

## **Annex**

**Figure 1** Briquetting press Brikstar 30-12 scheme

**Table 1** Hammer mill throughput of different biomass materials and different fractions

**Table 2** Hammer mill energy consumption of different biomass materials and different fractions

**Table 3** Biomass material moisture content of different biomass materials and different fractions

**Table 4** Briquetting press throughput of different biomass materials and different fractions

**Table 5** Mechanical durability of different biomass materials and different fractions

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**Table 7** Grinding and briquetting throughput

**Table 8** Grinding and briquetting energy consumption

**Table 1** Hammer mill throughput of different biomass materials and different fractions

<b>Material</b>	<b>Fraction (mm)</b>	<b>Throughput (kg.h<sup>-1</sup>)</b>
Hemp	4	80.40
Hemp	8	41.50
Hemp	12	51.71
<i>Mis. sinensis</i>	4	129.48
<i>Mis. sinensis</i>	8	136.80
<i>Mis. sinensis</i>	12	138.00
<i>Mis. x giganteus</i>	4	149.65
<i>Mis. x giganteus</i>	8	140.29
<i>Mis. x giganteus</i>	12	148.64
Apple wood	4	231.50
Apple wood	8	294.67
Apple wood	12	420.00

Source: Author (2017)

**Table 2** Hammer mill energy consumption of different biomass materials and different fractions

<b>Material</b>	<b>Fraction (mm)</b>	<b>Time (min)</b>	<b>Energy consumption (kWh)</b>	<b>Energy consumption (kWh.t<sup>-1</sup>)</b>
Hemp	4	60	5.30	65.97
Hemp	8	60	4.88	117.47
Hemp	12	60	3.46	66.85
<i>Mis. sinensis</i>	4	60	5.19	40.08
<i>Mis. sinensis</i>	8	60	5.07	37.06
<i>Mis. sinensis</i>	12	60	3.96	28.70
<i>Mis. x giganteus</i>	4	60	6.49	43.40
<i>Mis. x giganteus</i>	8	60	4.49	31.98
<i>Mis. x giganteus</i>	12	60	2.84	19.08
Apple wood	4	60	13.62	141.25
Apple wood	8	60	12.84	135.29
Apple wood	12	60	11.47	129.52

Source: Author (2017)

**Table 3** Biomass material moisture content of different biomass materials and different fractions

<b>Material</b>	<b>12 mm</b>	<b>8 mm</b>	<b>4 mm</b>
Hemp	9.97%	7.60%	8.08%
<i>Mis. x giganteus</i>	7.37%	9.31%	7.65%
<i>Mis. sinensis</i>	8.63%	7.29%	9.49%
Apple Wood	9.24%	8.29%	7.69%

Source: Author (2017)

**Table 4** Briquetting press throughput of different biomass materials and different fractions

<b>Material</b>	<b>Fraction (mm)</b>	<b>Moisture Content (%)</b>	<b>Throughput (kg.h<sup>-1</sup>)</b>
Hemp	4	8.08	28.71
Hemp	8	7.60	24.90
Hemp	12	9.97	25.86
<i>Mis. sinensis</i>	4	9.49	43.16
<i>Mis. sinensis</i>	8	7.29	34.20
<i>Mis. sinensis</i>	12	8.63	37.30
<i>Mis. x giganteus</i>	4	7.65	42.40
<i>Mis. x giganteus</i>	8	9.31	36.83
<i>Mis. x giganteus</i>	12	7.37	35.54
Apple wood	4	7.69	46.30
Apple wood	8	8.29	44.20
Apple wood	12	9.24	42.00

Source: Author (2017)

**Table 5** Mechanical durability of different biomass materials and different fractions

	12 mm	8 mm	4 mm
Hemp	96.36	98.29	98.34
<i>Mis.xgiganteus</i>	95.11	97.26	92.72
<i>Mis.Sinensis</i>	97.35	95.96	95.8
Apple Wood	95.39	95.13	92.36

Source: Author (2017)

