

**Expertise:** Production Development

**Industries:** Manufacturing

# Innovative carbon fibre weaving techniques – from lab to industrial production



## Overview of the partnership

<b>Partners:</b>	Oxeon, Biteam and Consat Engineering
<b>Objective:</b>	To industrialise and further develop innovative weaving techniques for carbon fibre composites with extreme performance, enabling serial production.

When the vision of serial production of high-performance carbon fibre components was to be realised, Consat Engineering became an important partner. Together with researcher and entrepreneur Nandan Khokar, Consat contributed to production solutions that paved the way for innovative materials – from flat tape weaving to the wings of NASA's Ingenuity helicopter on Mars.

In collaboration with Oxeon, and later Biteam, Consat helped turn bold ideas into reality – ideas that challenged how carbon fibre could be produced on an industrial scale. Through advanced technical solutions and close partnerships, the collaboration resulted in production systems that attracted interest from leading players in the aerospace industry. One of the most recognised results is TeXtreme™ – used in everything from Formula 1 components to NASA's Ingenuity helicopter on Mars.

### A pragmatic partner

It all began when Nandan Khokar, Professor of Textile Technology at the University of Borås, wanted to realise his idea of tape weaving carbon fibre. In 2005, through Oxeon, he contacted Consat to industrialise the technique.

Together with Nandan, Consat engineers developed an existing prototype into a functional production machine in close collaboration with Oxeon's team. The result became the launch of the patented material TeXtreme™ – today used in everything from Formula 1 components to the wings of NASA's Mars helicopter, Ingenuity.

Seven years later, Nandan returned to Consat, this time with his 3D technology called Uniaxial Noobing. In a new project, he and Consat engineers developed the first industrial production machine based on a prototype from Nandan's team.

### Challenge

Oxeon and Biteam needed to make the leap from groundbreaking research to reliable production – with entirely new carbon-fibre weaving techniques and no existing machine solutions.

### Solution

Consat Engineering helped develop prototype production machines for both tape weaving (Oxeon) and 3D weaving/Uniaxial Noobing (Biteam), in close collaboration with Nandan Khokar and his team.

**“Consat has always prioritised our interests and found a way forward, both technically and commercially”**

**Nandan Khokar, Professor of Textile Technology,  
University of Borås**

### The challenge

Creating three-dimensional carbon fibre structures through weaving placed high demands on innovation and engineering. The techniques were far ahead of their time – there were neither suitable machines nor sufficient market understanding.

For Oxeon, the challenge was moving from lab scale to serial production. For Biteam, the key was avoiding delamination in traditional composites. With no ready-made systems available, entirely new machines had to be developed.



## Key outcomes

- Entirely new weaving techniques were industrialised through Consat's machine development.
- Oxeon's TeXtreme™ is used in, among other applications, Formula 1 and NASA's Ingenuity helicopter on Mars.
- Biteam developed an industrial prototype machine for 3D weaving, taking a step towards automated production.

## Summary

- Oxeon needed to industrialise tape weaving – Consat developed the first production machine.
- Biteam created a unique 3D technology – Consat developed an industrial prototype machine.
- TeXtreme™ became part of NASA's Mars helicopter – a technological milestone made possible through Consat's machine development.
- The partnerships resulted in technological leaps within composite materials, with global impact.

## The solution

Consat Engineering contributed with both technical expertise and hands-on implementation.

- For Oxeon, Consat developed a complete production solution for tape weaving, including design, drawings, and testing.
- For Biteam, Consat further developed a prototype machine for 3D weaving within the Vinnova–Saab project GF-demo – a step towards an automated solution for industrial use.

## The result

With Consat's support, both Oxeon and Biteam were able to move from idea to production.

- TeXtreme™ has become an established material in sports and composites, used in Formula 1, bicycles, and NASA's helicopter on Mars.
- Biteam's 3D profiles have opened up new applications, especially in aerospace, where strength in all directions is critical.

## Value-driven innovations

Oxeon's tape weaving has enabled manufacturers to create lighter, stronger, and visually appealing composites. That the material was used on Mars is a testament to the technology's potential.

Biteam's Uniaxial Noobing technology opens up the possibility of replacing metal components with advanced 3D composites – the same strength, but with lower weight and greater design freedom.

Both solutions were made possible by close collaboration, curiosity, and technical perseverance. Consat engineers played an integral role in both development and industrialisation.

## Contact us

Interested in learning how Consat Engineering can support your organisation with value-driven innovation? Contact us today for more information or to schedule a demo.