



The Pepsi Max Big One

Blackpool Leisure Beach

The Project

Blackpool is Britain's best known seaside resort. Since May 1994, Blackpool Pleasure Beach has operated the world's biggest gravity rollercoaster. The £12 million "Pepsi Max Big One" has been described as the "most significant structure in Blackpool" since the famous Blackpool Tower was opened.

For Consulting Engineers Allott and Lomax in Manchester, the Pepsi Max Big One has provided more than a thrilling ride. As one of the UK's largest privately owned firm of Consulting Engineers, Allott and Lomax is a multi-disciplinary business. Employing over 600 staff the company offers clients a one- stop solution across all major sectors.



Company Profile

According to Ashwin Modi, Technical Director of Allott and Lomax' Structures Division past experience helped win the prestigious rollercoaster project. Allott and Lomax has carried out numerous testing, design and annual safety reviews for Alton Towers, American Adventure, Chessington World of Adventures, Legoland, Thorpe Park and Butlins Holiday Worlds in addition to previous projects at Blackpool Pleasure Beach itself.

"We have built up our technical knowledge on rides while carrying out structural surveys within many major leisure parks. When Blackpool Pleasure Beach wanted to build a new rollercoaster we were already well known to," said Modi.



The Problem

"One of the main problems we found with the ride was its very complicated geometry. Being able to model and visualise the structure with SuperSTRESS was very important. We could also manipulate the viewing angle," Ashwin Modi (Technical Director of Allot and Lomax)

Allott and Lomax were initially retained by Blackpool Pleasure Beach as technical advisors on the Pepsi Max Big One, originally designed by US specialists Arrow Dynamics. However a further problem presented itself in that, unlike greenfield sites, the rollercoaster had to be constructed amongst existing structures within a "very congested" 42 acre area. Allott and Lomax had to produce a modified design for 50 percent of the structure to suit site conditions.

The Solution

Using drawings and design information, Allott and Lomax deployed Graitec UK's SuperSTRESS frame analysis program to analyse loadings on various parts of the ride. The track is 1.665 kilometres long with gravity propelling the train to 125 kph. Supporting structures carry the full weight of the five cars with 30 passengers travelling around tight bends. The train will pull up to 4G, equivalent to 32 tonnes.

"We modelled the ride with SuperSTRESS in seven areas which needed special support structures. We converted the dynamic forces into equivalent static loads. By using these loads, combining centrifugal and gravity forces, you can design the supporting structure. There were 20 loadcases to consider in each area." Allot and Lomax

SuperSTRESS allowed Allott and Lomax to visualise the track and its supports in three dimensions. The track is made from 250 tonnes of tubular steel mounted on 2,000 tonnes of structural steelwork supported on 1,333 piled foundations and 277 pile caps. SuperSTEEL was used for some of the structural design."H-LOAD and AutoLoader make it simple to obtain accurate and fast results for BD37/88 loading by quickly working out the worst loading positions for you," explains Burrell.



Future Projects

Allott and Lomax has since undertaken another rollercoaster project. Although smaller, the timber rollercoaster at Gulliver's World theme park in Warrington is a record breaker. Not only is it the first timber rollercoaster to be built in the UK since the 1940s, but also the first to be completely designed and built in England.

Featuring a 500 metre figure-of-eight layout, the more solid-looking timber rollercoaster is quite different to the sleek and slender steel structure in Blackpool. Nevertheless, the structural problems were similar. Allott and Lomax carried out a complete structural design including a SuperSTRESS dynamic analysis using equivalent static loads.