however, its reflector is not a dish but a ring made of reflector panels with a diameter of 576 metres. In contrast, FAST's primary mirror is made up of 4,450 triangular elements placed inside a cable mesh. The reflector is the equivalent of some 30 football pitches.

The valley in which the gigantic reflector is embedded is framed by six 120-metre high pylons. Each of these pylons is equipped with 46 mm CASAR Superplast8 ropes that span the reflector, in order to hold the receiver in the centre at a height of 140 metres. A total of 3,226 metres of steel rope were supplied.

The steel ropes move the receiver up and down via 6 elevator winches for maintenance work and for focusing. The customer wanted the steel ropes to have a service life of 5 years. Twenty hoisting cycles are expected every day, and over the whole period of operation, a total of 36,500 hoisting cycles are anticipated. One of these ropes also serves as a suspension rope for the data cable. Naturally the targets that have been set for this 160 million EURO mega-project are highly ambitious. The aim of the observatory in China is to study far-distant pulsars – rapidly rotating neutron stars. In addition, data will be collected about molecules in interstellar space and gravitational waves will be researched. Moreover, FAST will be used on the Seti (Search for Extraterrestrial Intelligence) project to look for signs of extraterrestrial life.

World's largest ship lift starts operating at Three Gorges Dam

Mid-September 2016 and the date had finally arrived: the start of the ship lift's operating test finally brought the total of 23 years of construction work on the Three Gorges Dam to a conclusion. Often somewhat casually described as simply 'the world's largest lift', this ship's lift is the ultimate in structural superlatives and is in itself an engineering masterpiece. At 169 metres high and weighing 15,500 tonnes, this is the biggest ship lift in the world. The water basin is 120 m long, 18 m wide and 3.5 m deep. Some 6 million tonnes of goods are to be transported using the lift every year. Depending on the size of the ship, it may take between 40 minutes and 3 hours to pass through the lift.

The start of test operations signified the end of an era for CASAR. Since the ship's lift project began in 2004, we and our partners at Pfeifer are also approaching the end of 12 years of intensive collaboration. We deliberately chose to accompany the project from start to finish, because we see ourselves not only as a rope supplier alone, but as being in a position to contribute valuable know-how, which we have already mastered in countless other ship's lift and lifting bridge projects.

The advice and support we offer customers, even once the ropes have been delivered, is particularly highly valued and appreciated. The combination of technical advice and calculations, together with a special product, was the winning mix that finally clinched the contract in favour of CASAR. In total, almost 40,000 m CASAR Superplast8 with a diameter of 74 mm was produced and supplied for this ship's lift. It is the first ship lift worldwide that uses a rope with 10 outer strands. At the end of the day, the more rounded surface, the better support ratio to the Ø5 m rope sheaves, the high amount of flexibility and the bending behaviour of Superplast8 in comparison to the standard 8-strand rope constructions were the deciding factor for the customer. This special product and its positive properties were also why a lifetime guarantee of 50 years (subject to specified conditions) was given.

Delivery of the rope was completed on schedule at the end of 2012 so that the installation of the ropes could begin in 2013. During the installation work, Günter Knerr, Head of Customer Technical Services, was in permanent contact with the installation team on site and also visited the building site on multiple occasions to offer practical support as well. There were a total of 262 ropes to install on two-channel deflection rollers. The originally planned installation procedure from above proved not very productive and was too time-consuming. The decision was therefore taken to assemble from below, because this would reduce the required installation time from 2 days to only 3 hours per rope. The deflection rollers were at about 196 m in height, while the fixed points for the counterweights were about 189 m. An auxiliary winch was therefore installed at the height of the deflection rollers to lift one end of the rope high enough so that the overhead gantry positioned above the rope roller could catch on. Then, the end of the rope was pulled a further 10 m vertically above the level of the rope rollers. Clips and the auxiliary winch held the rope in place while the overhead gantry released the end carefully over the rope roller in the direction of the counterweights. Finally, the rope end hooked onto the counterweight. During the installation process the critical sections of the rope are covered in thin plastic tubing. Thick plastic sheets protect the rope from external damage by the clamps at the points where they are used on the rope.

The final fastening of the free-hanging ropes on the so-called trough set a further big challenge, because the self-weight of the sail was enough to create torque and therefore distort the rope. However, this distortion could only be detected and countered by means of the red surface line. It must be borne in mind that the surface line was raised under operating load and was therefore distorted in unloaded condition.

Furthermore, the ropes were calibrated, lengthened and sealed in under operating load by our partner company, Pfeifer in Memmingen. A temperature expansion coefficient was taken into account in this process in order to give due consideration to the ambient temperature at the subsequent deployment site. Due to the lack of stretch that would normally be created under operating load, the free-hanging ropes were approximately 2 metres shorter. This means the ropes would have to be pretensioned in a particular order using a special hydraulic frame under operating load to allow the catch to latch on. The final length adjustment was then done on the spanner nuts. The ropes were pushed downward not pulled. Only half of the ropes could be attached because there was no water in the trough and it was too light. Using additional weights, it was ultimately possible to simulate the weight of the water, whereby the counterweights were raised from the frames, and then the second half of the ropes was attached.

As you can see, this project involved an immense amount of expenditure, even for a rope manufacturer such as ourselves. Having said that or perhaps precisely because of it, it fills us with great pride that we made such a project a reality.

FACTS ABOUT THE THREE GORGES DAM

The Three Gorges Dam is a dam installation with a hydroelectric power station, a ship lift and a locking system on the Yangtze River in China; it lies in the town of Sandouping about 40 km upriver from Yichang in the province of Hubei. With an installed generator capacity of 18.2 gigawatts the hydroelectric power station is the largest in the world, despite the fact that there are higher and longer dams and larger reservoirs. The station can supply 50 million households with electricity and prevent an annual emission of several million tonnes of carbon dioxide from burning fossil fuels (50 million tonnes of coal).

The Three Gorges Project is a multifunctional water control system that provides protection from high water levels as well as offering a transport and power generation system.

The navigability of the Yangtze River was previously limited by the narrow gorges and the different depths of the water. Ships of up to 10,000 tonnes are able to master the 113 metre height difference via two parallel five-step locks; however, this is very time-consuming, and it limits the transport capacity. The ship lift is designed to help and can move ships of up to 3000 tonnes. It is currently the largest lift in the world.