
Question 22: What preventative maintenance program is applied to safety instrumented systems on a steam methane reformer that are Safety Integrity Level (SIL) rated?

ESTEBAN (Suncor Energy, Inc.)

Safety instrumented systems (SIS), as defined by ANSI/ISA-84.00.01-2004 Part 1(IEC-61511-1 Mod), are required to have components functionally tested and/or replaced/ refurbished under preventative maintenance (PM) to provide the reliability required to have a Safety Integrity Level (SIL) rating. SIL-rated safety systems are often required when a greater degree of protection layers is required than that offered by standard design. Typical instrumented functions are expected to have a probability of failure on demand (PFD) equal to 1×10^{-1} or once in 10 years. Given scenarios where the consequences of failure are significant often this failure rate is not acceptable to provide adequate layers of protection to reduce the risk of catastrophic consequences. In order to provide additional layers of protection SIS can be designed to meet a SIL rating from 1 to 4 where each level provides an additional layer of protection. For example, a SIL 1 system is designed to meet a PFD equal to 1×10^{-2} . These systems not only differ in design as specified by ISA-84, but they also must be tested and maintained to ensure that the failure rate is not increased. This testing includes calibration of instruments, complete function testing and servicing per manufacturer's recommendations of end control devices, and operation of logic solvers. In order to determine the frequency of this testing, ISA-84 requires the use of the PFDavg calculation.

Often refining units with high operating pressures and temperatures that also have high operating hydrogen partial pressures have failure scenarios identified that can have catastrophic consequences, and Steam Methane Reforming (SMR) units certainly fit this category. In order to prevent these scenarios several independent layers of protection are required, and due to the severity of the consequences identified some of these scenarios may require the use of SIL-rated SIS in order to provide adequate layers of protection. Where applicable Suncor Energy, Inc. employs the use of SIL-rated SIS on SMR units to prevent catastrophic consequences, and we strive to design and maintain these systems in accordance with ANSI/ISA-84.00.01-2004 Part 1(IEC-61511-1 Mod).

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