SERVICE BULLETIN

Date: **March 11, 2024**

Bulletin Number: **SB24-002**

***Bulletin Subject*:** **ADDITIONAL COMBUSTION AIR/FUEL SAFETY EQUIPMENT NOTIFICATION**

ATTENTION:

This Service Bulletin addresses the addition of equipment, instrumentation, and programing that provides additional air/fuel safety and reduces the possibility of an explosive event caused by lack of combustion air in an ICM dryer system or thermal oxidizer system.

BACKGROUND INFORMATION:

The ICM dryer and thermal oxidizer systems include required National Fire Protection Association (NFPA) burner management system interlocks for control of combustion air and fuel. Additionally, there are standard programed interlocks to minimize the possibility of a deviation in air and fuel rates from normal operating conditions.

With this equipment, there have been natural gas explosion events caused by multiple point failures. These events typically include two or more of the following: mechanical failures, improper maintenance, improper changes to programing, and/or multiple burner restart attempts by the operator without determining the cause for the initial trip or restart failure.

Below is a general summary of ICM's typical (past and current) installation for combustion controls:

- **Combustion control programing for standard ICM dryer systems and thermal oxidizers systems include an Air/Fuel Ratio Table. The Air/Fuel Ratio Table displays the position of the natural gas control valve from 1% open to 100% open. For each 1% change in the natural gas control valve's feedback position, the Air/Fuel Ratio Table has a corresponding combustion air damper and/or combustion air fan speed position. When the position of the natural gas control valve changes, the combustion air damper and/or fan speed changes per the Air/Fuel Ratio Table.**

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ADDITIONAL AIR/FUEL SAFETY:

ICM has incorporated additional air/fuel safety measures for monitoring, alarming, and tripping the burner when necessary. These additional safety measures are included in new systems and ICM can retrofit them into existing systems. Equipment and programing modifications require independent analysis of each system; however, in general these additional air/fuel safety measures include the following:

1. **Install a combustion air flow meter to measure the combustion air into the burner.**
    - **Photo 1 shows a typical installation for a dryer. The combustion air flow element is typically located on the combustion air fan inlet but some installations may require installation between the combustion air fan and burner.**
    - **The combustion air flow meter includes a differential pressure transmitter with an automatic re-zeroing function and temperature correction.**
    - **For dirty air services such as combustion air sourced from a baghouse exhaust, an automatic compressed air purge system is needed to keep the flow sensing element from plugging.**

2. **Incorporate an air/fuel alarm and burner trip interlock in the DCS. Below is a summary of the recommended programing.**
    - **Each burner has a combustion air flow meter to measure the flow of air into the burner. Each burner also has a fuel flow meter to measure the fuel rate into the burner. An air/fuel ratio alarm table is programed into the DCS for each burner and the table is accessed from a pop-up window on the DCS graphic. The first column in the table is the gas flow in 1 MMbtu/increments. The second column is the minimum air flow corresponding to the gas flow in first column. Using the actual operating gas rate to determine the minimum combustion air flow rate in the table, the DCS air/fuel ratio alarm continuously compares the operating combustion air flow rate to the minimum combustion air flow rate. The difference between the actual air flow rate and minimum air flow rate is displayed on the graphic. When the difference drops to a low value, the low air/fuel ratio will alarm the operator. If the operating combustion air drops below the minimum combustion air rate, the burner will trip if the alarm is active more than 10 seconds.**

3. **Incorporate a flow switch from the combustion air flow meter into the BMS proof of high fire purge circuit.**
    - **The pressure transmitter used for the combustion air flow meter has an alarm contact that is set up to close for a high fire purge flow rate. This**

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contact is used for proof of high fire purge air flow before light off to ensure adequate air flow during purge.

- **Update panel drawings to incorporate high fire proof of flow switch.**

Photo No. 1: Combustion Air Flow Meter

DRYER AND THERMAL OXIDIZER OXYGEN METER

This section provides clarification on oxygen meters and ICM typical installations.

