



The first moveable pitch in the German league

The "AufSchalke" arena offers space for 61,000 spectators after 33 months of building. There are also 72 VIP lounges (with an annual rent of up to 72,000 €) and 1600 business seats. The technical show-piece is the 11,500 ton reinforced concrete drawer with which the moveable pitch can be shifted in or out. The moveable roof weighs 560 tons, and can be opened or closed within 20 minutes. The arena, which cost 183 million €, replaces the old stadium as the ground for FC Schalke 04. It contains the world's largest video cube, having four screens, each with an area of 35 square meters.

Developer:

FC Schalke 04 Stadionbeteiligungsgesellschaft mbH & Co. Immobilienverwaltungs-KG, Germany

General contractor:

hbm Bau GmbH, Germany

Automation engineers:

Industriële Automatisering Kremer BV, Netherlands

→ One of Europe's most famous football clubs is getting its new stadium at the "AufSchalke" arena. The fans want to be close to the action, and this has been considered along with independence from the weather and multi-functionality. In addition to the moveable grandstand and the unusual roof construction, the pitch itself is amongst the technical highlights of this futuristic events facility. It weighs 11,500 tons, and can be moved using Beckhoff components.

The first moveable football pitch in the German league is controlled by Beckhoff

A palace for king football

FC Schalke 04 is one of those very special football clubs whose reputation has spread far beyond Germany's borders. The club's changing history, with all its ups and downs, has everything the fans want, making it an institution with cult status. In the 1980s, the football itself was a switchback ride and finances were mismanaged, so that FC Schalke were

not far from bankruptcy by the beginning of the 90s. The club went through an exemplary process of reconstruction – since then, the club has maintained a constantly high performance level, both on and off the field.



Investing 183 million € in the joy of football

Backed by an investment of 183 million €, the arena, which has been under construction since 1998, is presently not only the largest but also the most fascinating building project in all of Ruhr. Being as close as possible to the dramatic events on the pitch, also known as

the field, was to have top priority. The Gelsenkirchener Parkstadion, built in the 1970s, had been designed to function additionally as an athletics stadium, and had lacked this important quality. For this reason, a different kind of multifunctionality was sought for the new construction, so that, in addition to the football games, it would be possible to

fully exploit the stadium. The moveable football pitch rests in a reinforced concrete tray, and can be moved right outside the stadium between league games. It is this in particular that makes the arena adaptable to other events with such flexibility.

Moveable roof and pitch allow football in any weather

In future there should be no need to cancel games because of the pitch conditions. The designers of the "AufSchalke" arena therefore decided in favour of an unusually expensive construction – they put the pitch into a moveable steel tray measuring 118 m by 79 m. The moveable structure weighs 11,500 tons. It can be shifted into or out of the stadium within 4 hours, moving on 16 polyurethane tracks, each of which is 300 m long. The movement, totalling 180 m, is accomplished at an average speed of 0.75 m/min. The pitch stands on a total of 400 sliding feet. Four hydraulic operating grippers drive the huge slab forward. The control and monitoring functions are carried out by a total of nine Beckhoff Bus Terminal stations. Four BC3100 Bus Terminal Controllers with integrated mini PLCs are responsible for the synchronous operation of the advance mechanisms (the gripperjacks). The four hydraulic cylinders of the eight-ton grippers push the pitch about 1.5 metres out of its ground stops. After release, the grippers are then withdrawn, and are fixed again at the end or starting point. This caterpillar-like movement is now repeated until the final position is reached. The main task of the Bus Terminal controllers distributed throughout the pitch is to ensure that the field slab is advanced synchronously. Displacement sensors in the advance cylinders are used to measure the cylinders' positions, and the data is passed to the Bus Terminals via the SSI interface. Other parameters measured are the clamping and shifting pressure of the cylinders. The proportional valves for the synchronous movement of the pitch are also controlled. The Dutch control specialist, Industriële Automatisering Kremer, based in Netherland, supported by Industrial Automation Link, Beckhoff's exclusive representative in Netherlands, are responsible for the pitch automation.



From left to right: Everard Besselink (Hardware Engineering Project Management), Jørgen van Duren (Project Engineer, Software Engineering), both Kremer BV, Ruud van Veelen (Technical General Manager, IAL).

Profibus DP links the stations across the pitch

Other Bus Terminal stations with BK3100 Bus Couplers are responsible for supervising the lubrication and operating panel controls. This provides the operator with all the position data as well as the oil temperature in the cylinders via a display. Lubricant control for the total of 400 sliding feet is performed in four control units each. It is supplied, precisely as required, in order to obtain the lowest possible coefficient of friction. As a precaution against tilting of the pitch, another set of 4-20 mA signals from the

measurement of forces in the guide rails is obtained and evaluated. Temperature data for the pitch is also collected in the stations. Eight PT100 sensors at various depths at each location determine a precise temperature profile. Profibus DP fieldbus is to the control system what the playing field is to the game. It transports the data across this large structure faster than the events in the game on the surface. Kremer built a fibre optic implementation, providing speed-of-light coupling between the moving, distributed Beckhoff stations and the master PLC in the central control cabinet.

Within the playing field the fieldbus stations are connected by copper lines. It would be technically possible for the operator to allow the entire movement to take place under automatic control. The safety requirements, which only permit a maximum movement of 10 metres, also include visual checks at the other side of the pitch.

Football is still king

In spite of all this multi-functionality, football is still king in the "AufSchalke" arena. The players of Schalke will not have a lot to get used to, because their future "playground" will still measure 105 metres by 68 metres. And both the physical and emotional closeness to the possible 61,000 spectators will still be part of the players' experience at FC Schalke 04.

IAL: Automation Systems and Solutions for Dutch Industry

Industrial Automation Link BV is a company widely known in the automation market in Netherlands, where they are Beckhoff's exclusive representatives. IAL began in 1987 as a system integrator, principally developing software and hardware for the machine construction and materials transport industries. Four years later, IAL expanded their marketing activity, and in 1991 became the first of Beckhoff's representatives outside Germany. As experts for the industrial automation market, IAL engineers have specialized in the machine and production process automation sectors. IAL, as well as carrying Beckhoff's complete production range, is also a distributor for the SCADA software Genesis32 from Iconics. Genesis32 is fully integrated, as visualization software, into the Beckhoff Software PLC/NC TwinCAT. As an additional service, IAL offer support and solutions for complete automation systems. Support, service and training are provided by a team of engineers with thorough specialist knowledge of the field.

