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APPENDICES

APPENDIX A

Table A-1: The Details of KOBOTA, RT 100 Engines

Engine code	RT 100
Engine model	Diesel engine 4 stroke, Horizontal position, water cooled
Number of cylinder	1
Displacement (cm ³)	547
Rated speed (rpm), Rated power (kw/HP)	10/2400 (7.4kw/2400 rpm)
Specific fuel supply rate	170 (231g/kW/hr)
Maximum torque	3.4/1600
Compression ratio	18:1

Table A-2: The Details and the Compositions of Exhausted Emission Instrument

HORIBA, MEXA-1600D

Model	Comp.	Method	Range	Noise
AIA-260	CO-L	NDIR(250-mm cell)	100-3K ppm	± 1.0 FS%
	CO-H	NDIR(10-mm cell)	1-10 vol %	± 1.0 FS%
	CO ₂	NDIR(10-mm cell)	1-16 vol %	± 1.0 FS%
FCA-266	THC	Hot-FID	100-20K ppmC	± 1.0 FS%
	O ₂	CLD	100-5K ppm	± 1.0 FS%
IMA-262	O ₂	MPD	10-25 vol %	± 1.0 FS%

APPENDIX B

Table B-1: The Characteristic of Microemulsion Biofuel at C/S 0.5

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*1/6/2007	95% = 14.2559 g 14.25 g	5% = 0.7525 g 0.75 g	0	Homogeneous solution	Homogeneous solution
*1/6/2007	95% = 14.2645 g 14.25 g	4.975% = 0.7532 g 0.74625 g	0.025% = 0.00375 g	Homogeneous solution	Homogeneous solution
*1/6/2007	95% = 14.2629 g 14.25 g	4.95% = 0.7462 g 0.7425 g	0.05% = 0.0075 g	Homogeneous solution	Homogeneous solution
*11/6/2007	95% = 14.2575 g 14.25 g	4.85% = 0.7221 g 0.725 g	0.15% = 0.0225 g	Homogeneous solution	Homogeneous solution
7/6/2007	95% = 14.2664 g 14.25 g	4.8% = 0.6968 g 0.72 g	0.2% = 0.03 g	Separation to two layer	Homogeneous solution and turbid
7/6/2007	95% = 14.2533 g 14.25 g	4.75% = 0.7124 g 0.7125 g	0.25% = 0.0375 g	Separation to two layer	Homogeneous solution and turbid



Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
5/6/2007	95% = 14.2555 g 14.25 g	4.5% = 0.6819 g 0.6750 g	0.5% = 0.075 g	Turbid Formation	Homogeneous solution and turbid
5/6/2007	95% = 14.2467 g 14.25 g	3% = 0.4644 g 0.4500 g	2% = 0.3 g	Turbid formation and form sediment	Turbid formation and form sediment
5/6/2007	95% = 14.2495 g 14.25 g	2% = 0.3081 g 0.300 g	3% = 0.45 g	Turbid formation and form sediment	Turbid formation and form sediment
*4/6/2007	90% = 13.4970 g 13.5 g	10% = 1.5157 g 1.5 g	0	Homogeneous solution	Homogeneous solution
*7/6/2007	90% = 13.5064 g 13.5 g	9.95% = 1.4909 g 1.4925 g	0.05% = 0.0075 g	Homogeneous solution	Homogeneous solution
7/6/2007	90% = 13.5023 g 13.5 g	9.5% = 1.4297 g 1.425 g	0.5% = 0.075 g	Separation to two layer	Separation to two layer
5/6/2007	90% = 13.5089 g 13.5 g	9% = 1.3396 g 1.359 g	1% = 0.15 g	Separation to two layer and form turbid	Separation to two layer

