LAMPIRAN 1

LAMPIRAN 1

Perhitungan Fraksi Volume Komposit

Sebelum melakukan proses fabrikasi spesimen komposit hibrida serat kenaf bermatriks PP/PE, maka perlu dilakukan perhitungan massa serat dan matriks terlebih dahulu. Perbandingan fraksi volume serat dan matriks adalah 30% : 70% dengan variasi perbandingan matriks PP : LDPE masing-masing 1 : 1, 2 : 1, dan 1 : 2.

Berikut ini adalah perhitungan yang digunakan untuk menentukan fraksi volume serat kenaf dan PP/PE komposit hibrid:

Diketahui :

Massa jenis serat kenaf = 1,45 gr/cm^3

Massa jenis *polypropilene* = 0,92 gr/cm^3

Massa jenis LDPE = 0,94 gr/cm^3

Dimensi cetakan : Panjang (p) = 17 cm

Lebar (l) = 2 cm

Tebal (t) = 0,4 cm

Perbandingan frksi volume serat dan matriks 30% : 70%

Fraksi perbandingan volume PP : LDPE masing-masing 1:1, 2:1, dan 1:2

a. Fraksi Volume PP : LDPE (1 : 1)

Volume cetakan, V_e = p x l x t

= 17 cm x 2 cm x 0,4

= 13,6 cm^3

Volume matriks, V_m = $\frac{70\ \%}{100}$ x 13,6 cm^3

= 9,52 cm^3

Volume serat kenaf, V_s = $\frac{30\ \%}{100}$ x 13,6 cm^3

= 4,08 cm^3

Volume matriks PP, V_{PP} = $\frac{1}{2}$ x 9,52 cm^3

= 4,76 cm^3

Volume matriks PE, V_{PE} = $\frac{1}{2}$ x 9,52 cm^3

= 4,76 cm^3

Massa serat kenaf, m_{kenaf} = V_{kenaf} x ρ_{kenaf}

= 4,08 cm^3 x 1,45 gr/cm^3

= 5.9 gr

Masaa PP, m_{PP} = V_{PP} x ρ_{PP}

= 4,76 cm^3 x 0,92 gr/cm^3

= 4,37 gr

Masaa LDPE, m_{LDPE} = V_{PE} x ρ_{PE}

= 4,76 cm^3 x 0,94 gr/cm^3

= 4,47 gr

b. Fraksi Volume PP : LDPE (2 : 1)

Volume cetakan, V_e = p x l x t

= 17 cm x 2 cm x 0,4

= 13,6 cm^3

Volume matriks, V_m = $\frac{70\ \%}{100}$ x 13,6 cm^3

= 9,52 cm^3

Volume serat kenaf, V_s = $\frac{30\ \%}{100}$ x 13,6 cm^3

= 4,08 cm^3

Volume matriks PP, V_{PP} = $\frac{2}{3}$ x 9,52 cm^3

= 6,34 cm^3

Volume matriks PE, V_{PE} = $\frac{1}{3}$ x 9,52 cm^3

= 3,17 cm^3

Massa serat kenaf, m_{kenaf} = V_{kenaf} x ρ_{kenaf}

= 4,08 cm^3 x 1,45 gr/cm^3

= 5.9 gr

Masaa PP, m_{PP} = V_{PP} x ρ_{PP}

= 6,34 cm^3 x 0,92 gr/cm^3

= 5,83 gr

Masaa LDPE, m_{LDPE} = V_{PE} x ρ_{PE}

= 3,17 cm^3 x 0,94 gr/cm^3

= 2,97 gr

c. Fraksi Volume PP : LDPE (1 : 2)

Volume cetakan, V_e = p x l x t

= 17 cm x 2 cm x 0,4

= 13,6 cm^3

Volume matriks, V_m = $\frac{70\ \%}{100}$ x 13,6 cm^3

= 9,52 cm^3

Volume serat kenaf, V_s = $\frac{30\ \%}{100}$ x 13,6 cm^3

= 4,08 cm^3

Volume matriks PP, V_{PP} = $\frac{1}{3}$ x 9,52 cm^3

= 3,17 cm^3

Volume matriks PE, V_{PE} = $\frac{2}{3}$ x 9,52 cm^3

= 6,34 cm^3

Massa serat kenaf, m_{kenaf} = V_{kenaf} x ρ_{kenaf}

= 4,08 cm^3 x 1,45 gr/cm^3

= 5.9 gr

Masaa PP, m_{PP} = V_{PP} x ρ_{PP}

= 3,17 cm^3 x 0,92 gr/cm^3

= 2,91 gr

Masaa LDPE, m_{LDPE} = V_{PE} x ρ_{PE}

= 6,34 cm^3 x 0,94 gr/cm^3

= 5,95 gr

LAMPIRAN 2

LAMPIRAN 2

GRAFIK PENGUJIAN TARIK KOMPOSIT HIBRIDA

SERAT KENAF/(PP : LDPE)

