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Fremtidens landskab for Kassø-Tjele

Verdens største "solbro"
Boligen skal aktiveres via KNX



Draka - kabler til alle formål



By Mette Bjørnkjær Øllgaard

The upgrading of the 400 kV overhead transmission line Kassø- Tjele from a single circuit line to a double circuit line will increase the capacity from approx. 1150 megawatt to two times 1800 megawatt. This is necessary in order to meet the future demands for transmission of renewable energy in the Danish national grid.

The new overhead transmission line will therefore be vital in the achievement of Denmark's very ambitious goals within climate and renewable energy.

The long-term vision is to generate 50 pct. of the total power consumption as wind energy in 2020, and to extend the electrical infrastructure with strong and flexible connections to Norway, Germany and Holland to obtain an optimal energy transmission and trade with our neighbour countries.

The upgrading of the Kassø-Tjele backbone will take place in three steps and is expected to be completed in 2015 with an expected socio-economic saving

between 1.3 and 1.7 billion Danish crowns.

Energinet.dk – the Danish state owned high voltage grid operator – submitted the tender in January 2011 stating several technical detailed requirements to the conductor in terms of strength, sag, transmission capacity and greasing, all based in a reference conductor type ACSR Martin 772 mm² •

Essential was however, that Energinet.dk was open to new conductor types fulfilling the requirements. It was also a specific request that the losses should be capitalized with 526 EUR/mOhm pr km.



Contract award in June 2011. Anders Westmark, Man. Dir. Otra Danmark left. Carsten Jensen, Vice President Energinet.dk, right. Behind project managers Tine Kjeldsen from Otra Danmark and Lars Rasmussen, Energinet.dk

Midal Cables – a global partner

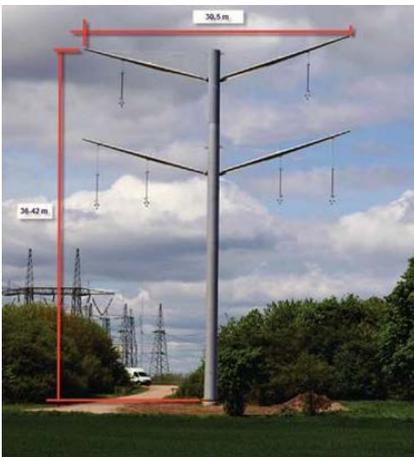
For Otrá Danmark, consultants and turn key suppliers to the Danish utility sector, the choice of manufacturer was easily taken and most naturally fell on Midal Cables.

Midal Cables are market leaders within overhead lines and have more than 30 years of international experience as a manufacturer of a complete program of aluminium conductors of outstanding quality.

In order to fulfill the requirements it soon became clear that an increase of the diameter was not possible. But the requirement to a higher conductivity could be obtained by using more aluminium in the conductor cross section. There were two options. One was to use trapezoidal shaped wires instead of round wires, resulting in less cavities between the wires. The other was to replace the steel core with aluminium by using an aluminium-magnesium-silicium alloy.

This conductor type is also known as AAAC, All Aluminium Alloy Conductor. With a conductor diameter of 36.17 mm, as in the reference conductor ACSR Martin, the AAAC type contained 925 mm² aluminium.

This type of conductor has not been installed in Denmark before, but the triple A conductor has been in operation with great success for several years, among others at the National Grid in the UK. The chosen conductor has a resistance 21 pct. lower than that of an ACSR Martin. And taking the mentioned capitalization factor into consideration, this improvement resulted in a less-loss of app. 5 mill. Euro.

