TRYSTAR

Solution Brief



CONDITIONED POWER FOR A HARSH OFFSHORE ENVIRONMENT

How an integrated voltage regulation and environmental control solution supported critical auxiliary and mechanical loads

The Application

Outdoor conditioned low-voltage power for HVAC, pumps and variable-torque fans.

The Challenge

Wide input variation, offshore environmental exposure and an operating range of -20°C to +50°C.

The Outcome

Two integrated 300 kVA regulator systems designed for the electrical, environmental and site-interface requirements.

The Engineering Problem

The offshore wind farm substation needed stable, conditioned low-voltage power for auxiliary and mechanical loads (e.g., HVAC, pumps, and variable-torque fans). The electrical design called for two three-phase systems: one converting 480V delta input to 480/277V wye output, and another converting 208V delta input to 208/120V wye output. Each system required wide input regulation, regulated output, and manual bypass capability.

The application became more demanding when the full installation environment was defined. The equipment would operate outdoors at an offshore location, across a -20°C to +50°C ambient range and with salt-air exposure. A conventional outdoor regulator arrangement, based on a narrower 0°C to 40°C operating range, would not adequately address the complete requirement.

15765 Acorn Trail / Faribault, MN 55021 / 507.333.3990

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Conditioned Power for a Harsh Offshore Environment

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The Solution

Each 300 kVA automatic voltage regulator was installed inside a separate purpose-built outdoor enclosure that created a controlled operating environment around the core electrical equipment.

Electrical Performance

Wide input regulation, regulated three-phase output, manual bypass, main input protection, and conditioned output provisions.

Environmental Protection

Sealed and painted 304 stainless-steel enclosure, HVAC cooling, conformal-coated circuit boards, and fused disconnect.

Site Integration

Provisions for plant controls, status and alarms, coordinated cable entry, junction boxes, enclosure lighting, and receptacles.

Single Integrated Assembly

Voltage regulators and their respective enclosures were completed as one system before shipment, reducing the need to coordinate separate equipment packages in the field.

Why It Matters to the Specifier

The voltage regulators, their enclosures, HVAC, protection, and controls had to function as one coordinated design. Defining only the electrical ratings would not have produced a complete or reliable outdoor solution.

Engineering Decisions That Shaped This Solution's Final Design And Success

1

Protected For Energization, Not Just Steady-State Load

Multiple site consulting engineering teams worked together to provide sufficient technical data to ensure site electrical feeders and overcurrent protection were appropriately sized. Sizing accounted for expected load demand, voltage regulator transformer inrush current, and enclosure HVAC load; while accommodating the requirement for a single feeder connection and a single load connection.

2

Engineered The Enclosure As Part Of The Electrical System

The sealed enclosure and HVAC resolved the outdoor temperature and salt-air exposure, but they also added electrical distribution, controls, maintenance access, and heat-management requirements. The enclosure was therefore treated as an engineered subsystem, not as a weather cover.

3

Resolved Control Interfaces Before Release

Alarms, status indications, control points, and site HMI integration affected drawings and the interface with the site control system. These requirements were reviewed as part of detailed engineering; along with cable entry, output and control junction boxes, lighting, receptacles, and installation provisions.

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Engineering Decisions That Shaped This Solution's Final Design And Success *(cont.)*

4

Planned Logistics While Equipment Was Still Being Designed

The completed assemblies were large and heavy. The two installed systems were approximately 7,200 and 10,000 pounds, respectively. Oversized-load permits, crane coordination, lifting access, and delivery sequencing therefore became design and project-planning considerations rather than last-minute details.

5

Matched Validation To The Installed Condition

HVAC solved an environmental requirement, but introduced an acoustic concern. The project required sound information for site analysis and agency review. Factory measurements of completed assemblies were taken indoors; background factory noise and test conditions prohibited the ability to isolate every sound source or reproduce the final outdoor condition. The issue was resolved by field measurement and acoustic evaluation after installation.

What Set This Solution Apart

Application-Level Engineering
Trystar addressed voltage regulation, transformer behavior, environmental control, protection, and controls as one interdependent system.

Coordinated Manufacturing
The core regulators were manufactured in one Trystar facility and integrated into the environmental enclosures at another, with completed assemblies prepared for site delivery.

Design-to-Field Continuity
Detailed review extended beyond the oneline diagram to feeder sizing, HMI points, cable routing, service access, lifting, permitting, startup, and field validation.

Specifier Takeaway

For outdoor power-quality applications, the specification must define the operating environment, electrical performance, transformer inrush, bypass philosophy, protection coordination, controls interface, acoustic expectations, service access, and site logistics early. Trystar helps designers create more cohesive power systems through deep source-to-load expertise, broad integration experience, and application engineering support across critical system components. Trystar's value is the ability to bring those requirements together into a coordinated, buildable system; rather than leaving the owner, engineer, and contractor to reconcile separate components in the field.

When the Application Falls Outside the Standard, Involve Trystar Early.

Early collaboration helps align the electrical design, enclosure strategy, controls, and field execution before the equipment package is released.

15765 Acorn Trail / Faribault, MN 55021 / 507.333.3990
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