1. PP : LDPE (1 : 1)

KUAT TARIK KOMPOSIT SERAT ALAM PP : PE

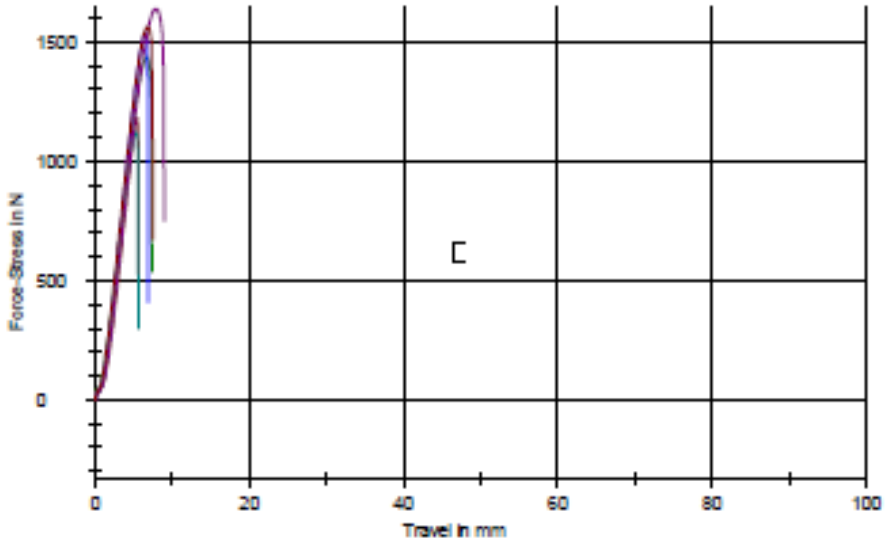
Parameter table:

Headline	: KUAT TARIK KOMPOSIT SERAT ALAM PP : PE
Customer	: 1633/VII/17
Tester	: APRIAL
Material	: SERAT ALAM PP : PE (1:1)
Test standard	: ASTM D 638
Evaluat. method	: M (Automatic A, B or C)
Specimen holders:	
Extensometer	:
Load cell	:

Results:

Legends	Nr	Fmax Lm kgf	Measurement travel end mm
	1	120,443	5,67
	2	146,256	7,42
	3	156,119	6,95
	4	114,314	5,62
	5	166,954	9,05
	6	159,232	7,55

Series graph:



2. PP : LDPE (1 : 2)

KUAT TARIK KOMPOSIT SERAT ALAM PP : PE

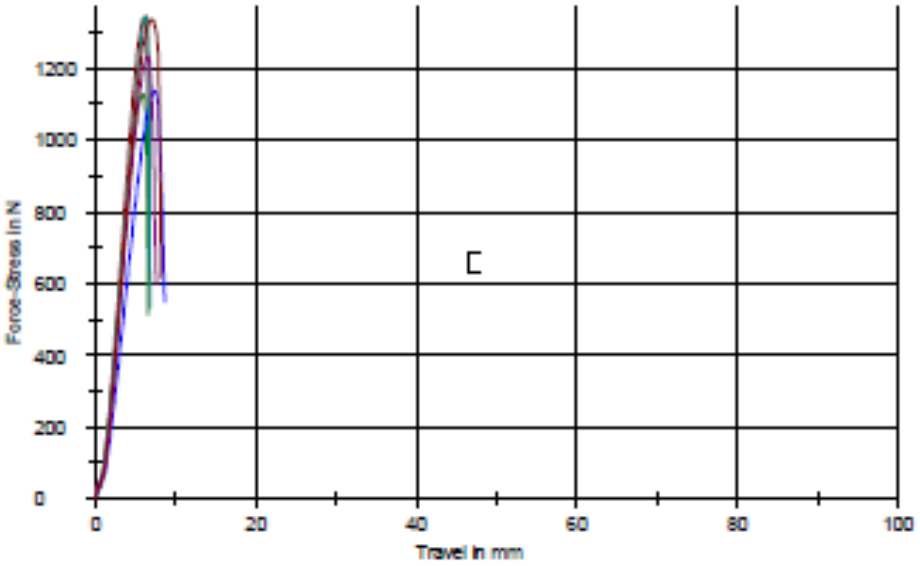
Parameter table:

Headline	: KUAT TARIK KOMPOSIT SERAT ALAM PP : PE
Customer	: 1634/VII/17
Tester	: APRIAL
Material	: SERAT KENAF PP : PE (1:2)
Test standard	: ASTM D 638
Evaluat. method	: M (Automatic A, B or C)
Specimen holders:	
Extensometer	:
Load cell	:

