ANSYS®

CASE STUDY

EXECUTIVE SUMMARY

Challenge:

To develop a washing machine that uses a single, high-performance sports car bearing to support the drum instead of two lower grade bearings

Solution:

Implement DesignSpace® to conduct easy and accurate simulations to verify load handling and to optimize the design

Benefits:

- Ability to run through hundreds of designs before settling on suitable candidates to check physically
- Save time and money by eliminating costly prototypes

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Innovative British Firm Puts New Spin in Market with Help from DesignSpace

DYSON LTD.

Introduction

A new phrase entered the English language in the 1990s – 'doing a Dyson' – meaning to take a standard action and work out a way of doing it better.

British entrepreneur James Dyson took the humble act of vacuuming, complete with clogged bags, fading suction and dowdy designs, turning it upside down. Or rather, round and round. Dyson's patented dual cyclone technology, which promises no loss of suction together with innovative and attractive design, was launched in 1993. Since then, the company has remained the market leader and has made the company the UK market leader with a worldwide turnover of more than $450 million.

Challenge

Dyson Ltd. (Tetbury Hill, Malmesbury, U.K.) has now turned its attention to a new area in the home, launching an innovative washing machine, the Contrarotator (below).

It is the only washing machine on the market with 2-drums rotating in opposite directions to give the cleanest wash results, with the largest load, in the fastest time. Since the CR-01 uses a single high-performance sports car bearing to support the drums instead of two lower grade bearings, engineers needed to know if the supporting "spider" (right) could handle the load.

"James Dyson built more than 5,000 prototypes of the original dual cyclone," explains Stefan Kukula, head of the Analytical Services Group at Dyson. "With products such as a washing machine it's more difficult and costly to make that number of prototypes, so we made much more use of analytical techniques."

Solution

Using DesignSpace, engineers at Dyson determined that a single bearing instead of two can support the CR-01 drum.

"In many ways, it (DesignSpace) is a natural extension of physical prototyping. With virtual prototyping provided by finite element analysis (FEA) complementing our test program, we could run through hundreds of designs before settling on suitable candidates to check physically."

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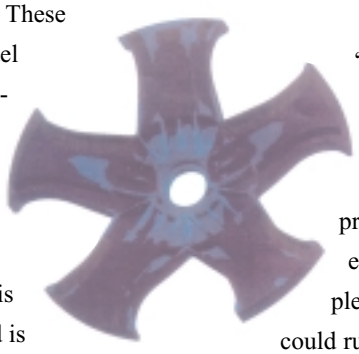
FEA allows design engineers to construct computerized models of linear, planar and solid engineering structures and components. The concept of the method is that a structure or component is optimized as an interconnected assembly of elements. These elements are designed to model specific engineering phenomena and to respond under loading conditions accordingly.



Dyson places great emphasis on the design of products, and is keen not to stifle creativity. "DesignSpace is the ideal tool for this. We can allow trained engineers to do preliminary analyses and checks locally, straight from CAD models on our Unigraphics system, before later stage designs, or trickier problems, are qualified by more specialist software, such as ANSYS, if required," said Kukula. "This method was used on Dyson's latest cleaner, the DC07, which extends the original dual cyclone concept to eight cyclones to produce the Root8, the most powerful upright cleaner on the market.

"We used DesignSpace to check the structural integrity of key components as the product was being designed, reducing the number of surprises we came across during user trials."

Benefits

The mix of dispersed design level and concentrated specialist tools offers great advantages for a creative company such as Dyson, and Kukula is keen to stress the opportunities.

"In many ways it (DesignSpace) is a natural extension of physical prototyping. With virtual prototyping provided by finite element analysis (FEA) complementing our test program, we could run through hundreds of designs before settling on suitable candidates to check physically," said Kukula. "The capability to tie in the different powerful analysis physics available in ANSYS with the design friendly front end of DesignSpace has been very exciting."

"We also used FEA to help design fatigue test rigs, ensuring that the stresses produced mirrored those we expected the components to see in service. After all, there's no point in doing a test if it isn't helping you design a better product."

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