



FAG Bearings for the World's Largest Observation Wheel

**SCHAEFFLER GROUP**  
INDUSTRIAL

## **22 Tons of Steel Make “Great Beijing Wheel” Go Round**

**Ever since FAG supplied the hub bearings for London’s Millennium Wheel, Schaeffler Group Industrial has been considered as the development partner and provider per se when it comes to such observation wheels that place special challenges both on the engineers and on bearings. Here the Beijing Wheel advances into new dimensions. Following over 18 months of preparation and production, the FAG-branded bearings are now on their way to faraway China.**

SCHWEINFURT, *August 29, 2008.* In fact they are two “ordinary” spherical roller bearings with anything but ordinary dimensions: outside diameter 3,200 mm, inner ring bore 2,600 mm, ring width 630 mm. Each bearing incorporates 118 rollers weighing about 20 kg per piece. Altogether more than eleven tons of steel have gone into each of the bearings. It’s perfectly justified to call them “rolling bearing giants”. Soon these giants will be in service about 108 meters above the ground: The new observation wheel will be 208 m tall – a superlative just like the two bearings it will revolve around. The wheel is designed to accommodate 1,920 guests. One revolution of the wheel will take 20 minutes and enable a stunning view of the city of Beijing.

While the bald facts are quite impressive themselves, the real dimension becomes apparent only when actually standing in front of the assembled, silver-shining bearing: an unprecedented giant. Henri van der Knokke, Head of Application Engineering within Schaeffler Group Industrial’s Heavy Industries Division in Schweinfurt was entrusted with overall project responsibility. He recalls: “When we received the dimensions and specifications from Great Wheel Corporation in black and white, at first we could hardly believe our eyes. We delved deep into the matter but a spherical roller bearing of such dimensions having to meet such demands has never been built before.” It’s true that the team had gained experience when designing and manufacturing the bearings for the London Millennium Wheel which was the largest observation wheel back then. But this takes it a couple of steps further: The hub bearings in London measure 2,600 mm in outside diameter and would thus fit precisely into the inner bore of the Beijing bearings.



“So the first thing we had to do was to find out if our production facilities would be up to manufacturing the bearings at all,” says Rainer Schröder, Design Engineer within the Spherical Roller Bearing Product Line. Would the machine tools be suitable for such dimensions? Is the hardening furnace large enough? Could the crane in production support such loads? And what would be the best way to transport the bearings to China? How could we ensure smooth installation over there? “It was like as puzzle with many thousands of single pieces. Well, bit by bit, with the help of close collaboration between the Application Engineering, Design, Calculation and Production departments we worked it out,” van der Knokke recalls.

During the process, the team members had to repeatedly break new ground, improvise and coordinate time schedules over and over again. The bearing rings were rolled and forged at a supplier in Italy. The barrel rollers were turned at the FAG plant in Eltmann, hardened in Wuppertal and brought back to Eltmann again where they underwent a new grinding process.

Finally, the bearings were manufactured and assembled by the FAG large bearing specialists in Wuppertal. Despite decades of experience with large bearings, this project held one or two surprises in store for them, reports Production Manager Gerd Benninghoven. The outer ring barely fitted into the hardening furnace. However nobody could tell how this process would affect the material. In fact, the diameter of the bearing rings shrunk by about one centimeter during heat treatment. During final machining, however, accuracy in the  $\mu$  range had to be restored. A special challenge with such large parts. Benninghoven: “Just imagine: During a single machining cycle, the tool covers a distance of more than 20 km as it cuts through the metal” – a real endurance test.

Talking of testing – mounting the bearings in Beijing required not only the erection of a more than 100-meter tower, but also involved the need for bores for eye bolts to lift it up. That’s peanuts, some may think. But far from it: With a complex test series at the Schaeffler Group’s headquarters in Herzogenaurach, the technicians had to verify that the threads of these eye bolts would reliably withstand these enormous loads. Because one thing is for sure: Safety is the utmost priority also in such applications.

For Henri van der Knokke and his colleagues this was an extremely exciting exercise: “We learned a lot during this project and will soon be able to put this



experience to further good use,” he says with conviction. For the Schaeffler Group has also won the orders for the observation wheels in Berlin and Orlando. It seems that customers like Schaeffler’s “All Inclusive, No-Worry Package” from application engineering advice via design and manufacture all the way through to services during operation, offered by Schaeffler subsidiary FAG Industrial Services (F’IS).

Incidentally, all members of the FAG project team share one common dream: to enjoy a trip together on the world’s tallest observation wheel in Beijing. They’ve earned it.

#### *About Schaeffler Group*

*Schaeffler Group, with its brands INA, FAG and LuK, is a leading global provider of anti-friction bearings and a respected supplier to the automobile industry. With some 66,000 employees worldwide in over 180 locations, the company produces and markets precision components and systems for the automotive, industrial and aerospace sectors. In 2007 the Schaeffler Group generated revenues of €8.9 billion. The Group has 29,000 employees in Germany.*

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**Picture 1:** Precision starts with the rolling elements - even though every one of them weighs a massive 20 kg.



**Pictures 2 and 3:** Rolling bearing giants supplied by Schaeffler.



**Picture 4:** This is how the Beijing Wheel should look.

Graphics: Great-Wheel Corporation



**Picture 5:** Design meeting in Schweinfurt.