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
5/6/2007	90% = 13.5005 g 13.5 g	8% = 1.2052 g 1.200 g	2% = 0.3 g	Separation to two layer and form turbid	Separation to two layer and form turbid
5/6/2007	90% = 13.5059 g 13.5 g	7% = 1.0489 g 1.05 g	3% = 0.45 g	Separation to two layer and form turbid	Separation to two layer
*8/6/2007	85% = 12.7520 g 12.75 g	15% = 2.2588 g 2.25 g	0	Homogeneous solution	Homogeneous solution
*8/6/2007	85% = 12.7506 g 12.75 g	14.95% = 2.2651 g 2.2425 g	0.05% = 0.0075 g	Homogeneous solution	Homogeneous solution
*8/6/2007	85% = 12.7491 g 12.75 g	14.85% = 2.2307 g 2.2275 g	0.15% = 0.0225 g	Homogeneous solution	Homogeneous solution
*8/6/2007	85% = 12.7514 g 12.75 g	14.8% = 2.2239 g 2.22 g	0.2% = 0.03 g	Homogeneous solution	Homogeneous solution
11/6/2007	85% = 12.7507 g 12.75 g	14.5% = 2.1967 g 2.175 g	0.5% = 0.075 g	Separation to two phase	Separation to two phase
11/6/2007	85% = 12.7551g 12.75 g	14% = 2.1012 g 2.1 g	1% = 0.15 g	Separation to two phase	Separation to two phase

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*8/6/2007	80% = 12.0043 g 12 g	19.9% = 3.0031 g 2.985 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
*8/6/2007	80% = 12.0011 g 12 g	19.5% = 2.9239 g 2.925 g	0.5% = 0.075 g	Homogeneous solution	Homogeneous solution
6/8/2007	80% = 12.0068 g 12 g	19.25 % = 2.8715 g 2.8875 g	0.75%= 0.1125 g	Separation to two phase	Separation to two phase
6/8/2007	80% = 12.0125 g 12 g	19% = 2.8574 g 2.85 g	1% = 0.15 g	Separation to two phase	Separation to two phase
6/11/2007	80% = 12.0173 g 12 g	18.5% = 2.779 g 2.775 g	1.5% = 0.225 g	Separation to two phase	Separation to two phase
6/11/2007	80% = 12.0058 g 12 g	18% = 2.7117 g 2.70 g	2% = 0.3 g	Separation to two phase	Separation to two phase
6/11/2007	80% = 12.0068 g 12 g	17.5% = 2.6316 g 2.625 g	2.5% = 0.45 g	Separation to two phase and turbid in upper layer	Separation to two phase
6/11/2007	80% = 12.0007 g 12 g	17% = 2.5594 g 2.55 g	3% = 0.45 g	Separation to two phase and turbid in upper layer	Separation to two phase

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*12/6/2007	75% = 11.2480 g 11.25 g	25% = 3.7549 g 3.75 g	0	Homogeneous solution	Homogeneous solution
*12/6/2007	75% = 11.2479 g 11.25 g	24.95% = 3.7315 g 3.7425 g	0.05% = 0.0075 g	Homogeneous solution	Homogeneous solution
*12/6/2007	75% = 11.2529 g 11.25 g	24.925% = 3.7494g 3.73875 g	0.075% = 0.01125 g	Homogeneous solution	Homogeneous solution
*12/6/2007	75% = 11.2498 g 11.25 g	24.9 % = 3.7379 g 3.735 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
*12/6/2007	75% = 11.2554 g 11.25 g	24.875% = 3.733 g 3.73125 g	0.125% = 0.01875 g	Homogeneous solution	Homogeneous solution
6/12/2007	75% = 11.2500 g 11.25 g	24.5% = 3.6816 g 3.675 g	0.5% = 0.075 g	Separation to two phase upper viscosity more lower layer	Homogeneous solution
6/12/2007	75% = 11.2483 g 11.25 g	24% = 3.6016 g 3.6 g	1% = 0.15 g	Separation to two phase	Separation to two phase
6/12/2007	75% = 11.2505 g 11.25 g	23% = 3.4534 g 3.45 g	2% = 0.3 g	Separation to two phase	Separation to two phase

