



CASE STUDY

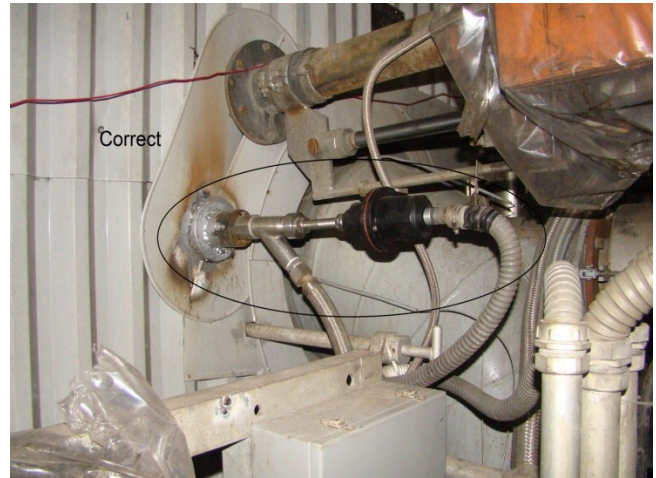
Advanced Fiber Optic Cable Technology for Next-Generation Power Plants

The Problem

Recent industrial and urban growth in many countries around the world has led to an increase in energy demand. While this is good news for the country's power producers, safety remains the top priority in the power industry. Whether new or an existing plant, daily operations are performed with safety in mind, therefore plant personnel work in a safer environment. For new or existing boilers, flame detection is one of the major concerns for safe boiler operation. On older boilers the reliability of the flame detection equipment will deteriorate over a period of time which leads to boiler shutdowns. The plant engineers realized the older flame detection equipment was more maintenance intensive than the current flame detection technology. Also many flame scanners that are presently installed on boilers are not mounted in the proper location and/or sighted properly, as shown in the pictures below. Some of the scanner installations may require the use of a fiber optic assembly for better flame monitoring and discrimination. Without advanced flame detection equipment and not meeting proper installation guidelines, boiler safety is greatly reduced. Safe-Fire has the advanced flame detection equipment and experienced personnel to meet the needs of many boiler configurations in the industry today.



Before Safe-Fire's flame scanner modifications. The existing scanners were mounted in the wrong location.



After the Safe-Fire flame scanner modification using the fiber optic assembly and mounted in the proper location.

The Solution

A simple lens is used to focus the flame to one end of the fiber optic bundle, with the other end coupled directly to the viewing head. This effectively extends the optical path of a standard Safe-Fire viewing head allowing for greater flexibility in sighting flames correctly. The scanners have advanced sensors and algorithms that can further discriminate between burners and adjacent flames. The fiber optic assembly consists of two major parts, the inner and outer carrier assembly as shown below.



Inner Carrier Assembly



Outer Carrier Assembly



Inside boiler view of the fiber optic assembly tip

Features

- Withstands high temperatures
- Withstands high vibrations
- Corrosion protected stainless steel construction
- Increased accuracy in monitoring flame signals at various boiler loads

Applications

- Tilting burners firing pulverized coal, oil or gas
- Applications where normal sighting is impossible
- Hostile environments
- Lime kilns
- Black liquor recovery boilers
- Incinerators - biomass and other waste fuel streams

Gas and oil fired turbine generator sets The Safe-Fire fiber optic viewing head extension is particularly useful for solving sighting problems associated with tilting or movable burners. The flame envelope from this type of burner can be tilted from a horizontal position up or down as much as 30 degrees. Therefore it would be impossible to follow this flame pattern with a fixed sighting through the wind-box. Welding the tip guide (lens end) of the viewing head extension to the movable air compartment nozzle solves this problem.

The Safe-Fire fiber optic viewing head extension can also be used in applications where finding a clear unobstructed view of the flame using a standard sight pipe is impossible. For a clear unobstructed view of the flame the viewing head extension is mounted inside the furnace.

Further applications would be those involving hostile environments. For example, the radiated heat from the burner front of a lime kiln may prohibit the use of a viewing head in this location even though there is an adequate supply of purge air. Another application would be gas and oil fired turbines where there can be a combination of high vibration, temperature and pressure excursions. The Safe-Fire fiber optic viewing head extension should be considered for any application deemed too hostile for the viewing head itself.

The Results

Flame detection equipment has improved through the years with advancements in processors, software and various types of sensors. Using Safe-Fire's fiber optic assembly with proper sighting methods is another step to attain reliable flame detection with the following benefits.

Benefits

- Improves boiler performance and reliability
- Reduces boiler downtime
- Boiler safety improved
- Increase in production
- Lower maintenance

A burner flame detection system is an arrangement of flame detectors, interlocks, and relays and is part of the burner management system. The purpose of the flame detection system is to sense flame operation and to shut off fuel supply if a hazardous condition develops. The flame detection system senses the presence of a good flame, proper combustion and prepares the operation of a burner so that motors, blowers, ignition and fuel valves are activated when needed, in the proper sequence. In the event of a lost flame signal, the flame detection system signals the burner management system, which then shuts down the associated burners in order to prevent a fuel-rich environment inside the boiler, which is extremely dangerous. To maintain the boiler reliability and proper operation, the flame detection equipment should be inspected periodically.