

LAMPIRAN 1

HASIL PENGUJIAN KEKERASAN



KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI  
JURUSAN MESIN FAKULTAS TEKNIK UNIVERSITAS BRAWIJAYA  
LABORATORIUM PENGUJIAN BAHAN

Jl. Mayjen Haryono 167 Telp. 553286 Pes. 1214 Malang 65145

DATA HASIL PENGUJIAN

Jenis Pengujian : Pengujian Kekerasan Rockwell  
Satuan : HRB  
Beban : 980 N  
Bahan : Aluminium  
Penguji : Tamaryska Setyayunita  
Nim. : 125060201111021  
Jurusan : S-1 Teknik Mesin  
Universitas Brawijaya Malang  
Tanggal Pengujian : 20 Desember 2015

Permukaan

Spesimen	Recycling ke-	Titik 1 (HRB)	Titik 2 (HRB)	Titik 3 (HRB)	Titik 4 (HRB)	Titik 5 (HRB)	Rata-rata (HRB)
A	1	75.5	77	78.9	79.5	81	78.4
B	2	81.5	82	82.2	82.6	82.8	82.2
C	3	86.8	87	88.5	88.5	88.2	87.8
D	4	84	84.5	84.8	84.8	85	84.6

Tengah

Spesimen	Recycling ke-	Titik 1 (HRB)	Titik 2 (HRB)	Titik 3 (HRB)	Titik 4 (HRB)	Titik 5 (HRB)	Rata-rata (HRB)
A	1	66.2	77.1	77.1	83.1	80.1	76.7
B	2	75	78.8	81.2	81.8	82.5	79.9
C	3	75.5	78.5	81.8	81.8	82.5	80.0
D	4	75.5	80.8	81	81	81.5	80.0



Malang, 11 April 2016

Lab. Pengujian Bahan

H. Erwin Sulistyono, MT.

NIP. 19661215 199802 1 007

LAMPIRAN 2

TABEL PERHITUNGAN UKURAN BUTIR ASTM




TABLE 4 Grain Size Relationships Computed for Uniform, Randomly Oriented, Equiaxed Grains

Grain Size No. G	$\bar{N}_A$ Grains/Unit Area		$\bar{A}$ Average Grain Area		$\bar{d}$ Average Diameter		$\bar{T}$ Mean Intercept		$\bar{N}_L$ No./mm
	No./in. <sup>2</sup> at 100X	No./mm <sup>2</sup> at 1X	mm <sup>2</sup>	μm <sup>2</sup>	mm	μm	mm	μm	
00	0.25	3.88	0.2581	258064	0.5080	508.0	0.4525	452.5	2.21
0	0.50	7.75	0.1290	129032	0.3592	359.2	0.3200	320.0	3.12
0.5	0.71	10.96	0.0912	91239	0.3021	302.1	0.2691	269.1	3.72
1.0	1.00	15.50	0.0645	64516	0.2540	254.0	0.2263	226.3	4.42
1.5	1.41	21.92	0.0456	45620	0.2136	213.6	0.1903	190.3	5.26
2.0	2.00	31.00	0.0323	32258	0.1796	179.6	0.1600	160.0	6.25
2.5	2.83	43.84	0.0228	22810	0.1510	151.0	0.1345	134.5	7.43
3.0	4.00	62.00	0.0161	16129	0.1270	127.0	0.1131	113.1	8.84
3.5	5.66	87.68	0.0114	11405	0.1068	106.8	0.0951	95.1	10.51
4.0	8.00	124.00	0.00806	8065	0.0898	89.8	0.0800	80.0	12.50
4.5	11.31	175.36	0.00570	5703	0.0755	75.5	0.0673	67.3	14.87
5.0	16.00	248.00	0.00403	4032	0.0635	63.5	0.0566	56.6	17.68
5.5	22.63	350.73	0.00285	2851	0.0534	53.4	0.0476	47.6	21.02
6.0	32.00	496.00	0.00202	2016	0.0449	44.9	0.0400	40.0	25.00
6.5	45.25	701.45	0.00143	1426	0.0378	37.8	0.0336	33.6	29.73
7.0	64.00	992.00	0.00101	1008	0.0318	31.8	0.0283	28.3	35.36
7.5	90.51	1402.9	0.00071	713	0.0267	26.7	0.0238	23.8	42.04
8.0	128.00	1984.0	0.00050	504	0.0225	22.5	0.0200	20.0	50.00
8.5	181.02	2805.8	0.00036	356	0.0189	18.9	0.0168	16.8	59.46
9.0	256.00	3968.0	0.00025	252	0.0159	15.9	0.0141	14.1	70.71
9.5	362.04	5611.6	0.00018	178	0.0133	13.3	0.0119	11.9	84.09
10.0	512.00	7936.0	0.00013	126	0.0112	11.2	0.0100	10.0	100.0
10.5	724.08	11223.2	0.000089	89.1	0.0094	9.4	0.0084	8.4	118.9
11.0	1024.00	15872.0	0.000063	63.0	0.0079	7.9	0.0071	7.1	141.4
11.5	1448.15	22446.4	0.000045	44.6	0.0067	6.7	0.0060	5.9	168.2
12.0	2048.00	31744.1	0.000032	31.5	0.0056	5.6	0.0050	5.0	200.0
12.5	2896.31	44892.9	0.000022	22.3	0.0047	4.7	0.0042	4.2	237.8
13.0	4096.00	63488.1	0.000016	15.8	0.0040	4.0	0.0035	3.5	282.8
13.5	5792.62	89785.8	0.000011	11.1	0.0033	3.3	0.0030	3.0	336.4
14.0	8192.00	126976.3	0.000008	7.9	0.0028	2.8	0.0025	2.5	400.0



