How to Choose the Right Electric Motor for the Chemical Process Industry – Part 4 of 5

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Uriah van Amerom, Zeton Inc.

Operating an electric motor in a hazardous location poses risks that range from production downtime to injury and death. In this series of articles, learn how to select the appropriate motor for your operating environment in the chemical process industry.

Class I, Division 2 Motors: An Overview

In this article, we will look at how Class I, Division 2 electric motors are made and how they are best used in hazardous environments.

It stands to reason that any motor considered suitable for a Class I, Division 1 location would also be appropriate for a similar environment containing the same hazardous materials but deemed Division 2. Indeed, an explosion-proof motor certified for use in a Class I, Division 1 location—where a hazardous material is present under normal operating conditions—may also be operated in a Class I, Division 2 area—where the hazard is only present under abnormal conditions—assuming the motor meets the group and T-code requirements.

One could conclude, then, that it would be easier to use an explosion-proof Class I, Division 1 motor in a Class I, Division 2 location than to convince the authority having jurisdiction over the applicable code that a non-explosion-proof motor is suitable. This approach has been taken by some equipment users in the past, and it is a safe one, but it is expensive and outdated.

First, installation costs for labour and materials may be two to three times more for an explosion-proof motor than for an equivalent non-explosion-proof one, depending on the size of the motor. And second, while it used to be the case that third-party certifying authorities such as Underwriters Laboratories (UL) and the Canadian Standards Association (CSA) only certified explosion-proof motors required for Division 1 environments, this is no longer the case. Recently, non-explosion-proof electric motors that meet the requirements of, and are specifically certified and labeled for, Class I, Division 2 environments have become available.

As one would expect, the minimum requirements for NEC/CEC Class I, Division 2 locations are less stringent than those for Class I, Division 1 locations. For example, a totally enclosed, fan-cooled (TEFC) motor and even an open, drip-proof (ODP) motor may be used in a Division 2 environment provided the motor does not have arc-producing brushes or switching mechanisms, which could act as ignition sources. As an added precaution, if the motor includes a space heater, its surface temperature must not exceed 80% of the AIT of the hazardous gas or vapour in the environment. In practice, this means that in a Class I, Division 2 location, three-phase induction motors with sufficiently low surface temperatures and no sparking parts can be used because it is unlikely that a spark-producing failure will occur at the same time that combustible materials are present due to a spill, leak, or other system upset.

There is the potential for cost-savings now that the certification of motors has been expanded for Class I, Division 2 locations. Class I, Division 2 motors now have nameplates detailing class, division, group, and T-code in the same way as is required for explosion-proof electric motors, making the sourcing and purchasing of these motors more efficient. With the added regulations of Class I, Division 2 electric motors, there is a transparency of use and increased security of worker environment that translates into an overall decrease in equipment and maintenance costs for the project.

In the final article in this series, we will look at how inverter-duty electric motors are used to counteract the heating effects of variable-frequency drive controllers in hazardous environments.