

SUCCESS STORY



CQFA CARREFOUR QUÉBÉCOIS
DE LA FABRICATION ADDITIVE

COLLABORATE TO INNOVATE

STRENGTH IN NUMBERS

Kupol is a pioneer in 3D-printed energy structures. It operates with a clear goal in mind: to improve the safety of athletes by harnessing the power of additive manufacturing technologies. Since 2019, the organization has been involved in a unique collaboration known as Kollide. This consortium has allowed Kupol to join its knowledge and expertise with three innovative companies:

- Tactix is an industrial design firm that specializes in the development of high-performance sporting, health and safety equipment;
- Numalogics is a virtual testing laboratory used to evaluate biomechanical interactions between humans and sporting or medical equipment;
- Shapeshift 3D specializes in the development of software that digitizes and customizes high-performance sporting and medical equipment.

Researchers Éric Wagnac and Yvan Petit from the École de technologie supérieure have also contributed to Kollide by characterizing the behaviour of the consortium's structures and by lab testing prototypes to assess the resulting technology and collect data that can improve football helmets.

Together, these unique entities make up Kollide, a consortium dedicated to the innovation, research and development of the ultimate football helmet.

A FRUITFUL COLLABORATION

Kollide proved a successful collaboration when the consortium made a strong showing at the 2019 NFL Helmet Challenge. During the competition, held in 2020, the NFL awarded grants to innovative companies that had developed new helmets. Four out of 100 companies were selected. Among those, Kollide was the only Canadian organization chosen to create its prototype with a grant valued at US\$250,000. In 2021, Kollide received another US\$550,000 to take its prototype to the commercial production stage.

Kollide was able to develop an entirely new approach to energy absorption by bringing together multidisciplinary knowledge for sporting equipment design and validation testing. The solution involved the weaving of polymeric strings. Together, Kollide's partners set out to manufacture football helmets by creating a prototype from scratch. The approach: treat the football helmet like a medical device.

Football helmets have remained largely the same over the years; they include an outer shell, a face mask, and the inner padding. Each of these components plays an important role when protecting athletes. First, the outer shell absorbs energy. Its range of hardness varies considerably. Next, the face mask serves as the main element of protection for the face. Finally, the inner padding protects the head from impact. This final component is central to the problem; it represents a fundamental weakness in terms of protection. Kollide is working to solve this weakness. Through FDM, the consortium's objective is to use the thickness between the outer shell and the head in a more effective manner to achieve maximum protection during impacts.

COLLABORATE TO INNOVATE



“Passion and respect are at the heart of our work. It takes a lot of mutual appreciation and teamwork to create an effective and functional consortium. This partnership is pushing the boundaries of Fused Deposition Modelling (FDM). It’s important to understand that additive manufacturing is more than a trend; it’s the future of comfortable, high-performance equipment. A given technology is only interesting if it achieves something, and that’s what happens with FDM.”

– Gabriel Boutin,
Co-founder at Kupol

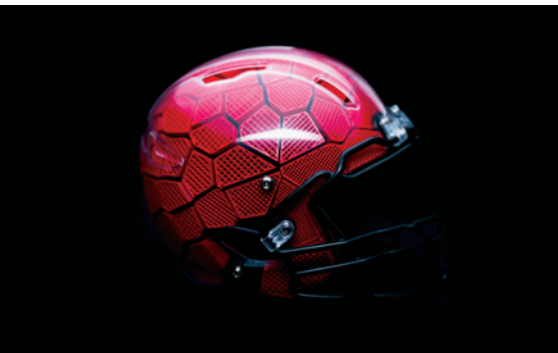
The helmet lining that was developed by Kollide involves 95 pads 3D printed into a mesh structure. Each pad includes its own mesh interior. Every zone on the helmet has been optimized for the specific type of impact that is most likely to occur. Kollide can also use 3D scans to precisely fit the protective liner to a player’s head. Kollide’s helmet technology differs from that of competitors due to the composition of its complex and organic 3D printed mesh structure, which has been optimized to absorb and redirect impact energy. More than any other helmet, Kollide’s helmet reduces the linear and rotational head accelerations that occur at the moment of impact.

Working on the cutting edge of helmet design, Kollide continues to refine its prototypes while further developing the structures involved. The goal is to market a football helmet that offers superior protection and unparalleled comfort without compromising the needs and satisfaction of NFL players. This challenge continues to push the consortium and its members to develop their additive manufacturing expertise, along with their knowledge of impacts and the body’s response, all with an eye on diversification. The expertise developed with this football helmet is certain to find other applications. Kollide is already considering a range of applications and will soon contribute to the improvement of other products involving bodily protection.

DEMOCRATIZING QUALITY THROUGH INNOVATION

The cost of the Kollide’s helmets has yet to be determined. But the consortium knows that its technological choices will help optimize the manufacturing process and lead to a fair price. 3D printing is an evolving, adaptable technique. It takes time to master at high performance levels. A deeper understanding of programming, more precise control of manufacturing steps and sequencing, along with the automation of certain tasks represent potential areas of improvement when creating value-added for production activities and cost reductions. Due to its flexibility, performance and accuracy, FDM has the potential to become more cost-effective than other technologies. The choice will help democratize high-quality helmets for all football players.

Despite the technology’s considerable role in Kollide’s success, let us not forget that this achievement is the result of collaborative efforts from the various companies involved. This story is built on the pooling and sharing of expertise from various sectors. It is teamwork that has allowed Kollide to take its business to the next level. Kollide’s innovation would not have been possible without support from these Quebec companies, all of which showed a willingness to innovate by working together.



ADDITIVE MANUFACTURING: AN ENORMOUS POTENTIAL

The Kollide consortium was quick to understand the wide range of possibilities that come with Fused Deposition Modelling (FDM) and chose this process for that reason. Using this approach, Kollide was able to create high-performance and technical-grade prototypes while designing industrial-grade parts with unmatched mechanical, thermal and chemical resistance, in addition to developing versatile, safe and durable helmets.