

Case Study: AMPS PRS Performance in Iraq



This case study presents the operational performance of two AMPS Power Reliability Systems (“PRS”) installed in Iraq over a 7 month period June 2024 – January 2025. The primary objective was to ensure uninterrupted power supply to critical loads at 2 sites, specifically a Variable Speed Drive (“VSD”) connected to an Electric Submersible Pump (“ESP”), supported by a 500 kVA diesel generator. The AMPS PRS played a pivotal role in energy management, voltage and frequency stability, and overall power quality enhancement, ensuring 99.7% uptime on the pump under challenging conditions with ambient temperatures in excess of 50 deg C.

Incident Response and Power Continuity

During the trial period, both planned and unplanned maintenance occurred, including generator and PRS maintenance events. Despite these incidents, the AMPS PRS ensured a seamless power supply, maintaining 99.7% uptime throughout. Notable incidents included:

- **Generator Maintenance:** On several occasions, the PRS was fully charged prior to scheduled maintenance, ensuring uninterrupted power during generator downtime. The transition was so seamless that the VSD remained unaware of the generator’s offline status, and production deferment due to generator maintenance was eliminated.
- **Unanticipated Power Loss:** The generator experienced fuel filter blockage due to poor quality fuel and shut down unexpectedly. The AMPS PRS instantly responded to supply power to the ESP without interruption, and also communicated the fault to the operators who were able to mobilize to the site, troubleshoot, and restart the generator without any ESP shutdown.
- During the trial period the ESP’s were stopped only once, due to generator faults occurring while the site was inaccessible for security reasons.

Power Quality Enhancement

Before AMPS Installation:

- Power Factor: Approximately 0.93
- Total Harmonic Distortion THD (I): 32.3%

After AMPS Installation:

- Power Factor: Improved to **0.99/1.0**
- Total Harmonic Distortion (THD): Reduced to **8.7%**

The AMPS PRS significantly improved power quality, particularly during the hot summer months, underscoring its effectiveness in demanding environments, ensuring the VSD-ESP operated efficiently.

Voltage and Frequency Stability

The AMPS PRS demonstrated exceptional performance in maintaining voltage and frequency stability. The system consistently held an average voltage of 415V and a frequency of 50 Hz. Minimal deviations (less than 0.5%) were observed, highlighting the PRS' ability to regulate power under various operating conditions, ensuring the VSD-ESP operated without interruptions.

Generator Operation and Adjustments

The AMPS PRS played a crucial role in managing transient events and ensuring consistent generator output. For example, on several occasions, the generator's operational parameters were adjusted remotely, ensuring optimal performance and contributing to the achievement of 100% uptime.

A significant adjustment was made on July 06, 2024, in response to a client request, where the battery's state of charge (SOC) boundaries was modified from 25-85% to 55-85%. This change, implemented online and remotely by the PRS, increased the generator's cycling frequency to ensure that sufficient battery capacity was available for maintenance personnel to respond in the event of a generator failure.

Additionally, the PRS continuously monitored critical metrics, such as the generator's water temperature, allowing potential issues to be identified and addressed before they could cause interruptions. By shutting down the generator and operating on battery power during the hottest part of the day, the reliability of the system was further improved, ensuring uninterrupted operation of the ESP and demonstrating the PRS' adaptability and responsiveness to changing requirements.

Overall Benefits Summary

- **Uptime:** Maintained at 99.7% throughout the trial period.
- **Generator Run time:** Diesel generator run-time hours reduced by 25%.
- **Generator and BESS Maintenance Incidents:** 11 total, with seamless power supply maintained throughout.
- **Harmonics Mitigation:** THD (I) at the generator reduced by a factor 3.7 times.
- **Power Factor:** Improved to near unity.
- **Voltage and Frequency Stability:** Minimal deviations, ensuring consistent load operation.

Conclusion

The seven-month period running in temperatures up to 52 deg C highlighted the AMPS PRS' exceptional performance in Iraq, providing seamless power regulation, stability, and significant power quality improvements. The PRS proved to be a reliable and adaptable solution, ensuring **99.7% uptime** for the ESP in a challenging environment reducing oil deferment, extending the life of the ESP and reducing diesel consumption.