**Table 6** Energy consumption of different biomass materials and different fractions

<b>Material</b>	<b>Fraction (mm)</b>	<b>Moisture Content (%)</b>	<b>Energy consumption (kWh)</b>	<b>Energy consumption (kWh.t<sup>-1</sup>)</b>
Hemp	4	8.08	2.01	115.24
Hemp	8	7.60	2.16	107.00
Hemp	12	9.97	2.31	55.43
<i>Mis. sinensis</i>	4	9.49	2.12	63.24
<i>Mis. sinensis</i>	8	7.29	2.07	50.95
<i>Mis. sinensis</i>	12	8.63	2.19	64.67
<i>Mis. x giganteus</i>	4	7.65	2.04	43.91
<i>Mis.x giganteus</i>	8	9.31	2.09	53.50
<i>Mis.x giganteus</i>	12	7.37	1.93	63.87
Apple wood	4	7.69	2.34	80.65
Apple wood	8	8.29	1.44	78.00
Apple wood	12	9.24	1.62	80.67

Source: Author (2017)

**Table 7** Grinding and briquetting throughput

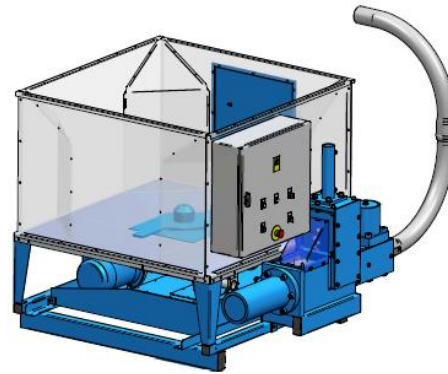
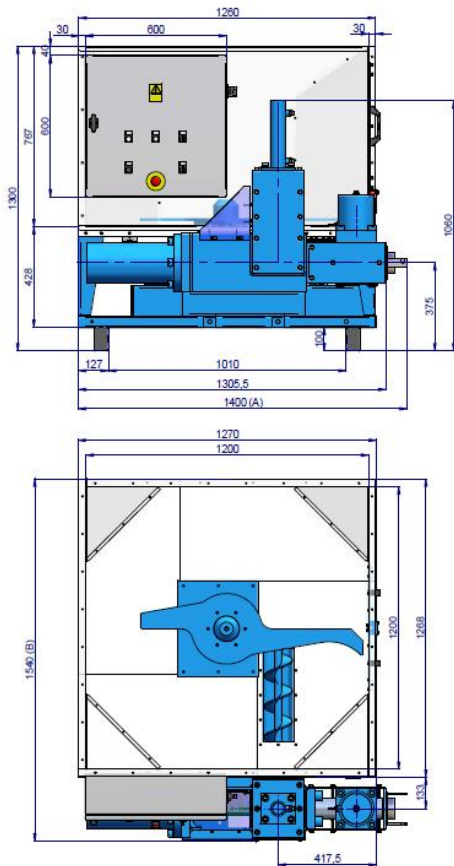
<b>Material</b>	<b>Fraction (mm)</b>	<b>Energy consumption (kWh)</b>	<b>Energy consumption (kWh.t<sup>-1</sup>)</b>
Hemp	4	7.31	181.21
Hemp	8	7.04	224.47
Hemp	12	5.77	122.28
<i>Mis. sinensis</i>	4	7.31	103.32
<i>Mis. sinensis</i>	8	7.14	88.01
<i>Mis. sinensis</i>	12	6.15	93.37
<i>Mis. x giganteus</i>	4	8.53	87.31
<i>Mis. x giganteus</i>	8	6.58	85.48
<i>Mis. x giganteus</i>	12	4.77	82.95
Apple wood	4	15.96	221.90
Apple wood	8	14.28	213.29
Apple wood	12	13.09	210.19

Source: Author (2017)

**Table 8** Grinding and briquetting energy consumption

<b>Material</b>	<b>Fraction (mm)</b>	<b>Throughput (kg.t<sup>-1</sup>)</b>
Hemp	4	109.11
Hemp	8	66.40
Hemp	12	77.57
<i>Mis. sinensis</i>	4	172.64
<i>Mis. sinensis</i>	8	171.00
<i>Mis. sinensis</i>	12	175.30
<i>Mis. x giganteus</i>	4	192.05
<i>Mis. x giganteus</i>	8	177.12
<i>Mis. x giganteus</i>	12	184.18
Apple wood	4	277.80
Apple wood	8	338.87
Apple wood	12	462.00

Source: Author (2017)



BrikStar 30, 50, 70 - 12

**Figure 1** Briquetting press Brikstar 30-12 scheme

Source: Briklis, (2011)