THE TOWER CLOCK OF SUPERLATIVES

CASE STUDY: MAKKAH CLOCK, MECCA, SAUDI-ARABIA

One of the five pillars of Islam is the pilgrimage to Mecca that every Muslim should do at least once in their lives. Another pillar are the ritual prayers at fixed hours. In order to meet these hours also during the pilgrimage, the company Perrot GmbH & Co. KG from Calw in Germany together with the architect Dr. Bodo Rasch and his team has built the biggest tower clock in the world in Mecca. The bolts were tightened with the electric torque multiplier alkitronic EFCip.

COMPANY PROFILE

The company Perrot GmbH & Co. KG Turmuhren und Läuteanlagen from Calw (Germany) was founded in 1860 and is one of the leading manufacturers of tower clocks, electronic bell systems, carillons and special clocks. The family company today is managed by the fifth generation and development, production, installation and maintenance for all products are done by the company itself. Perrot clocks can be found in Germany and all over the world.

INITIAL SITUATION

The Makkah Clock Royal Tower of the Fairmont Hotel in Mecca, Saudi-Arabia, is more than 600 meters high – that makes it six times as high as London's "Big Ben". It is part of a 1.5 million square meter shopping mall that was built especially for the Muslim pilgrims. To help them stick to their prayer times and see the time even from among a crowd of sometimes two million people, the world's biggest tower clock was installed at this tower, 426 meters above the earth.

There is a clock face on each of the four sides of the tower and these dials can be read from a distance of up to eight kilometers.

The biggest tower clock in the world with a dial of 43 meters diameter, installed 426 meters high

SOLUTION

The responsibility for this gigantic chronometer is with the company Perrot GmbH & Co. KG from Calw and with the architect Dr. Bodo Rasch and his team from Leinfelden-Echterdingen in Germany. They developed a clock face with a diameter of 43 meters as well as accessible hour hands with a length of 22 meters, and minute hands that are 17 meters long. Each of these weighs approximately seven tons. Furthermore, the clock is equipped with a lightning rod and is run with solar energy.

Figure 1: The tower complex with the Makkah Clock Royal Tower in Mecca, Saudi-Arabia. Photo: © SL Rasch

Mounting this clock of superlatives was a challenge for the designers and the technicians: The great weight of clock face and clock hands had to be fixed up high, making sure their resistance to all possible weather conditions.

Figure 2: The clock dial at night. Photo: © SL Rasch

Not only strong winds can arise in the Saudi Arabian desert, but heavy thunderstorms and sandstorms are also frequent.

Also, the clock should show the time reliably for at least 100 years. In order to fulfill all these conditions, the altogether 16 plain bearings of the clockwork play a special role. In the minute hand, these bearings have a diameter of 350 mm, whereas the ones in the hour hand have a diameter of 750 mm.

To install these parts as precisely as possible, the technicians used the electric torque multiplier alkitronic EFCip. “The advantage of this torque multiplier is its precision when reaching the torque. This can be pre-set in the range from 60 to 6,500 Nm. A second important characteristic is the repeat accuracy with the screw connections“, explains Alexander Kipfelsberger, CEO of alki TECHNIK GmbH. Furthermore, according to him the EFCip is the perfect tool for big construction sites due to its robust built and the protection art IP 54, which makes it possible to use the tool even in bad weather conditions.

Also of importance are the time and power, which can be saved using the torque multiplier. As the torque value can be pre-set and there is an automatic shut-off mechanism when reaching this value, the three work steps of tightening, re-tightening and examination were carried out in one single work step.

“By using the EFCip, three work steps can be performed in one.”

So, the alkitronic torque multipliers play an important part in fastening the hands of the world’s biggest tower clock and in moving them – 60 times per hour, 1440 times per day and 525.600 times per year.

Figure 3: The largest tower clock in the world at night. Photo: © SL Rasch

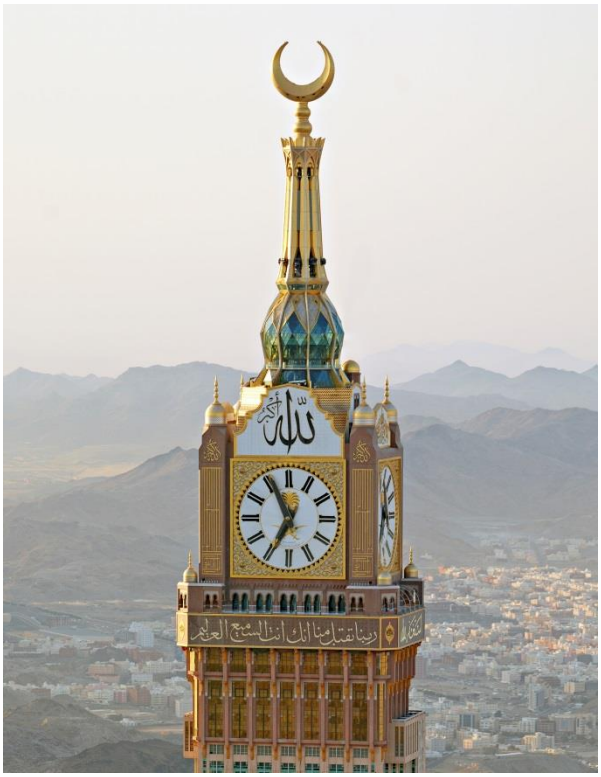

Figure 4: The tower top of Makkah clock with 251 meters height. Photo: © SL Rasch

TECHNICAL DATA OF THE EFCip

- ✓ Repeat accuracy ± 3% for the same bolting application
- ✓ Electrical data: Universal AC Input 100 V - 253 V, frequency 45 Hz - 66 Hz, power max. 2000 W, protection class IP 54 (standard)
- ✓ Maintenance-free, low-war and brushless synchronous motor with excellent efficiency
- ✓ Permanently higher joint quality compared to ratchet torque tools by continuous rotation of the square drive
- ✓ Ergonomic operation: The 360° rotating handle prevents reaction forces from being transferred to the operator