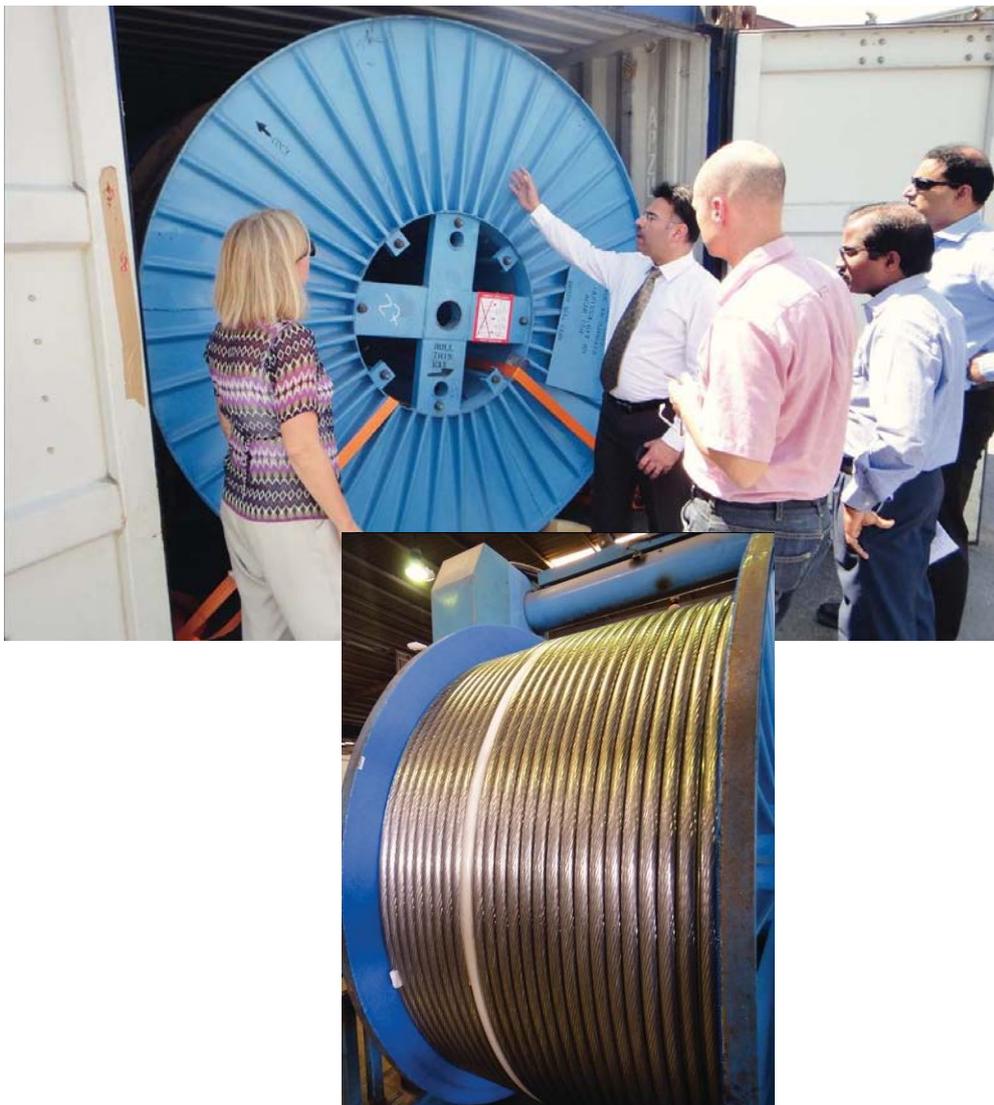


Outstanding test results

At a factory inspection in June Otrá Danmark and Energinet.dk discovered that the aluminium produced here was of an exceptional high-grade quality, which could result in even lower resistance than promised.

During the following type tests in September at the SAG Laboratory in Langen, Germany, the DC resistance was measured to 0.0323 ohm/ km, representing capitalized savings of further 625,000 Euro for Energinet.dk. – which by far go beyond the savings stated in the tender.

Power engineer Jens Erik Stubkjær, working as external consultant for Otrá Danmark, participated in the first test at the SAG Laboratory in Langen together with two representatives from Energinet, and expresses that he is surprised with the quite unique data of the AAAC TW 925-AL7 conductor.



With an aluminium purity that high as we see here, you would from experience expect this to have a negative influence on the tensile strength, as the tensile strength is normally inversely proportional with the conductivity. But our tests here have shown a tensile strength of 8.8 pct. better than the guaranteed values given in the tender by Midal Cables and Otra.

Another positive fact, he says, is that the break elongation is over 5 pct, where you normally consider 1 pct to be good.

After the official contract award to Otra Danmark and Midal Cables in June 2011, the first Factory Acceptance Test of the conductor took place already in September under the supervision of Bjarke Jensen and Kristian Pedersen from Energinet.dk and project manager Tine Kjeldsen from Otra Danmark.

Apart from all the mechanical and electrical tests, focus was also here on the greasing of the conductor. The tender paper specified precise specifications on the greasing to obtain a minimum life time of the conductor of at least 40 years, as the Danish climate has a very corrosive environment.

Delivery capability of utmost importance

Already in November 2011 the delivery of the first 189 drums with each 1.9 km conductor will arrive to Aarhus harbour in 20" containers, and from Aarhus the drums will be transported by truck to three-four working sites ready for the conductor installation.

With continuous deliveries of the remaining 379 drums the rest of the year and up to the summer of 2012, this logistic process will be controlled and followed in detail, as this is of high importance in order to keep the time schedule of the overall project, says Bjarke Jensen, Energinet.dk.

The critical point in this project is the stringing of the conductors. It is vital and of the utmost importance that we always have a sufficient quantity of the conductor available, in order not to stop the installation works and to finish the project in accordance with the set time schedule. Therefore the delivery capability has also been a crucial parameter to us in the choice of manufacturer.