LAMPIRAN 3

HASIL PENGUJIAN KOMPOSISI *RECYCLING* 1

 **PT.H.P.METALS INDONESIA** **122804**

Method: AI-ADC-12 11/10/2015 10:45:10 AM

Comment: AI-Base ADC-12 Element Concentration

Sample No.: Sample ID:

1

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
1	0.469	0.369	0.0899	0.0534	9.77	0.0113	0.0687	0.0109
2	0.457	0.365	0.0875	0.0532	9.57	0.0112	0.0683	0.0120
3	0.424	0.361	0.0829	0.0531	9.30	0.0112	0.0596	0.0120

	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
1	< 0.00005	0.00087	0.0066	0.0088	< 0.00050	0.0035	< 0.00040	< 0.00010
2	< 0.00005	0.0013	0.0065	0.0082	< 0.00050	0.0032	< 0.00040	< 0.00010
3	< 0.00005	0.0010	0.0060	0.0073	< 0.00050	0.0026	< 0.00040	< 0.00010

	Be	Zr	Bi	Cd	Al			
	%	%	%	%	%			
1	0.00006	0.0012	0.00048	0.00067	89.1			
2	0.00006	0.0012	< 0.00030	0.00064	89.4			
3	0.00006	0.0011	0.00033	0.00066	89.7			

 **PT.H.P.METALS INDONESIA** **122804**

Method: AI-ADC-12 11/10/2015 10:45:10 AM

Comment: AI-Base ADC-12 Element Concentration

Sample No.: Sample ID:

1

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
Ø (3)	0.450	0.365	0.0868	0.0532	9.55	0.0112	0.0649	0.0116

	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
Ø (3)	< 0.00005	0.0011	0.0064	0.0081	< 0.00050	0.0031	< 0.00040	< 0.00010

	Be	Zr	Bi	Cd	Al			
	%	%	%	%	%			
Ø (3)	0.00006	0.0011	0.00037	0.00066	89.4			

LAMPIRAN 4

HASIL PENGUJIAN KOMPOSISI RECYCLING 2


 **122804**  
PT.H.P.METALS INDONESIA

Method: AI-ADC-12 11/10/2015 10:41:57 AM  
 Comment: AI-Base ADC-12 Element Concentration  
 Sample No.: Sample ID:  
**2**

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
1	0.529	0.411	0.119	0.0568	9.75	0.0118	0.0809	0.0125
2	0.538	0.391	0.108	0.0566	9.76	0.0117	0.0769	0.0123
3	0.550	0.418	0.117	0.0570	9.89	0.0119	0.0806	0.0124

	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
1	< 0.00005	0.0018	0.0075	0.0092	< 0.00050	0.0038	< 0.00040	< 0.00010
2	< 0.00005	0.0016	0.0062	0.0089	< 0.00050	0.0036	< 0.00040	< 0.00010
3	< 0.00005	0.0018	0.0073	0.0100	< 0.00050	0.0042	< 0.00040	< 0.00010

	Be	Zr	Bi	Cd	Al			
	%	%	%	%	%			
1	0.00006	0.0011	< 0.00030	0.00066	89.0			
2	0.00006	0.0012	0.00039	0.00070	89.0			
3	0.00006	0.0012	0.00032	0.00061	88.8			