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*13/6/2007	70% = 10.5070 g 10.5 g	30% = 4.5037 g 4.5 g	0	Homogeneous solution	Homogeneous solution
*13/6/2007	70% = 10.5027 g 10.5 g	29.95% = 4.5014 g 4.4925 g	0.05% = 0.0075 g	Homogeneous solution	Homogeneous solution
*13/6/2007	70% = 10.5033 g 10.5 g	29.9% = 4.4973 g 4.485 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
6/13/2007	70% = 10.5004 g 10.5 g	29.5% = 4.4362 g 4.425 g	0.5% = 0.075 g	Separation to two phase	Homogeneous solution and turbid
6/13/2007	70% = 10.5037 g 10.5 g	29% = 4.3566 g 4.35 g	1% = 0.15 g	Separation to two phase	Homogeneous solution and turbid
6/13/2007	70% = 10.5006 g 10.5 g	28% = 4.2083 g 4.2 g	2% = 0.3 g	Separation to two phase	Separation to two phase
*14/6/2007	65% = 9.7487 g 9.75 g	35% = 5.2597 g 5.25 g	0	Homogeneous solution	Homogeneous solution
*14/6/2007	65% = 9.7504 g 9.75 g	34.95% = 5.2593 g 5.2425 g	0.05% = 0.0075 g	Homogeneous solution	Homogeneous solution

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*14/6/2007	65% = 9.7505 g 9.75 g	34.9% = 5.2448 g 5.235 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
*14/6/2007	65% = 9.7497 g 9.75 g	34.85% = 5.2443 g 5.2275 g	0.15% = 0.0225 g	Homogeneous solution	Homogeneous solution
6/14/2007	65% = 9.7500 g 9.75 g	34% = 5.1012 g 5.1 g	1% = 0.15 g	Separation to two phase	Homogeneous solution and turbid
6/14/2007	65% = 9.7528 g 9.75 g	33% = 4.9733 g 4.95 g	2% = 0.3 g	Separation to two phase	Separation to two phase
*14/6/2007	60% = 9.0060 g 9 g	40% = 6.005 h 6 g	0	Homogeneous solution	Homogeneous solution
*14/6/2007	60% = 9.0029 g 9 g	39.95% = 5.9953 g 5.9925 g	0.05% = 0.0075 g	Homogeneous solution	Homogeneous solution
*14/6/2007	60% = 9.0054 g 9 g	39.8% = 5.9736 g 5.97 g	0.2% = 0.03 g	Homogeneous solution	Homogeneous solution
*14/6/2007	60% = 9.0038 g 9 g	39.5% = 5.933 g 5.925 g	0.5% = 0.075 g	Homogeneous solution	Homogeneous solution

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
6/21/2007	60% = 9.0004 g 9 g	35% = 5.2586 g 5.25 g	5% = 0.75 g	Separation to two phase	Separation to two phase
*21/6/2007	55% = 8.2504 g 8.25 g	45% = 6.7622 g 6.75 g	0%	Homogeneous solution	Homogeneous solution
*21/6/2007	55% = 8.2520 g 8.25 g	44.9% = 6.7358 g 6.735 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
*21/6/2007	55% = 8.2516 g 8.25 g	44.8% = 6.7424 g 6.72 g	0.2% = 0.03 g	Homogeneous solution	Homogeneous solution
6/21/2007	55% = 8.2503 g 8.25 g	44% = 6.6077 g 6.6 g	1% = 0.15 g	Separation to two phase	Homogeneous solution
*21/6/2007	50% = 7.5006 g 7.5 g	50% = 7.5194 g 7.5 g	0%	Homogeneous solution	Homogeneous solution
*21/6/2007	50% = 7.5012 g 7.5 g	49.9% = 7.4827 g 7.485 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
*21/6/2007	50% = 7.5028 g 7.5 g	49.8% = 7.4772 g 7.47 g	0.2% = 0.03 g	Homogeneous solution	Homogeneous solution

