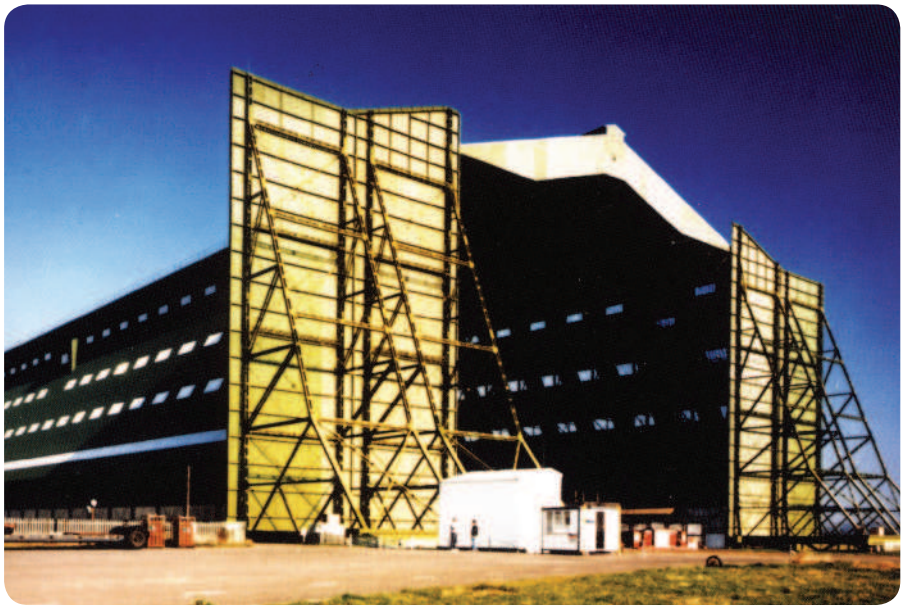
Civil engineering industry

Cardington Airship Hangar

Spherical roller bearings



Heavy duty bearing solution for aircraft hangar

The Building Research Establishment (BRE) invited SKF to offer a solution to problems it was encountering in opening one of the huge doors of the Cardington Airship Hangar. The new design, incorporating SKF's heavy duty bearings, is enabling smooth operation of the door and minimising wear to extend considerably the service life of the bearings.

The Grade II listed Cardington Airship Hangar, in Bedfordshire, is currently used by the Building Research Establishment to house the largest enclosed laboratory in the world. The hangar, previously used to house the Barnes Wallis-designed R100 airship in the late 1920s, is big enough to contain both Nelson's Column and the aircraft carrier Ark Royal easily. It has a floor area twice the size of Wembley football pitch and a volume equal to 8,338 double-decker buses.

Despite a recent major refurbishment programme, engineers from BRE began to experience difficulties sliding aside the southern hangar door. Requiring the door to be opened and closed virtually every day, BRE urgently required a solution to the problem. As each hangar door measures a massive 55 m high by 24 m wide and weighs 470 tons, whatever bearing arrangement that would be used would have to be extremely robust and able to withstand the extremely heavy loads it would be subjected to.

The hangar doors run on a twin track system using four, four-wheeled bogies mounted on each track. On close examination of the bogies on the inner track, it was noticed that the existing bearings were in a state of collapse and clearly the reason for the problems with moving the door. The degradation of the bearings had also created flats on some of the 760 mm diameter wheels, due to their skidding instead of rotating. One bearing was removed, stripped for examination and found to be a poorly constructed needle roller bearing design that had disintegrated.

In fact, most of the rollers were in a poor condition and the side plates were almost worn away entirely.

While BRE could have simply tried to replace the bearing arrangement with a similar system, it was concerned about the degree of wear on the side plates and contacted SKF to see what benefits modern bearing arrangements could provide, and how the wear problem could be overcome. SKF closely analysed the problems that BRE were having and proposed a new design, using heavy duty spherical roller bearings along with the adaption and re-use of existing bogie components where possible, to give the best all-round solution while remaining cost effective.

After tests on site, SKF and BRE engineers determined that the inner bogies were carrying three-quarters of the door's weight, which equated to a load of 33 tons on each of the wheels; in high winds, this figure could almost double. Track measurements also revealed that the side plate wear was caused by a difference of 20 mm in the height level of the inner and outer rail tracks.

In order to accommodate these massive loads, the SKF refurbishment included detailed redesign plus shaft, housing and wheel re-machining, and complete assembly of wheel units. At the end of the project, SKF had refurbished all 16 wheels on four bogies on one door and fitted a total of 32 new bearings. As a cost saving measure, the existing shafts and wheels were used where possible, and incorporated into the new design.

This solution ensured that all loads were held within the wheeled units, containing the high static loads and particularly, the lateral forces involved, preventing the original wear problems from re-occurring. Throughout the redesign, SKF and BRE worked closely together to co-ordinate the efficient removal and re-machining of individual wheel sets so that the door still remained fully operational.

Engineers are now able to open and close the extremely large door easily, with SKF's latest bearing technology ensuring reliable operation for at least another 50 years.

Work in progress – Cardington Airship Hangar

SKF spherical roller bearing

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