Information regarding the requirements of the Pressure Equipment Directive 2014/68/EU.

Dovre Sertifisering AS

INFORMATION

INF-DSE-2020-010 Pressure sensors in Steam boilers

**Information regarding Pressure sensors in Steam Boilers**

 Last Revision date: December 10th 2020 (Rev. 0)

Introduction

It has come to our attention that there is some misunderstanding about the use of pressure sensors in boiler systems.

In this information document we will explain the requirements regarding these sensors. We will in this document concentrate us on the European requirements (EN12953) regarding this issue.

Basis for the problem.

The problem was pointed out that the pressure sensor should withstand the temperature of the steam in the boiler. The problem with this requirement is that this means that the large majority of steam boilers around the world need to be changed. Is this a problem and is this creating a safety issue?

Why a boiler has a water seal (pig tail).

The use of a water seal is to prevent process temperature steam to enter the pressure transmitter. The water seal will cause the steam to condensate / be absorbed in the seal sinking the temperature of the water /steam to prevent damage to the pressure indicator.

Discussion.

The basic design for steam boiler has been changed together with technical advancements, safety systems and regulations. However steam boiler around the globe still have roughly the same design basis.

The design of the manifold for the pressure transmitter is no exception.

Today it is common to use the so called “pig tail” loop as a water seal to protect the transmitter for excessive temperatures. The European standard EN12953-9 describes that the pressure transmitter shall be mounted behind a water seal if this Is found necessary §6.34.

It is not allowed to influence the water seal when it is required to purge the piping. This is to prevent that sludge or dirt enters the water seal that can influence the working of the pressure transmitter §6.3.5.

 Note regarding systematic error as described in EN50156-1 and 2 regarding electrical equipment for furnaces and ancillary equipment.

A systematic error is an error that has been present in an earlier stage and can only be solved by a change in design etc. A safety loop will secure the requirements and should be calculated from the values of the supplier of the components and design choices that were made.

EN61508 has several parts and covers the functional safety. The problem here is the question if the equipment can be damaged due to an erroneous boiler design.

Important notice: it is difficult for manufacturers to find transmitters that are able the temperatures of the boiler steam.

The piping on the manifold will purge steam when opened if the boiler is hot or not cooled down sufficiently. This will create a risk for Health and safety to the person opening the manifold.

But the question is if this scenario is realistic?

 Conclusion.

The intention of the standard is to secure that the boiler can be used safely and the risk for adverse events is minimal.

The question is if there is a safety issue on the manifold solution with the water seal and will the manifold be opened when the boiler is hot or not fully cooled down.

1. Safety issue due to the water seal.

The design of a boiler according to EN12953 will allow the water seal before the pressure transmitter. Purging when the system is closed will only press the water further into the water seal and thus nothing will happen Picture 1.



Picture 1 Pressing in steam or purging from point A wil only result in the fact the water is pushed towards the pressure transmitter.

1. Opening the manifold during service or when the system isn’t cooled down sufficiently.

The piping on the manifold during purging will on no case be performed during a hot boiler situation. Doing this will introduce several issues. Opening the manifold under service or while the boiler isn’t cooled down enough will result in a steam or steam and water blow out.

It is very unlikely that a approved boiler operator will open the manifold when the boiler is hot or not cooled down sufficiently to purge the piping. An error in the system due to sludge or dirt will cause the shut down of a boiler. This can be done manually or automatically based on the type of error.