

# **Malfunction Abatement Plan**

for

**Zellar MPI Equipment, Inc.**

**MI-ROP-A6475-2014**

**EUBLR004**

**Operating Company: UP Paper, LLC**



**Revision Date: October 24, 2016**

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**

Zellar MPI Equipment, Inc. 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 following emission source 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 following items

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

***Production Manager*** – Inspection of air-cleaning devices

**III. Inspection Items**

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

*Items to be inspected daily*

- Gas pressures
- Gas flows
- Flame Pattern

*Items to be inspected quarterly or at earliest convenience*

- Fuel safety shutoff valve for leakage
- Natural gas piping sediment legs

*Items to be inspected annually*

- High and low fuel pressure interlocks
- Igniter and burner components
- Combustion control system

- Combustion air flow
- Piping, hoses, 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 NOx Burner**

*Items to keep 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 NOx Burner**

While operating EUBLR004, the burner will normally operate between firing rates of 0-100%, therefore there isn't reason to believe that a certain firing rate would lead to a malfunction. Given the performance specification given to us by the boiler manufacturer the gas flow rate to this boiler shouldn't exceed 9100 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 ducting has dampers that regulate the amount of flue gas and ambient air that is drawn into the inlet of the fan to make up the combustion air. There always should be some combination of each being drawn into the fan and 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 as to why this occurred. Such air flow changes could be signaling an imminent problem that could lead to more serious consequences.

## **VI. Corrective Procedures**

If an equipment malfunction is found as a result from performing the inspections found in section III above, UP Paper, LLC will take immediate action to remedy the problem. If such issue is found to cause an emission excursion, the MDEQ will be notified of the problem and a plan will be formulated to correct the problem as safely and expeditiously as possible.

Given the multiple circumstances that may arise from the several different malfunction scenarios it's hard to lay out each event. In a general sense, if we have a burner or flue gas recirculation malfunction we will take the necessary steps

### **Low NOx 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 make sure the gas flows and pressures are stable. Also check to make sure that the combustion air flows are stable. If any flows seem to surge, ensure that the gas regulator and fan drive are working properly. Also ensure any valves or dampers are opened to the correct position and functioning properly. Any sudden changes to these devices would cause these surges.

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

### **Flue Gas Recirculation**

- Check drive output speed with actual speed of fan
- 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's possible that the air louvers aren't opening properly or together and creating a block, or the air inlet is blocked, preventing the proper amount of air to flow.