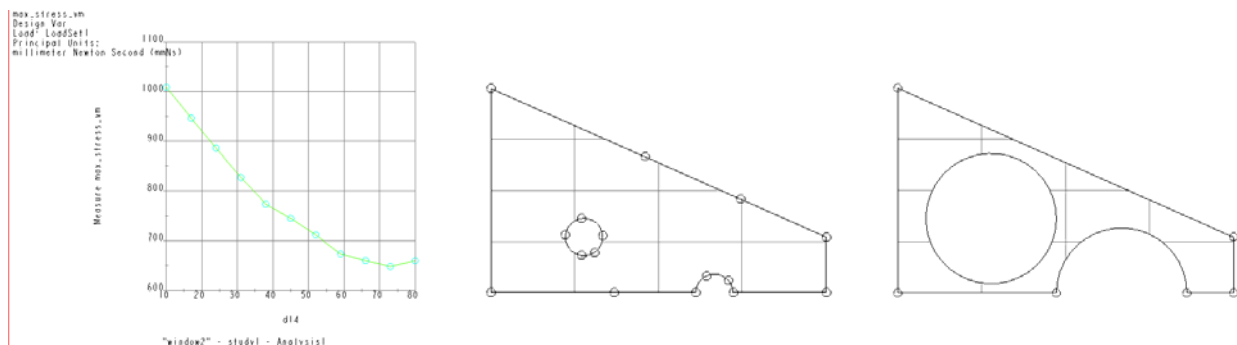


Design Optimisation & Knowledge-Based Engineering

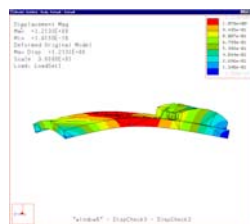
Using the tools available in the Pro/ENGINEER® family of software, Elite Consulting can help you to improve both your designs and your design process.

Structural Optimisation using Pro/MECHANICA®

Pro/MECHANICA is the finite element analysis part of the Pro/ENGINEER suite. It has built-in sensitivity & optimisation capabilities, so that designs can be optimised efficiently and automatically for structural and/or thermal performance. Typically this will involve determining the minimum mass or minimum cost design that meets certain targets such as strength and stiffness. Design parameters are set up in Pro/ENGINEER and these are allowed to vary within appropriate limits in a Pro/MECHANICA design study. A global sensitivity study can be run to determine how the output changes as each parameter is changed. Alternatively an optimisation study can be run, whereby as many parameters as you like are allowed to vary and Pro/MECHANICA uses an in-built routine to determine the optimum design. In a Pro/MECHANICA optimisation there can be 1 goal, but multiple constraints, from a number of analyses; e.g. max. principal stress, maximum deflection, minimum fundamental frequency etc.



Case Study - Thermal Distortion of an OHP



Company X had redesigned an OHP to be made from ABS instead of aluminium, only to find that it suffered from thermal distortion. They had tried some 'fixes', but none worked, so we were called in to see if we could find a solution. We analysed the model in Pro/MECHANICA Thermal and Structure, obtained correlation and then optimised the design to obtain two possible solutions; a long term one that would require a tooling change, and a short term one that didn't.

Elite Consulting can undertake design optimisation projects off-site or work with you to help you to develop your own design optimisation routines.

Design Optimisation & Knowledge-Based Engineering

Knowledge-Based Engineering using Pro/ENGINEER® Functionality

Using the tools available in the Pro/ENGINEER® family of software, Elite Consulting can help you to improve both your designs and your design process. Not everybody knows that Pro/ENGINEER has some very powerful functionality built into it as standard. With family tables, relations and Pro/PROGRAM some powerful design rules can be incorporated without the need for any extra modules.

Optimisation using Behavioural Modelling® Extension (BMX)

PTC took the design optimisation routine out of Pro/MECHANICA and created a new module, BMX, that can be used to optimise any kind of Pro/ENGINEER parameter, not just for structural performance. This is done by creating an analysis feature in Pro/ENGINEER.

An analysis feature can be created using any of the geometry measures available in Pro/Engineer plus:

- Motion analysis
- Mechanica analysis
- Relation analysis
- Excel analysis
- External Analysis
- User Defined analysis
- MathCAD analysis (Wildfire 3.0 on)

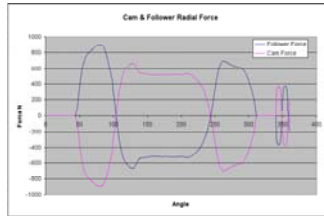
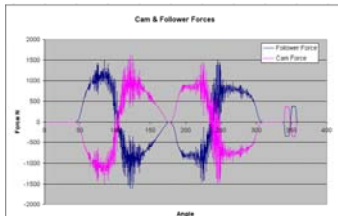
Then BMX can perform the following types of study:

- Sensitivity study
- Feasibility analysis
- Optimisation
- Multi-Objective study

Therefore it is possible to define some very complex design rules and to incorporate them into your design and optimise the design at the same time.

Case Study – Optimisation of a Cam Profile

- Paper handling system
- Quick return mechanism
- Reduce forces in linkage
- To increase operating speed
- Cam force reduced from 1611N to 895N



Other BMX Case Studies

- Controlling the position of the C of G for an assembly
- Controlling the cross-sectional area of a duct as it changes shape along its length
- Balancing exhaust manifold lengths
- Controlling the perimeter length for a hydro-formed tube as it changes shape along its length.

The capabilities are so broad that the limit is your imagination. Elite Consulting can help you to define and program design rules and optimisation routines in Pro/ENGINEER.