Results:

Legends	Nr	Fmax Lm kgf	Measurement travel end mm
	1	136,472	6,73
	2	114,855	6,57
	3	116,021	8,65
	4	137,348	6,76
	5	125,670	7,59
	6	136,220	8,23

Series graph:



3. PP : LDPE (2 : 1)

KUAT TARIK KOMPOSIT SERAT ALAM PP : PE

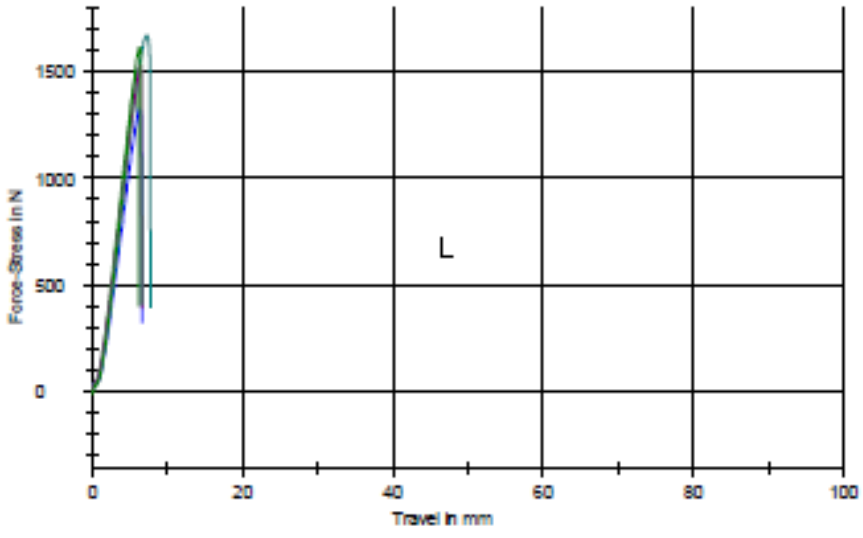
Parameter table:

Headline	: KUAT TARIK KOMPOSIT SERAT ALAM PP : PE
Customer	: 1635/VII/17
Tester	: APRIAL
Material	: SERAT KENAF PP : PE (2:1)
Test standard	: ASTM D 638
Evaluat. method	: M (Automatic A, B or C)
Specimen holders:	
Extensometer	:
Load cell	:

Results:

Legends	Nr	Fmax Lm kgf	Measurement travel end mm
	✝7	166,476	6,55
	10	154,148	6,19
	11	134,935	6,64
	12	170,505	7,75
	13	155,715	6,61
	✝14	158,761	8,85
	15	164,785	6,55

Series graph:



PENGUJIAN TARIK SERAT TUNGGAL

Serat Tunggal (serat kenaf)

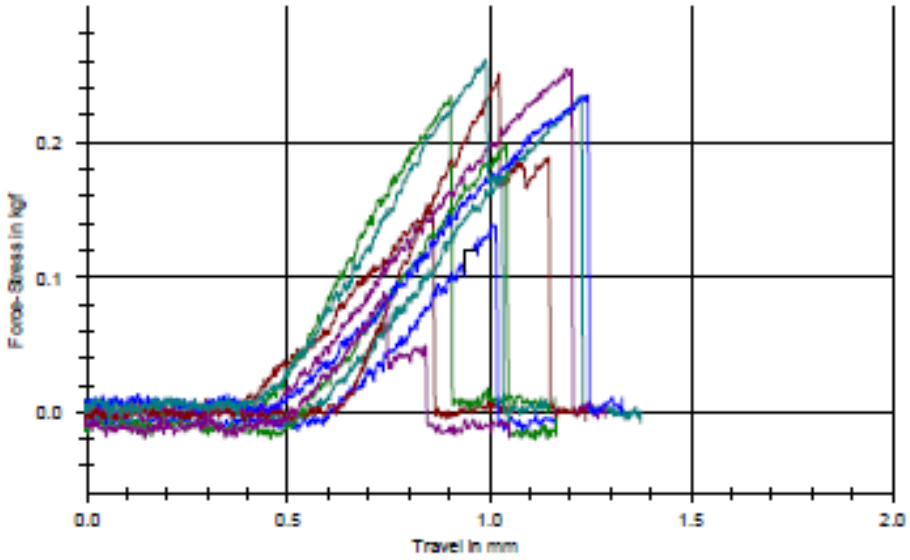
Parameter table:

