduce the number of components needed to achieve the required strength. For example, most of the panels are elimi-

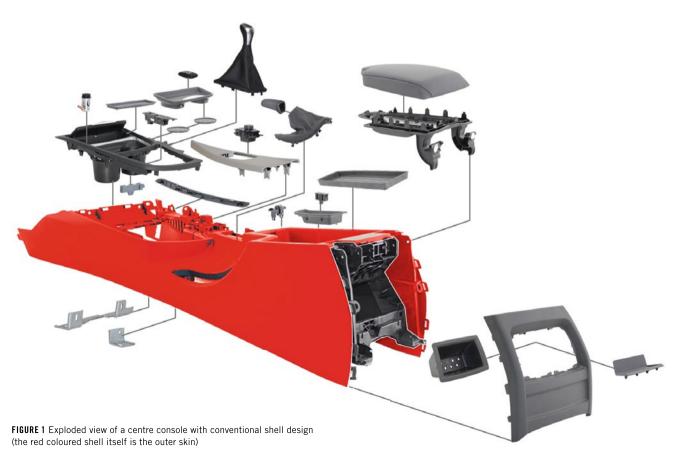


FIGURE 2 Exploded view of a centre console with conventional support element design (structural component shown in red)



nated, and the reinforcing interior elements can be reduced to a single component, **FIGURE 3**.

The closure on the armrest is also eliminated, which further supports the principle of lightweight design. This is replaced by an innovative opening concept driven by a special spring. The base configuration, which is the lightest, can be upgraded with an armrest height adjustment feature, if desired. The modularity of the X² centre console comes into play here: The upgrade only requires two easily installed additional parts on the console sides.

LIGHT MATERIALS

Another important aspect is the use of lightweight materials in the X² centre console. For example, the two lightweight design side support elements are produced using a Thermoplastic Foam Moulding (TFM) process. Plastics reinforced with natural and glass fibres are also used. The storage compartment and the panel are made, for instance, of the light, sustainable composite material Natural Fibre Polypropylene (NFPP). Overall, the interior concept is roughly 30 % lighter than a conventional centre console currently found in mid-range vehicles. This corresponds to weight savings of around 1.5 kg. The new laminated design and the the centre console's tool-free installation help optimise costs.

STYLING POSSIBILITIES

At the same time, the X² centre console permits alterations according to customer requirements. For example, side padding can be subsequently installed in the knee area. The styling of decorative elements and the decorative panel can also be varied. Decorative styling of plastic, aluminum or wood is possible. Special features such as applications or decorative designs on the armrest covering as well as premium leather stylings are conceivable. In other words, this is a huge leap towards maximum styling freedom. However, the lightweight design potential is best achieved in the entry-level variants.

SERIES REQUIREMENTS SATISFIED

The goal is to ready the X² centre console for series production. The simulations required for this goal have already been completed. These include testing of warping properties, filling pressure, crash behaviour and stiffness load cases. For the latter, the forces acting on multiple locations of the X² centre console were determined using the finite element method, **FIGURE 4**. The result: All values comply with the standard. The same is true of the other simulations mentioned, all of which satisfy all OEM requirements.

The ease of assembly was also tested for series production compatibility. For this the developers focused on clip assembly ensuring efficient production without compromising on crash or stability requirements. An interlocking clamp mount enables screw-free fastening in the vehicle.

SUMMARY

Lightweight design offers huge potential. This is especially true when applied inventively as is the case with the integral design approach of Dräxlmaier Group's X² centre console. It is a good example of systematic lightweight design, thanks to a combination of the surface and structure by merging the shell and support element design approaches. In conjunction with topology optimisation of the components in the interests of constructive lightweight design and the use of light materials, it is possible to achieve weight savings of roughly 30 %. In its base configuration, the X² centre console is roughly 1.5 kg lighter than centre consoles currently installed in mid-size vehicles.

Numerous analytical studies for confirming the series production compatibility of the interior concept have been completed, and several patents have already been granted. A number of OEMs have already shown interest.



FIGURE 3 Exploded view of the new X² centre console with an integral design that combines the outer surface and formative structural elements into a single unit with little parts

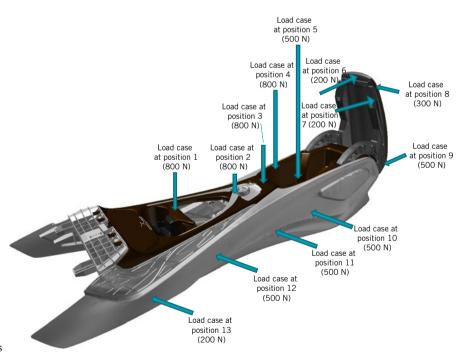


FIGURE 4 FEA load case simulation – pressure was applied to the X² centre console with a piston to simulate load cases; the result: the measurement values in N exceed the required values at all 13 positions

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