ARTICLE

Applying low-voltage motors offshore in the oil & gas industry

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Demanding environments
Reliable, safe and highly efficient motor solutions

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ABB's Baldor-Reliance® Severe Duty IEEE 841XL motor

It is generally understood that the industry specifications used in the chemical, oil and gas industries (IEEE 841, API 541, API 547 and API 546) were established as the result of practical experience in the field to improve reliability. These standards form the basis for almost all user specifications in this segment; however, special consideration must be given for specifications for offshore applications.

Although offshore applications are similar to onshore operations, oil companies face unique challenges when operating offshore. To increase motor reliability, it is common for manufacturers to add features beyond what is dictated by the industry standard, specific to the harsh environment of an offshore platform. In addition to the harsh environment, offshore locations are also remote and have a limited storage area for motors and spare parts. When considering all factors relating to motors on a production platform, complete reliability of the product is a key factor, including the coating specified for the harsh enviorment.

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For low-voltage motors, in addition to the requirements of IEEE 841-2021, specifications may include:

- Higher or lower ambient temperatures
- Reduced sound levels
- Class I, Division 2. Groups A, B, C, D with T3 (part of IEEE 841) or other hazardous area classifications
- Anti-fungal treatment of insulation systems
- 316 stainless steel hardware
- Extremely durable coatings and paint systems
- Space heaters with separate connection boxes
- Connection boxes with terminal posts
- For extremely low ambient temperatures, special materials may need to be specified
- Inverter duty per NEMA MG1 Part 31.4.4.2
- Foot flatness within 0.005 inches for precision alignment to driven equipment
- Vibration limits 0.08 in/s peak velocity or less
- All internal rotor, stator and shaft surfaces are epoxy coated
- Non sparking fans designed for hazardous locations
- Complies with JIP33 requirements
- IOGP (International Association of Oil & Gas Producers) standard

Division 2 hazardous locations and PWM Inverter Duty for variable torque loads are considered usual service conditions in IEEE 841-2021. Often, offshore applications will be located in a division 1 hazardous location. In these cases an explosion proof motor will need to be specified. The motor shall be certified explosion proof for the class, group and temperature code of the classified division 1 location. When the motor will be operated with an inverter the motor shall be certified and labeled for inverter duty operation including speed range capability and temperature code when operating on an inverter.

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ABB's Baldor-Reliance RPM AC top-drive drill motor

For offshore applications, if American Bureau of Shipping (ABS) compliance is required, electrical performance may change, as well as some testing requirements. Additionally, customers may ask that the motors meet specific requirements to withstand the motion of a floating structure.

For example:
- 22.5-degree list and 10-degree trim
- Pitch and roll angle of 20 degrees
- Predominant motion period of 9-11 seconds
- Lateral acceleration factor of .65G
- Vertical acceleration factor of 1.2G
- Meets and exceeds IEEE 45 on nameplate

Motors with a power-dense design offering higher performance in a smaller package are necessary for offshore drilling applications. In addition to providing high performance, these motors must be designed to operate reliably in harsh conditions while ensuring equipment and personnel safety. As an alternative to rotary table or kelly drive systems, top-drive drilling motors reduce the manual labor involved in drilling, thereby reducing the associated safety risks. Top-drive motors are also more efficient, resulting in faster drilling and reduced costs, and the simplicity of the system compared to other methods means there are fewer components to fail and less whole-system maintenance.

Some desirable features of a top-drive drill motor include:
- Ambient temperature ratings up to 55° C
- Certifications such as CSA, ATEX, IEC-Ex and ABS
- Rugged laminated-steel frames with IP44-rated drip-proof separately ventilated enclosures
- Ductile iron bearing brackets with drive end and opposite drive end flanges
- Stainless steel air outlet covers and mesh screens
- Wire or cotter key-fastened components for increased safety
- Rated for shock loads up to 6G

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When ABB is engaged by our customers to supply motors for any offshore installation, it is important to acknowledge the very stringent requirements. Careful and complete review of project specifications and data sheets for every motor are necessities.

ABB offers a full range of performance-proven, energy-efficient, motors and variable speed drives for the chemical, oil and gas industry. Our products are engineered with industry-driven designs and patented technologies that ensure greater uptime with less maintenance. With our in-depth understanding of application needs, we provide dependable solutions that keep operations running reliably day after day.

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