Southwire ACSS/TW HS285® Cable

Project Profile
N1/Otra Danmark

Project Title: Trige-Tange Line Upgrade

Location: Arhus, Denmark

Project Owner: N1/Otra Danmark

Electrical Contractor: Delpro A/S

Product Used: Southwire ACSS/TW HS285® Conductor

In Service Date: November 2006

Ultra-High-Strength Steel Upgrades Danish Grid

On Denmark's Jutland peninsula, near Arhus, the second-largest city in Denmark and a major seaport, power needs for homes and industry are growing just as quickly as in the U.S. But building new towers to carry larger, heavier conductors can push upgrade budgets past the breaking point. The Danish utility operator N1 found an alternative. They have reconductored existing towers using Southwire's ACSS/TW (aluminum conductor, steel supported, trapezoidal wire) HS285® conductor.

Reconductoring Made Upgrade Affordable

N1's ACSS/TW HS285 conductor project is a double-circuit 170kV line stretching 22.5 miles (36 km) between the cities of Trige and Tange. The line was built in 1963, using ACSR (aluminum conductor, steel-reinforced) conductors. By 2005, the original 980 amp capacity just wasn't sufficient. N1's goal was to develop a capacity of 1,500 amp down the same right-of-way. The problem was finding a cost-effective approach to the expansion.

Several Approaches Were Considered

N1 worked with Otra Danmark and Delpro A/S, supplier of overhead conductors, cables, transformers and switch gear to the Danish utility market. Otra also contributed engineering services that helped make the upgrade both successful and cost-effective.

N1 and Otra spent a year considering several approaches to the problem, including conductors manufactured in Europe. They reviewed environmental impact, installation costs and operating economy. In the end, the only alternative that met the needs of price and performance was the newly developed product from Southwire. The ACSS/TW HS285 conductor solution required no structural modifications to the existing towers.

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N1 and Otra then took another full year testing and confirming the performance of the new design. "Otra helped N1 with technical assistance in sag, tension, and tower strength calculations," says Merete Neilsen, Manager of Power and Networks for Otra.

Southwire ACSS/TW Experience was a Factor

N1's Trige-to-Tange project was energized in mid-November of 2006. The upgrade used a total of 137.5 miles (220 km) of 954 kcmil Cardinal ACSS/TW conductor with the HS285® steel core. "Southwire has 25 years of experience with the ACSS/TW conductor architecture," says Neilsen. "That was an important factor in making the choice." Mark Lancaster, former manager of overhead transmission engineering, adds, "Southwire also brought specialized conductor engineering expertise to the project, to design a steelcore, high-temperature low-sag conductor with specifications tailored to the application." In meeting the application requirements, the ACSS architecture was a "must-have" to control sag due to thermal elongation under a 1,500 A load. The ACSS/TW HS285 conductor core was needed to handle the weight of the conductor spans and expected ice loads. Ice loads can be heavy in Denmark. One incident reported 1.15 inches (29.2 mm) of conductor ice at 23° F (-5.2°C).

ACSS/TW use is Expected to Grow

N1's project is the first installation of the ultra-high-strength ACSS/TW HS285 conductor in Europe. The ACSS/TW architecture in general is relatively new to Europe. Conductors there more commonly use ACSR or AAAC (all aluminum alloy conductor) designs. The ACSS/TW HS285 cable installs just like other steel-core ACSS/TW conductors, but because of the relative unfamiliarity of the ACSS/TW design, a team from Southwire conducted a pre-installation conference for the contracting crew doing the job. The Southwire team inspected the site, trained installers and consulted with Otra engineers. "This project is the first of its kind in Denmark and this type of upgrading is only carried out in a few places in Europe," Neilsen says. "We're pleased with the results," Lancaster adds. "We're expecting to see growth in the use of ACSS/TW conductors in Europe as grid operators continue to confront the cost of upgrade projects."

High Temperatures with Low Sag

In ACSS conductors, the weight of the wire is taken almost entirely by the steel core. Sag is determined by the low expansion rate of steel, rather than the high expansion rate of aluminum. That allows higher operating temperatures – and more capacity. ACSS can operate continuously at temperatures up to 250°C without loss of strength. For the same conductor size and weight, an ACSS solution can give substantial increases over ACSR without significant changes in structure or line design, sometimes exceeding 100 percent more power than ACSR with the same sag.

Strength Comparison of Steel Cores

- A typical steel core in a standard ACSR cable has a tensile strength of about 210 ksi.
- A traditional "high-strength" core delivers a tensile strength of about 235 ksi.
- ACSS/HS285 cable's steel core can stand up to 285 ksi before failure, 21 percent stronger than the usual "high-strength" core, and 36 percent stronger than a standard core.

If you need increased capacity in a new line, Southwire ACSS/HS285® conductor is the multi-purpose tool you need.

Call your Southwire representative or visit www.southwire.com today to learn more.

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