 **122804**  
PT.H.P.METALS INDONESIA

Method: AI-ADC-12 11/10/2015 10:41:57 AM  
 Comment: AI-Base ADC-12 Element Concentration  
 Sample No.: Sample ID:  
**2**

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
Ø (3)	0.539	0.406	0.114	0.0568	9.80	0.0118	0.0795	0.0124


	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
Ø (3)	< 0.00005	0.0017	0.0070	0.0094	< 0.00050	0.0039	< 0.00040	< 0.00010

	Be	Zr	Bi	Cd	Al			
	%	%	%	%	%			
Ø (3)	0.00006	0.0012	0.00034	0.00066	89.0			

10/11/2015

LAMPIRAN 5

HASIL PENGUJIAN KOMPOSISI RECYCLING 3


 **PT.H.P.METALS INDONESIA** **122804**

Method: AI-ADC-12 11/10/2015 10:37:22 AM  
 Comment: AI-Base ADC-12 Element Concentration  
 Sample No.: **3** Sample ID:

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
1	0.564	0.435	0.107	0.0545	8.72	0.0121	0.0699	0.0128
2	0.567	0.436	0.105	0.0545	8.84	0.0122	0.0692	0.0130
3	0.544	0.419	0.106	0.0542	8.70	0.0119	0.0691	0.0127

	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
1	< 0.00005	0.0015	0.0082	0.0083	< 0.00050	0.0036	< 0.00040	< 0.00010
2	< 0.00005	0.0015	0.0081	0.0085	< 0.00050	0.0037	< 0.00040	< 0.00010
3	< 0.00005	0.0015	0.0080	0.0079	< 0.00050	0.0033	< 0.00040	< 0.00010

	Be	Zr	Bi	Cd	Al			
	%	%	%	%	%			
1	0.00006	0.0011	< 0.00030	0.00057	90.0			
2	0.00006	0.0012	< 0.00030	0.00060	89.9			
3	0.00006	0.00094	< 0.00030	0.00059	90.1			

 **PT.H.P.METALS INDONESIA** **122804**

Method: AI-ADC-12 11/10/2015 10:37:22 AM  
 Comment: AI-Base ADC-12 Element Concentration  
 Sample No.: **3** Sample ID:

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
Ø (3)	0.558	0.430	0.106	0.0544	8.75	0.0121	0.0694	0.0128


	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
Ø (3)	< 0.00005	0.0015	0.0081	0.0083	< 0.00050	0.0035	< 0.00040	< 0.00010

	Be	Zr	Bi	Cd	Al			
	%	%	%	%	%			
Ø (3)	0.00006	0.0011	< 0.00030	0.00059	90.0			

10/11/2015

LAMPIRAN 6

HASIL PENGUJIAN KOMPOSISI RECYCLING 4

 **122804**  
PT.H.P.METALS INDONESIA

Method: AI-ADC-12 11/10/2015 10:59:15 AM

Comment: AI-Base ADC-12 Element Concentration


Sample No.: Sample ID:

4

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
1	0.475	0.398	0.0903	0.0549	9.93	0.0109	0.0712	0.0100
2	0.480	0.391	0.0899	0.0548	10.05	0.0109	0.0701	0.0088
3	0.464	0.395	0.0878	0.0548	9.77	0.0111	0.0638	0.0102

	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
1	< 0.00005	0.00078	0.0069	0.0090	< 0.00050	0.0037	< 0.00040	< 0.00010
2	< 0.00005	0.00078	0.0067	0.0084	< 0.00050	0.0034	< 0.00040	< 0.00010
3	< 0.00005	0.00078	0.0068	0.0088	< 0.00050	0.0038	< 0.00040	< 0.00010

	Be	Zr	Bi	Cd	Al			
	%	%	%	%	%			
1	0.00006	0.0011	< 0.00030	0.00060	88.9			
2	0.00006	0.0010	0.00041	0.00068	88.8			
3	0.00006	0.0012	0.00059	0.00056	89.1			

 **122804**  
PT.H.P.METALS INDONESIA

Method: AI-ADC-12 11/10/2015 10:59:15 AM

Comment: AI-Base ADC-12 Element Concentration

Sample No.: Sample ID:

4

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
Ø (3)	0.473	0.395	0.0893	0.0548	9.91	0.0110	0.0684	0.0097

	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
Ø (3)	< 0.00005	0.00078	0.0068	0.0087	< 0.00050	0.0036	< 0.00040	< 0.00010

	Be	Zr	Bi	Cd	Al			
	%	%	%	%	%			
Ø (3)	0.00006	0.0011	0.00044	0.00061	89.0			

10/11/2015