FINAL REPORT

PACKAGING CORPORATION OF AMERICA

FILER CITY, MICHIGAN

2022 BIOGAS EVALUATION

RWDI #2201968

August 3, 2022

SUBMITTED TO

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1 INTRODUCTION

1.1 Overview

RWDI USA LLC (RWDI) has been retained by Packaging Corporation of America (PCA) to complete testing for heat content and hydrogen sulfide (H_2S) of the biogas routed to the EUBIOGASFLARE (biogas flare) at their facility located at 2246 Udell St, Filer City, Michigan. The test program was conducted to fulfill the requirements of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) MI-ROP-B3692-2015b, special conditions V.2 and VI.1 of FGBIOGASSYSTEM. PCA is required by permit to document the British Thermal Units (BTUs) in the biogas fuel on an annual basis.

1.2 Schedule and Summary of Testing Parameters

RWDI completed the testing on June 7th and 30th, 2022.

1.3 Test Program Organization

Details with respect to the key individuals involved with the stack sampling survey are provided below:

Company Name:	**Packaging Corporation of America**
Company Address:	2246 Udell St, Filer City, Michigan
Environmental Contact:	Josh Kosmowski
Cellular No:	231-510-6390
E-mail:	Joshkosmowski@packagingcorp.com
Sampling Company:	**RWDI USA LLC**
Project Manager:	Brad Bergeron
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2 SOURCE DESCRIPTION

2.1 Plant Overview

PCA operates the biogas flare as part of the FGBIOGASSYSTEM that is used to combust biogas during upset or malfunction conditions that may occur with the biogas generating system or the combustion boilers. If no upset conditions occur in the process, the biogas is directed to EUBOILER4A and combined with natural gas to generate steam from various mill process operations, and for electrical generation.

3 DESCRIPTION OF TESTING METHODOLOGIES

The following section provides brief descriptions of the sampling methods and discusses modifications that were completed per the test conditions. A summary of test durations, methodologies and sampling location are provided in Section 1.2.

3.1 Summary of Specific Methodologies

3.1.1 ASTM D-5504

Four (4) approximately 60-minute tests were performed on the biogas system in accordance with specifications stipulated in ASTM D-5504 and in accordance with Michigan EGLE requirements on June 30th, 2022. A minimum of 5 remaining inches of mercury were required on the evacuated summa canister to ensure proper sample collection.

3.1.2 Modifications

Original testing was completed on June 7th, 2022. Due to a malfunction of the flow transmitter servicing the biogas system, a retest was executed on June 30th, 2022. As per conversation with PCA and Mr. Rob Dickman (EGLE), the results from the initial testing were not used to determine any emission rates. The laboratory report from the June 7th event is included only for completeness of all samples collected as per the approval letter for EGLE. The June 30th, 2022 results were used for all emission rate calculations.

4 PROCESS DATA

During the testing program, plant process data was monitored and collected by PCA personnel to ensure representative operation of the facility.

EUBOILER4A

1. Average biogas flowrate during each test

5 SUMMARY OF RESULTS

Table 1: Summary of Results

Parameter	Target Pollutant	Emission Rate (lb/hr)	Limit
FGBIOGASFLARE	Pre combustion H_2S	0.12	4.49
	Post combustion H_2S	0.0012	0.0449
	SO_2	0.23	8.45

The average higher heating value (HHV) of the biogas was 662 British thermal units per dry standard cubic foot (BTU/dscf).

5.1 Discussion of Results

The measured average biogas flare H_2S emission rates were less than the EGLE permit requirements of MI-ROP-B3692-2015b.

6 CONCLUSIONS

Testing was originally completed on June 7th, 2022 and repeated on June 30th, 2022 due to a flow transmitter malfunction that resulted in no available flow data during the June 7th testing event. All measured results from the June 30th testing resulted in the average biogas flare H_2S emission rates being less that the limits set out in MI-ROP-B3692-2015b.

TABLE

Table 1
EUBIOGAS Results

Test	1	2	3	4	Average
Date	30-Jun	30-Jun	30-Jun	30-Jun	--
Time	10:48-11:43	11:44-12:39	12:39-13:34	13:35-14:30	--
H_2S Concentration ppm	2500	2700	2200	2700	2525
Average Flow (cfm)	4.92	3.28	16.29	12.72	9.30
Standard Flow (scfm)	5.01	3.34	16.60	12.96	9.48
H_2S lb/hr (mass flow)	0.07	0.05	0.19	0.18	0.12
H_2S lb/hr (emitted)1	0.0007	0.0005	0.0019	0.0018	0.0012
SO_2 lb/hr (emitted)2	0.12	0.09	0.36	0.35	0.23
HHV	628	668	675	679	662

1 Calculated by assuming 99% destruction of H2S during combustion
2 Calculated by assuming complete combustion of H2S to SO2