

# Malfunction Abatement Plan for



## UP Paper LLC

Under state of Michigan R 336.1911 a malfunction abatement plan (MAP) shall be prepared to prevent, detect, and correct malfunctions or equipment failures resulting in emissions exceeding any applicable emission limitation. For our facility, a MAP was drafted under the following sections below to fulfill that requirement.

### **I. Description of Source**

UP Paper LLC (UP Paper) has a natural gas boiler capable of generating 150,000 lb/hr of steam at an operating pressure of 300 psig. There are emission limits in place to regulate the amount of GHGs (as CO<sub>2</sub>e) and NO<sub>x</sub> that are emitted from the boiler.

The emission sources and affected emissions are as follows:

Emission Source	Emission Control Device	Affected Emission
EUBLR004 – Natural Gas Boiler	Low NO <sub>x</sub> Burner	NO <sub>x</sub>
EUBLR004 – Natural Gas Boiler	Flue Gas Recirculation	NO <sub>x</sub>

### **II. Responsible Parties**

The following personnel are responsible for overseeing the specified items:

**Maintenance Manager** – Inspection, maintenance, and repair of air-cleaning devices.

**Shift Supervisor & Boiler Operator** – Inspection of air-cleaning devices.

### **III. Inspection Items**

#### **Low NO<sub>x</sub> Burner**

*Items to be inspected daily:*

- Gas pressure
- Gas flows
- Flame pattern

*Items to be inspected quarterly or at earliest convenience:*

- Fuel safety shutoff valve for leakage
- Gas cleaner and drip leg

*Items to be inspected annually:*

- High and low fuel pressure interlocks
- Igniter and burner components
- Combustion control system
- Combustion air flow
- Piping, hosing, wiring, and electrical connections

#### **Flue Gas Recirculation**

*Items to be inspected quarterly or at earliest convenience:*

- Fan damper linkages for looseness and binding
- Fan for proper operation
- Vibration analysis on combustion fan and electric motor

*Items to be inspected annually:*

- Ducting and expansion joints for cracks and/or leaks
- Damper louver bearings
- Recalibrate damper positioners

#### **IV. Replacement Parts**

##### **Low NO<sub>x</sub> Burner**

*Items to be kept on hand for quick replacement:*

- Igniter spark plug
- Pilot low pressure switch
- Main gas low pressure switch
- Main gas high pressure switch
- Main gas safety shutoff valve
- Main gas flow control valve
- Main gas pressure regulator

##### **Flue Gas Recirculation**

*Items to keep on hand for quick replacement:*

- Damper louver bearings
- Damper actuator
- Air flow transmitter
- Combustion fan bearings

#### **V. Normal Operating Parameters**

##### **Low NO<sub>x</sub> Burner**

While operating EUBLR004, the burner will normally run between a firing rate of 0-100%, therefore there is no reason to believe that a certain firing rate would lead to a malfunction. Given the performance specification given to UP Paper by the boiler manufacturer the gas flow rate to this boiler should not exceed 9,100 lb/hr. In addition to this flow rate, by monitoring the flame pattern and watching for any abnormalities, the burner's proper function should be held in check.

##### **Flue Gas Recirculation**

The boiler fan that supplies the combustion fan will be driven by a variable frequency drive (VFD). For different operating loads it would not be unlikely to see the fan run at any speed within its capable range. However, while it is running, the inlet ducts have dampers that regulate the amount of flue gas and ambient air that is drawn into the fan inlet to make up the combustion air. There should always be a combination of each being drawn into the fan. Neither damper should be closed during operation.

Air flow readings will be monitored closely and any abrupt changes in flow without an abrupt change in load will be investigated for a root cause. Such air flow changes could be signaling an imminent problem with serious consequences.

## **VI. Corrective Procedures**

If an equipment malfunction is found as a result of performing routine inspections, UP Paper will take immediate action to remedy the problem. If an issue is found to incur an emission excursion, EGLE will be notified of the problem and a plan will be created to correct the problem as safely and expeditiously as possible.

Given the multiple circumstances that may arise from the several different malfunction scenarios it is difficult to describe each event. In general, if a burner or flue gas recirculation malfunctions shall occur, UP Paper will the following steps.

### **Low NO<sub>x</sub> Burner**

- Check gas flows for any surges in flow and/or pressure.
- Check flame pattern for any asymmetries, pulsations, and/or color variations.

If the flame seems to pulsate within the boiler, check to ensure gas flows and pressures are stable. Also check that combustion air flows are stable. If any flows seem to surge, ensure the gas regulator and fan drive are working properly. Any sudden changes to these devices would cause these surges.

If the flame pattern or color changes, ensure that the correct air and gas flows are present at the burner. The incorrect air/fuel ratio can result in poor combustion and potential create emission excursions.

### **Flue Gas Recirculation**

- Check drive output speed with actual fan speed.
- Check inlet damper position with damper position on DCS system.
- Check damper linkages on louvers so that all the louvers are turning together.
- Inspect fresh air inlet for any blockages and/or air flow restrictions.
- Check air flows for any surges in flow and/or pressure.

As long as the boiler load stays relatively constant over a period of time, the amount of flue gas recirculation should remain relatively the same. If the air flows begin to change without a recognizable change in boiler load, there would be reason to believe that the air flow requirements are not being recognized by the control system. If the flow is too low, the fan will likely try to speed up to increase air flow. The VFD will reflect that change. If the air flow will not come up, it is possible that the air louvers are not opening properly or together, creating a block, or the air inlet is blocked, preventing the proper amount of air flow.