

## Thompson Couplings

Customer Success Story

Autodesk Inventor™

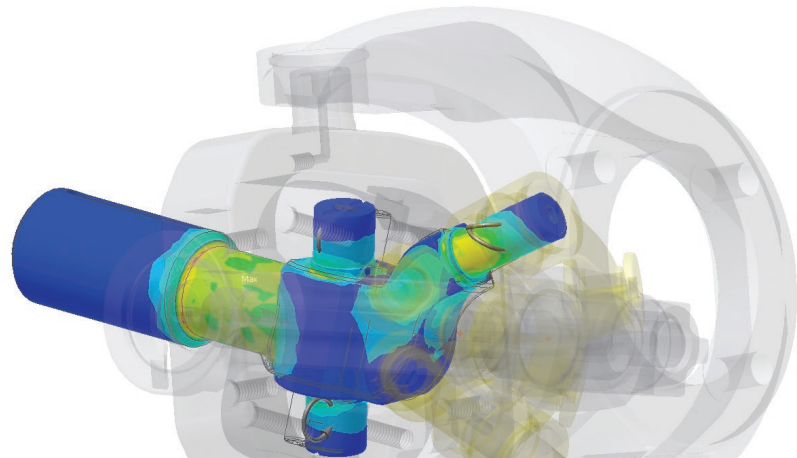
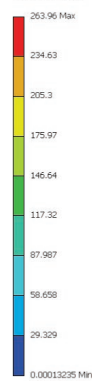
The true benefit of Autodesk Inventor for a small business such as ours is the affordable cost combined with the ease of operation. The software enables us to quickly manufacture and simulate the prototype components digitally and rapidly alter the design in a matter of minutes.

– David Farrell  
Director of Engineering,  
Thompson Couplings Limited

# Thompson Couplings Limited used Autodesk Inventor™ to reduce physical prototypes and design time.

Autodesk Inventor accelerates and simplifies the concept-to-manufacturing process of the Thompson Coupling, enabling designers to leverage advanced 3D digital prototypes to test, simulate and validate designs prior to production.

Equivalent Stress  
Type: Equivalent Stress  
Unit: MPa  
31/07/2007 11:20



### Project Summary

Autodesk Inventor™ has helped Thompson Couplings Limited (TCL) accelerate and simplify the concept-to-manufacturing process, thereby realising significant benefits ranging from operational efficiencies to increased productivity. Inventor has enabled the company to visualise, analyse and amend 3D designs prior to manufacturing a physical model. It allowed engineers to produce a 3D model of the innovative Constant Velocity (CV) joint, The Thompson Coupling to simulate real-time capabilities, conduct performance tests and make necessary refinements prior to final development and thereby shorten time to market.

### The Challenge

#### Bringing the Thompson Coupling to life

A wholly Australian company, TCL acquired the sole ownership of a new Australian invention known as the 'Thompson Coupling'. Invented in 1999 by Glenn Thompson, the Thompson Coupling is a true CV joint that allows two shafts to rotate at constant speed whilst at an angle to one another.

According to Thompson Coupling Limited, the Thompson Coupling is one of the most important inventions since the advent of the internal combustion engine and is the world's first and only practical CV joint to have no load bearing sliding surfaces. Although the traditional joint shaft was designed 400 years ago, no other joint had been able to transmit torque at a high shaft angle with true constant velocity until the Thompson Coupling. The product was featured

on the ABC television program 'New Inventors' in April 2007 and was judged the best new invention on the night. In addition, the company was recently presented with the 2007 GOLD award for Automotive Engineering Excellence by the SAE-Australasia.

Unlike other CV joints, the Thompson Coupling uses an exclusive arrangement of roller bearing hinges that create a fluid movement with reduced friction, resulting in less wear and tear as well as greater efficiency. It has a unique centring device made up of a spherical 4-bar linkage that centres and orientates the hinge joint. In short, the joint is able to cope with greater loads, making it suitable for heavy-duty applications such as helicopter rotor heads, rear wheel and front wheel drive systems and many other types of machinery.

In its quest to commercialise the Thompson Coupling, the company sought to develop a 3D model of the product to validate designs. An avid Autodesk user since the mid-80's, David Farrell, Thompson Couplings Limited's Director of Engineering turned to Autodesk Inventor to produce an advanced 3D digital prototype to interactively test, simulate and amend designs before production. The company initially engaged local firm Central Design & Engineering to create a model using Autodesk Inventor. It has since employed its own engineering team, dedicated to refining the model, using Inventor's dynamic simulation capabilities and digital prototyping functionality, while working with their local Autodesk Reseller – Envision Solutions Pty Ltd.

