

The NEW WSL Caravan Wheel Safety Bolt

In Spring 2011, Wheel Solutions Ltd assisted with an investigation into wheel detachments on touring caravans. In conjunction with OEM customers, component suppliers and the National Caravan Council, WSL was engaged to examine the joint between the brake hub, the wheel bolts and the wheel itself.

Caravans today are considerably more sophisticated than those produced a decade ago: Weights and content have increased; braking systems are more technical; trailer stability control systems are available; larger wheel diameters and lower profile tyres are now fitted and new innovative caravan production methods are involved. Yet, the original inherited wheel bolt has not changed – until now!

In conjunction with a European bespoke fastener manufacturer, world renowned bolt technologists, specialist testing facilities and WSL's determination to research and design a ground-breaking bolt that will perform with a high safety margin in this demanding environment, we have developed:

The New WSL Caravan Wheel Safety Bolt

Increasing the clamping force forms part of maintaining sufficient strain in the joint. Also, bolt extension (stretch) is an area that is vitally important to overcome settlement (embedding) of the mating surfaces, i.e. the hub face and the wheel, and will also combat any potential "creep" of paint or lacquer especially under higher temperatures created through braking or stability control.

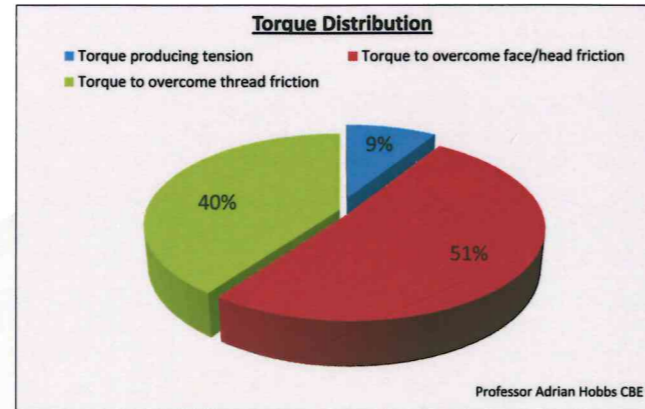


Fig 1 (above). Previously, as can be seen, only a very small percentage of the applied torque is actually creating bolt extension and clamping force. The rest is simply being lost overcoming friction.

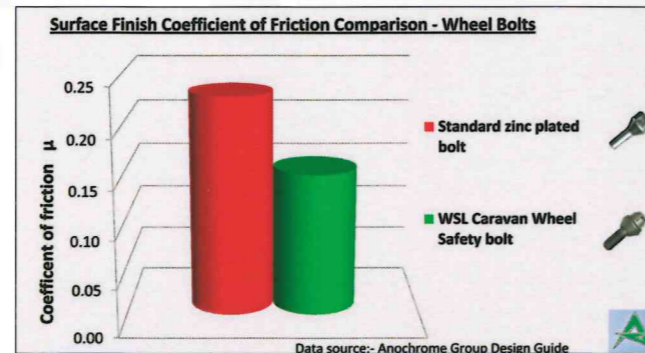


Fig 2 (above) shows the reduction in the coefficient of friction between the original Bright Zinc plated bolt finish and the 2-part anti-friction surface finish.

This allows more of the torque energy to be converted into clamping force rather than being lost on thread and head friction (as Fig 1).

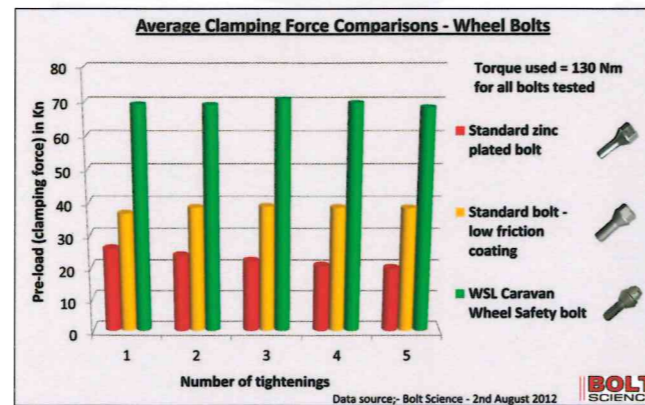


Fig 3 (above) shows the increase in clamping force that the new bespoke collar design and 2-part anti-friction surface finish achieves. (Applied torque 130 Nm.)

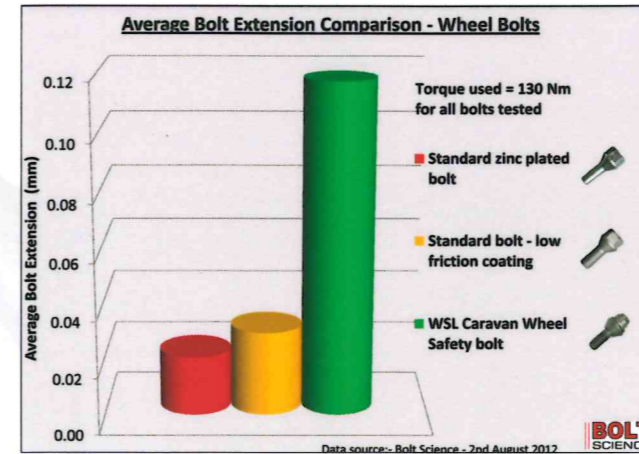


Fig 4 (above) shows the extraordinary gain the new bespoke floating collar design and 2-part anti-friction surface finish achieves in Bolt Elongation.

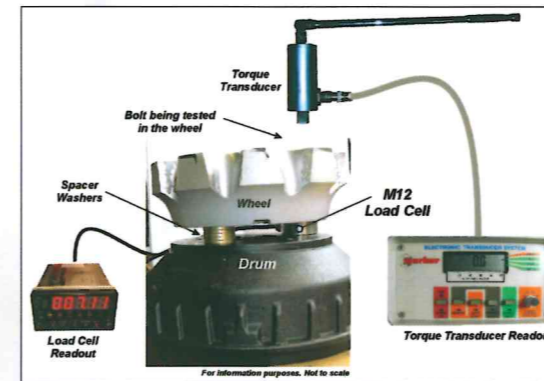


Fig 5 (above) shows the test method of measuring clamping force at Bolt Science's laboratory.



Fig 6 (above) shows the test rig at AL-KO Kotz in Germany where a rigorous test programme was positively conducted on various steel and alloy wheels all fitted with the new WSL Caravan Wheel Safety Bolt. The test was conducted in an overload scenario at high temperatures to achieve a significant safety margin.

With data gathered from Bolt Science and the component manufacturers, the total extension on the new WSL Caravan Wheel Safety Bolt is 2-3 times the total dimension of any potential creep and the embedding process! (Applied torque 130 Nm.)

The huge increase in clamping force and bolt extension has been tested and verified by Bolt Science (one of the world's leading specialists on bolt training and technology).

Once the design had been finalised, prototype tooling produced, prototype bolts produced and positive testing at Bolt Science had been concluded, it was time to test the bolt, hub and wheel in both a simulated test environment and ultimately on a caravan!

Millbrook Proving Ground - Quote:

At 1,583 test miles the wheel bolts were checked (cold) and all bolts recorded 130 Nm. without movement.



Fig 7 (above) shows a test caravan at the Millbrook Proving Ground.

This indicates any embedding or creep has been totally overcome by clamping force and bolt elongation.

