

The real-world benefits of Teardrop Trailers

Teardrop trailers have been appearing on our roads in the UK since 2007 when Marks and Spencer became the first company in the world to buy them. So why is it that they're becoming so common? Chamone Beytell outlines SpringTide's experience of working with the design, and how it showed compelling benefits.

The logistics industry has for years pursued the dual goals of increasing load and improving fuel efficiency – two objectives that often seem to be pulling in conflicting directions. The teardrop trailer design, however, is a solution that provides gains in both areas: providing reductions in CO2 of up to 20% and fuel savings of up to 8% – at the same time as increasing available capacity for carrying cargo.



The teardrop shape was designed and patented by Don---Bur, a commercial vehicle trailer specialist, in response to industry demand for more cost---effective vehicles. Don---Bur wanted to achieve not just fuel savings, but also a solution that was cost---effective and provided a quick return on investment. To meet those criteria, the trailer needed to be widely compatible and not impact payload carrying capacity.

A good hunch

Whilst you'd expect that the solution would come after hours spent testing in a wind tunnel, it actually was the result of a hunch: that the aerodynamic benefits of the curved roofline would outweigh the impact of the extra frontal area from the extra half a metre roof height.

The hunch paid off, and it was subsequently shown that the total resistant drag force on the Teardrop Trailer at 90 km/h was 35.7% less than a standard trailer (despite the increase in height) – with the aerodynamic effect increasing as speed increases.

The streamlined shape of the teardrop trailer minimises the turbulence caused by the sudden shape change between the truck and trailer and the large area of turbulence towards the rear of the combination – an effect clearly visible in the images below.

These images show airflow over a conventional cab and trailer compared to that over the teardrop shape – turbulence can be identified as the areas where the flow lines distort.



Fig 1. Comparison of aerodynamic performance between a conventional cab and trailer (top) and a teardrop design

This improved aerodynamic effect has an impressive impact on the vehicle's economics: operators of the teardrop such as Marks and Spencer and DHL have found fuel savings of up to 10% and CO2 emissions reduced by up to 20%. In addition, the humped shaped trailer provides up to 16% additional load volume – achieving the holy grail of improving fuel efficiency at the same time as load capacity.

Implementation in South Africa

It was these compelling benefits that led the Lafarge Group to utilise the teardrop design when they set out to modernise their South African vehicle fleet.

The Lafarge group had committed to reducing its global carbon footprint by 20% and one of the key areas of focus was its distribution footprint – reducing its carbon footprint per mile travelled. Modernising its South African vehicle configuration in line with western European levels of environmental and health and safety was considered a primary objective, yet this required moving away from traditional flatbed vehicles.

Whilst their flat beds allowed maximum carrying capacity, they brought many issues: The loading and unloading of these flatbed trailers required personnel to climb onto the vehicle beds, resulting in working at height risks; loads were not as secure and as protected as in curtain-sided vehicles; and their poor aerodynamics meant poor fuel efficiency. The challenge was to move to curtain-sided vehicles to resolve these problems, whilst overcoming the loss in payload resulting from this change.



Fig 2. A multi-link Teardrop Trailer design

To solve this problem, rather than introducing minor change improvements, Lafarge took the decision to implement world-class innovation and technology:

- Introducing all health & safety improvements available on commercial vehicles;
- Introduction of aerodynamics as way of improving fuel consumption and therefore minimising the vehicle's environmental impact;
- Setting a new limit for legal payload carrying capacity;
- Publicly showing that Lafarge was at the forefront of distribution in the South African market.

A project team was created within the country, involving key personal from the local business, key members from the Group Transport Procurement function and SpringTide's Procurement and Logistics specialists, to deliver:

- The introduction of curtain-sided vehicles without impacting on carrying capacity and to even improve this if possible. A target was set of 40 tonnes carrying capacity on a super-link vehicle with a gross vehicle weight of 52 tonnes;
- A load securing system that could be easily managed from the ground thus mitigating the need for climbing onto the trailer;
- The introduction of the 'Teardrop' concept as introduced by Lafarge in the United Kingdom;

- Combining this with all health & safety technology currently a standard specification in Lafarge's European operations.

A focus on the details

Initial meetings were held with a number of commercial vehicle and trailer manufacturers to outline Lafarge's expectations and, based on their ability to meet Lafarge's requirements; the top 3 suppliers were identified for Tractor Units and for Trailers. The procurement team then drew up a detailed scope of work and the shortlisted suppliers were scored on their ability to accommodate the defined needs of Lafarge. Following the provision of detailed specification and quotations to create the concept vehicle, MAN truck & bus and SA Truck bodies were selected as the main suppliers.

The project team worked closely with the commercial vehicle manufacturer to define the vehicle specification, which focused around payload and health & safety improvements. This resulted in the introduction of aluminium wheels, air tanks, optimum aluminium fuel tanks, and tailored cab and chassis specifications. 'Red' seat belts, white noise reversing alarms and reversing cameras were incorporated and ancillary equipment not necessary for the application was removed.



Fig 3. Safety features on the new vehicle

The trailer was also redesigned totally. This included the co-ordinating of a licensing agreement between Don---Bur (the Patent owners of the 'Tear Drop' design trailer based in the UK) and SA Truck Bodies to facilitate the building of these trailers in South Africa.

Every aspect of the trailer was reviewed to lighten the trailer design through the introduction of buckle---less curtains, the use of alternative materials, namely aluminium. Certain components were even shipped over from the UK to South Africa to help facilitate this.

The introduction of health & safety components were also incorporated into the design such as side bars, a load securing system mounted in the roof which was ground operated,

vehicle axle weight indicators, 'Safe Suzi' (ground operated air---line connection device), LED rear lights and wheel locking nut indicators.

Impressive results

Despite aggressive timescales, the project was delivered smoothly. The new vehicles rolled out through 2012 and were the first multi---link teardrop trailers deployed in the world. More importantly, they met all of Lafarge's objectives set at the outset:

- The vehicle configuration is capable of legally carrying 39 tonnes of payload – an increased payload capacity that translates into fewer vehicle trips
- The aerodynamic trailer, combined with the other design measures adopted to reduce weight, has reduced fuel consumption by 12% – dramatically reducing the vehicles carbon footprint
- The new fleet has some of the safest operating vehicles currently operating in South Africa.



Fig 4. Mike Utting, SpringTide's Managing Director inspecting the huge load space of the new teardrop trailer

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