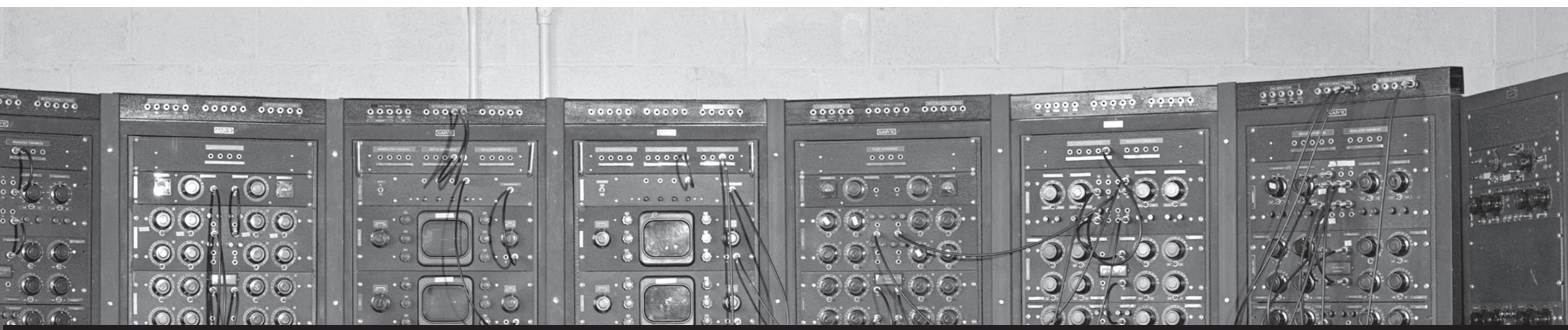
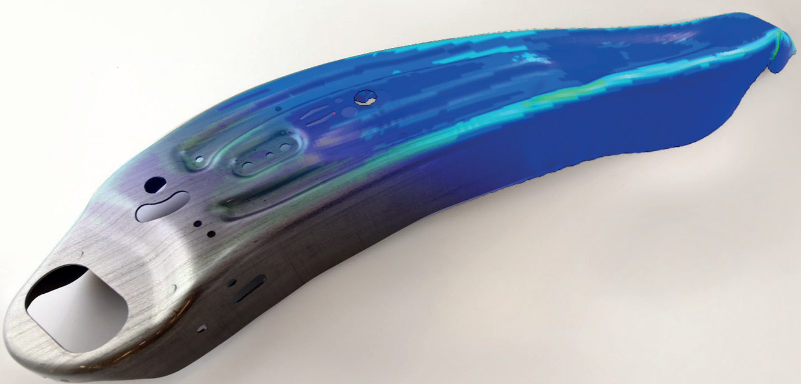


Complex materials made easy to use

We strive to make the increasingly complicated mechanical behaviour of new materials accessible to an audience lacking the resources to penetrate their complexity. A strong scientific foundation and the determination to lift the burden from the end users make the Swerea KIMAB Virtual Methods research environment an ideal partner when introducing new materials to the market.



$$
\begin{aligned}
\mathbf{D} &= \mathbf{D}_e + \mathbf{D}_p \\
\dot{\sigma} &= C\mathbf{D}_e = C\left[\mathbf{D} - \mathbf{D}_p\right] \\
\dot{s}_p &= \sqrt{\frac{2}{3}}\|\mathbf{D}_p\| \\
f &= \|\sigma^D - \mathbf{X}^D\| - \sqrt{\frac{2}{3}}(\sigma_0 + \sigma_f) \\
\mathbf{D}_p &= \gamma \frac{\partial f}{\partial \sigma}
\end{aligned}
$$

$$
\begin{aligned}
\sigma_f &= \alpha M \mu b \sqrt{\rho} \\
\mathbf{X} &= M \frac{\mu b}{L} \mathbf{n} \\
\frac{d\rho}{ds_p} &= M\left(\frac{1 - \frac{n}{n_0}}{bL} + \frac{k}{b}\sqrt{\rho} - f\rho\right) \\
\frac{1}{L} &= \frac{1}{d} + \frac{1}{t} \\
\frac{1}{t} &= \frac{1}{2e}\frac{F}{1 - F} \\
F &= F_0\left(1 - e^{-\beta(s_p - \epsilon_{init})}\right)^m
\end{aligned}
$$

The design process of a high grade product typically involves several iterations between simulation software packages. Unless the mechanical behaviour of a candidate material is characterised properly for use in these simulations, the integrity of the component cannot be established. Thereby the material loses its competitive place on the market.

New materials tend to require increasingly complicated descriptions of evolving microstructural features. The Swerea KIMAB Virtual Methods research environment packages the mechanical behaviour of new materials and new material models into software code for use in 2-D and 3-D simulations.

Our Approach

- We look at the **usage** of the material to determine the level of complexity that is needed for that specific market
- We set up a **test plan** that reflects the usage
- We **adopt the model** to the required environment
- We **validate** the built model

Contacts
Niclas Stenberg, niclas.stenberg@swerea.se

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