**Autodesk®**

# Autodesk Inventor™ reduces design time by 75%.

## The Solution

### Digital prototyping speeds manufacturing cycle

By harnessing the power of Inventor, TCL can validate designs before they are produced. Specifically, engineers and designers can simulate in real-time the capabilities of the coupling throughout its full operating cycle and reduce the time spent on iterating designs. They also have the ability to analyse designs in detail and conduct performance tests to avoid field failures. As a result, the team can focus on designing and refining the coupling rather than solving complex geometry modelling problems.

Today, TCL benefits from the rich functionality provided by Inventor. Featuring a comprehensive set of design applications and 2D transition tools, Inventor helped the company to move to 3D with ease and bring the Thompson Coupling to market faster at a greatly reduced cost.

David Farrell explains, "Autodesk Inventor has been invaluable in outputting the various data codes for rapid prototype, CNC machining and high quality drawings all generated from the initial model geometry. We have saved considerable time in calculating the dynamic forces of the components, which ordinarily are mathematically quite time consuming."

### Functionality simplifies complex computations

The Thompson Coupling CV joint comprises high capacity needle roller bearings for the main torque transmission combined with the patented centring mechanism that works by constantly dividing the input and output motions across the homokinetic plane. Due to the angular acceleration forces produced by the rotational members, the dynamics proved quite complex. With Inventor, the computation of these forces and the revolution angles of the joints were completed with ease.

"The major challenge with this project was the intricacy of the mechanism," elaborates David. "As the Thompson Coupling uses a number of orbiting four bar spherical linkages to generate the constant velocity, defining the constraints required in the design was a difficult process. The features inherent in Inventor meant we were able to overcome these challenges."

### Efficiently communicating designs

As a widely utilised application in the manufacturing space for the generation of CNC data, Inventor helped TCL share and communicate their designs to industry stakeholders more effectively. It also enabled the company's design team to review, amend and reuse designs while protecting the integrity of the project. Moreover, Autodesk's commitment to interoperability has meant that the company could create AVI files to demonstrate how the coupling works, with cutaway section views all interacting in real-time motion.

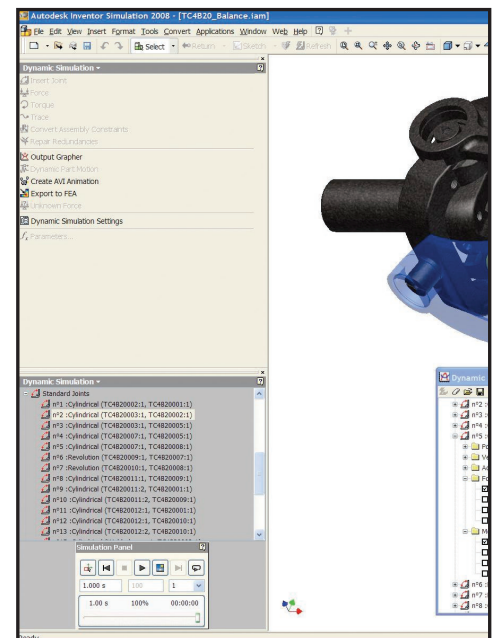
## The Result

### Inventor reduces design time by 75%

With a workflow driven by Digital Prototyping, Thompson Couplings Limited's engineers reduced the design time required to develop the coupling by as much as 75 per cent. Leveraging Inventor's readily adaptable model geometry to generate codes for CNC and STL, the company was able to rapidly create production-ready drawings. In addition, due to the product's parametric architecture, designers benefited from the ability to generate future iterations of the coupling to handle different sized torques and shaft angles.

### Speed and affordability drive commercialisation

Increased affordability and ease of operation was a key driver in helping TCL rapidly develop and bring to market such a groundbreaking invention. Being a small business, the company was extremely focused on the bottom line

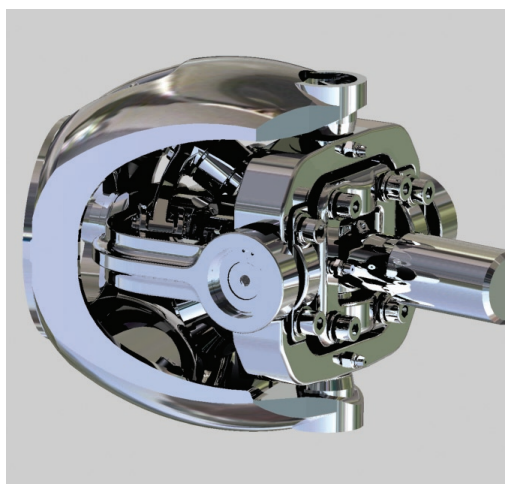


and needed to minimise prototyping costs in a bid to preserve much needed capital for the development phase of the final product.

David adds, "Inventor's true benefit for a small business such as ours is the affordable cost combined with the ease of operation. It is very easy to learn and come up to speed with its functionality."

### For more information

To learn more about how Autodesk applications are helping companies save time and money, visit us on the web at [www.autodesk.com.au/inventor](http://www.autodesk.com.au/inventor)



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