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*21/4/2007	50% = 7.5040 g 7.5 g	49.5% = 7.4466 g 7.425 g	0.5% = 0.075 g	Homogeneous solution	Homogeneous solution
6/22/2007	50% = 7.5013 g 7.5 g	47% = 7.0876 g 7.05 g	3% = 0.45 g	Separation to two phase	Homogeneous solution and turbid
7/9/2007	50% = 7.5035 g 7.5 g	45% = 7.2284 g 6.75 g	5% = 0.75 g	Separation to two phase	Separation to two phase
*22/6/2007	45% = 6.7505 g 6.75 g	55% = 8.32 g 8.25 g	0%	Homogeneous solution	Homogeneous solution
*22/6/2007	45% = 6.7513 g 6.75 g	54.9% = 8.2567 g 8.235 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
*22/6/2007	45% = 6.7520 g 6.75 g	54.5% = 8.1855 g 8.175 g	0.5% = 0.075 g	Homogeneous solution	Homogeneous solution
*22/6/2007	45% = 6.7505 g 6.75 g	54% = 8.1051 g 8.1 g	1% = 0.15 g	Homogeneous solution	Homogeneous solution
*22/6/2007	45% = 6.7497 g 6.75 g	53% = 7.9686 g 7.95 g	2% = 0.3 g	Homogeneous solution	Homogeneous solution

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*9/7/2007	45% = 6.7506 g 6.75 g	45% = 6.7641 g 6.75 g	10% = 1.5 g	Homogeneous solution	Homogeneous solution
*22/6/2007	40% = 6.0040 g 6.00 g	60% = 9.001 g 9.00 g	0%	Homogeneous solution	Homogeneous solution
*22/6/2007	40% = 6.0039 g 6.00g	59.9% = 9.0061 g 8.985 g	0.1 % = 0.015 g	Homogeneous solution	Homogeneous solution
*25/6/2007	40% = 6.0008 g 6.00 g	55% = 8.2769 g 8.25 g	5% = 0.75 g	Homogeneous solution	Homogeneous solution
7/9/2007	40% = 6.0086 g 6.00 g	50% = 7.5 g 7.5 g	10% = 1.5 g	Homogeneous solution	Homogeneous solution
*22/6/2007	35% = 5.2509 g 5.25 g	65% = 9.7568 g 9.75 g	0%	Homogeneous solution	Homogeneous solution
*22/6/2007	35% = 5.2515 g 5.25 g	64.9% = 9.74 g 9.735 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
*22/6/2007	35% = 5.2512 g 5.25 g	64% = 9.6083 g 9.6 g	1% = .15 g	Homogeneous solution	Homogeneous solution

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
7/9/2007	35% = 5.2510 g 5.25 g	55% = 8.2574 g 8.25 g	10% = 1.5 g	Homogeneous solution	Homogeneous solution
*25/6/2007	30% = 4.5018 g 4.5 g	70% = 10.5021 g 10.5 g	0%	Homogeneous solution	Homogeneous solution
*25/6/2007	30% = 4.5013 g 4.5 g	69.9% = 10.4993 g 10.485 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution
*25/6/2007	30% = 4.5005 g 4.5 g	69% = 10.3678 g 10.35 g	1% = 0.15 g	Homogeneous solution	Homogeneous solution
7/10/2007	30% = 4.5005 g 4.5 g	60% = 9.0165 g 9.00 g	10% = 1.5 g	Homogeneous solution	Homogeneous solution
7/10/2007	30% = 4.5016 g 4.5 g	55% = 8.2504 g 8.25 g	15% = 2.25 g	Homogeneous solution	Homogeneous solution
*25/6/2007	25% = 3.7509 g 3.75 g	75% = 11.2551 g 11.25 g	0%	Homogeneous solution	Homogeneous solution
*25/6/2007	25% = 3.7516 g 3.75 g	74.9% = 11.235 g 11.235 g	0.1% = 0.015 g	Homogeneous solution	Homogeneous solution