Headline	: Serat Tunggal (serat kenaf)	Evaluat. method	: M (Automatic A, B or C)
Customer	: 923/LUPKKP-SERAT/IV/17	Specimen ID	: A1-A10
Tester	: Aprial	Specimen holders	:
Material	: Serat Tunggal	Extensometer	:
Test standard	: ASTM D 3379	Load cell	:

Results:

Legends	Nr	Fmax Lm kgf	Measurement travel end mm
	1	0.155	1.06
	2	0.234	1.16
	3	0.139	1.17
	4	0.235	1.37
	5	0.254	1.29
	6	0.251	1.24
	7	0.198	1.17
	8	0.235	1.33
	9	0.262	1.14
	10	0.089	1.05

Series graph:



LAMPIRAN 3

LAMPIRAN 3

HASIL PERHITUMGAN PENGUJIAN KOMPOSIT HIBRIDA SERAT KENAF/(PP : LDPE)

1. PP : LDPE (1 : 1)

Perhitungan Sifat Tarik komposit Serat Kenaf/PP : LDPE (1 : 1)

Spesimen	Tebal	Lebar	Luas Area	F (kgf)	G	F(N)	σ (Mpa)	L0	ΔL	ε	E (MPa)
1	3,5	13,25	46,375	146,256	9,81	1434,771	30,93846598	57	7,42	0,1301754	977,3709318
2	3,51	13,24	46,4724	156,119	9,81	1531,527	32,95563367	57	6,95	0,1219298	816,0169935
3	3,68	13,11	48,2448	166,954	9,81	1637,819	33,9480885	57	9,05	0,1587719	1092,009619
4	3,65	12,19	44,4935	159,232	9,81	1562,066	35,10773304	57	7,55	0,1324561	1089,352631
Rata-Rata							33,2374803			0,135833	993,6875438
Standar Deviasi							1,767079858			0,015947	112,5301022
Coefficient of Variation (%)							5,316527734			11,74	11,3244956

2. PP : LDPE (2 : 1)

Perhitungan Sifat Tarik komposit Serat Kenaf/PP : LDPE (2 : 1)

Spesimen	Tebal	Lebar	Luas Area	F (kgf)	G	F(N)	σ (Mpa)	L0	ΔL	ε	E (MPa)
1	3,51	13,29	46,6479	166,476	9,81	1633,13	35,00971233	57	6,55	0,1149123	1023,360822
2	3,45	13,29	45,8505	154,148	9,81	1512,192	32,98092453	57	6,19	0,1085965	1044,395943
3	3,4	13,18	44,812	170,505	9,81	1672,654	37,32602986	57	7,75	0,1359649	1012,65288
4	3,64	13,17	47,9388	164,785	9,81	1616,541	33,72092856	57	6,55	0,1149123	985,688681
Rata-Rata							35,10555557			0,119825	1026,803215
Standar Deviasi							1,905399611			0,011956	24,42259765
Coefficient of Variation (%)							5,427629845			9,977584	2,3785081

3. PP : LDPE (1 : 2)

Perhitungan Sifat Tarik komposit Serat Kenaf/PP : LDPE (1 : 2)

Spesimen	Tebal	Lebar	Luas Area	F (kgf)	G	F(N)	σ (Mpa)	L0	ΔL	ε	E (MPa)
1	3,45	13,57	46,8165	136,472	9,81	1338,79	28,59654865	57	6,73	0,1180702	986,6847901
2	3,55	13,17	46,7535	137,348	9,81	1347,384	28,818888	57	6,76	0,1185965	894,7040391
3	3,61	13,57	48,9877	125,67	9,81	1232,823	25,16596411	57	7,59	0,1331579	713,6616688
4	3,5	13,44	47,04	136,22	9,81	1336,318	28,408125	57	8,23	0,144386	844,6860329
Rata-Rata							28,7077183			0,118333	940,6944146
Standar Deviasi							1,729114296			0,012661	113,8753907
Coefficient of Variation (%)							6,02316867			10,69951	12,10546049

PROPERTIS *POLYPROPYLENE* (Callister, 2007)

	Modulus of Elasticity	
Material	***GPa***	***10^6psi***
Polyethylene		
• Low density (LDPE)	0.172–0.282	0.025–0.041
• High density (HDPE)	1.08	0.157
• Ultrahigh molecular weight (UHMWPE)	0.69	0.100
Poly(ethylene terephthalate) (PET)	2.76–4.14	0.40–0.60
Poly(methyl methacrylate) (PMMA)	2.24–3.24	0.325–0.470
Polypropylene (PP)	1.14–1.55	0.165–0.225
Polystyrene (PS)	2.28–3.28	0.330–0.475
Poly(tetrafluoroethylene) (PTFE)	0.40–0.55	0.058–0.080
Poly(vinyl chloride) (PVC)	2.41–4.14	0.35–0.60