

University of British Columbia Independent Torrefaction Tests and Analysis

Summary of Analysis and Test Results

A. CHEMICAL ANALYSIS

Parameter	Reference	Unit	Test Results
<i>Dry Basis</i>			
Ash	ASTM D 5142	Weight %	1.35
Heat of Combustion	ASTM D 5865	Btu/lb	12178
Sulfur	ASTM D 4239	Weight %	0.01
<i>As Received</i>			
Ash	ASTM D 5142	Weight %	1.34
Heat of Combustion	ASTM D 5865	Btu/lb	12093
Sulfur	ASTM D 4239	Weight %	0.01
Moisture	ASTM D 3302	Weight %	0.7
<i>General</i>			
Heat of Combustion, MAF	ASTM D 5865	Btu/lb	12345
Sulfur	ASTM D 3180	lbs/mm Btu	0.008

B. BTU

Sample	HHV (KJ/KG)	HHV (Kcal/kg)	Btu/Kg	BTU/Lb
Torrefied Pellet at 260o	22.7	5.430622	21.5364	9.759235
Torrefied Pellet at 280o	23.6	5.645933	22.3908	10.14617

2 ASH ANALYSIS (OMRR Requirements)

Substance	Class A Compost (ppm)	Biosolids Growing Medium (ppm)	Class B Biosolids & Compost (ppm)	Ash Analysis (ppm)
Arsenic	13	13	75	8
Cadmium	3	1.5	20	7.99
Chromium	100	100	1 060	20.7
Cobalt	34	34	150	5.5
Copper	400	150	2 200	141.77
Lead	150	150	500	89.03
Mercury	2	0.8	15	5 (ppb)
Molybderum	5	5	20	5.7
Nickel	62	62	180	20.2
Selenium	2	2	14	2.5
Zinc	500	150	1 850	889.6

D. BARK VS. PINE

Sample	Bark	Pine
Initial Weight	700g	700g
Drying Temperature	150 C	150 C
Drying Duration	1 hr	1 hr
Torrefaction Temperature	280 C	280 C
Torrefaction Duration	30 mn	30 mn
Initial MC %	65-66	47-50
Final MC %	1.5	1.45
Final Weight	210 g	273 g
HHV after Torrefaction	21.6 GJ/ton	21.8 GJ/ton
Ash content after Torrefaction	2.10%	0.56%