- **An oxygen meter is a useful tool to continuously monitor oxygen levels in the system. ICM does not typically set up the oxygen meter to trip the burner for a dryer or thermal oxidizer. Low and high oxygen are alarms for notification to the operator.**
- **For the dryers, oxygen trim should not be used in the combustion controls. Leaks from seal belts or hatches can cause readings that should not change the air to fuel ratio at the dryer's burner. If installing an oxygen meter on a dryer system, it should be used for continuous monitoring and alarms. Oxygen meters are typically installed on dryer's inlet plenum downstream of the burner and air heater.**
- **For the thermal oxidizers, ICM's typical installation is using the oxygen meter for monitoring and alarms. However, oxygen trim can be setup in a safe way for thermal oxidizers systems to make small adjustments to the air to fuel ratio. Oxygen meters are typically installed after the stack coils.**

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Photo No. 2: Oxygen Probe

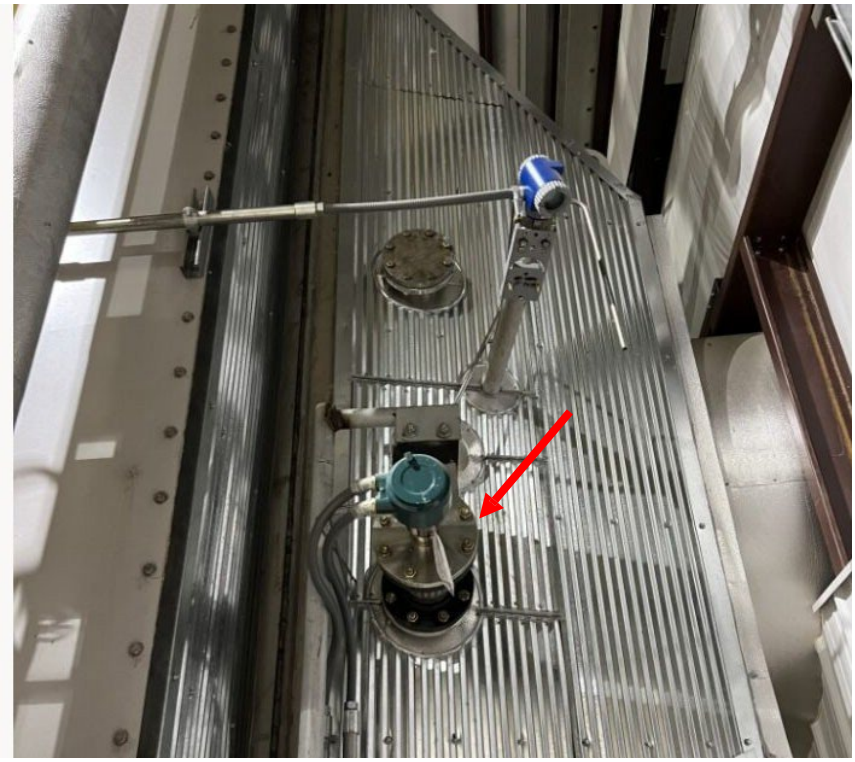
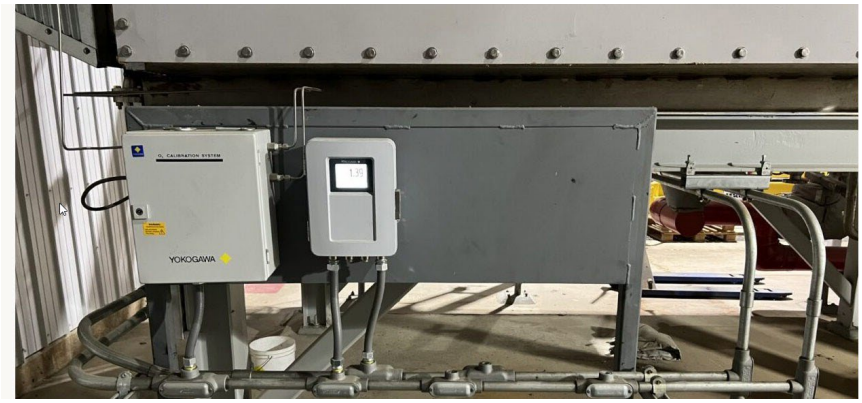


Photo No. 3: Oxygen Analyzer



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ICM SUPPORT:

If you need additional information or would like to receive a quote for any services related to dryer or TO systems, please contact your ICM Account Manager, or ICM Aftermarket Services at 877-456-8588 for assistance.

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