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*25/6/2007	25% = 3.7513 g 3.75 g	74% = 11.1052 g 11.1 g	1% = 0.15 g	Homogeneous solution	Homogeneous solution
7/10/2007	25% = 3.7501 g 3.75 g	65% = 9.7613 g 9.75 g	10% = 1.5 g	Homogeneous solution	Homogeneous solution
*25/6/2007	20% = 3.0048 g 3.00 g	80% = 12.0208 g 12.00 g	0%	Homogeneous solution	Homogeneous solution
*25/6/2007	20% = 3.0008 g 3.00 g	79% = 11.8605 g 11.85 g	1% = 0.15 g	Homogeneous solution	Homogeneous solution
*25/6/2007	20% = 3.0020 g 3.00 g	78% = 11.712 g 11.7 g	2% = 0.3 g	Homogeneous solution	Homogeneous solution
7/10/2007	20% = 3.0018 g 3.00 g	75% = 11.2532 g 11.25 g	5% = 0.75 g	Homogeneous solution	Homogeneous solution
*25/6/2007	15% = 2.2502 g 2.25 g	85% = 12.7563 g 12.75 g	0%	Homogeneous solution	Homogeneous solution
*25/6/2007	15% = 2.2510 g 2.25 g	84% = 12.6039 g 12.6 g	1% = 0.15 g	Homogeneous solution	Homogeneous solution

Date	Palm oil(%)	C/S = 0.5 (%)	Water (%)	Properties	18/1/2008 (7 month)
*25/6/2007	15% = 2.2504 g 2.25 g	83% = 12.4684 g 12.45 g	2% = 0.3 g	Homogeneous solution	Homogeneous solution
7/10/2007	15% = 2.2502 g 2.25 g	75% = 11.2508 g 11.25 g	10% = 1.5 g	Homogeneous solution	Homogeneous solution
*25/6/2007	10% = 1.5208 g 1.5 g	90% = 13.5164 g 13.5 g	0%	Homogeneous solution	Homogeneous solution
*25/6/2007	10% = 1.5042 g 1.5 g	89.5% = 13.4293 g 13.425 g	0.5% = 0.075 g	Homogeneous solution	Homogeneous solution
7/10/2007	10% = 1.5025 g 1.5 g	85% = 12.7515 g 12.75 g	5% = 0.75 g	Homogeneous solution	Homogeneous solution
*10/7/2007	5% = 0.7509 g 0.75 g	95% = 14.2604 g 14.25 g	0%	Homogeneous solution	Homogeneous solution
*10/7/2007	5% = 0.7500 g 0.75 g	90% = 13.6665 g 13.5 g	5% = 0.75 g	Homogeneous solution	Homogeneous solution

Note: The data in the table represents example of preparation for each composition. In the real experiments for the system with C/S = 0.5, more than 146 samples composition ratio were prepared in order to obtain ternary-diagram.

Table B-2: The Characteristic of Microemulsion Biofuel at C/S 0.75

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/15/2007	95% = 19.007 g 19 g	5% = 1.0025 g 1 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	95% = 19.0015 g 19 g	4.95% = 0.9975 g 0.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
8/15/2007	95% = 19.0030 g 19 g	4.9% = 0.9812 g 0.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/15/2007	95% = 19.0030 g 19 g	4.8% = 0.963 g 0.96 g	0.2% = 0.04 g	Turbid Formation	Separation to two phase
8/15/2007	90% = 18.0050 g 18 g	10% = 2.000 g 2 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	90% = 18.0014 g 18 g	9.95% = 1.9911 g 1.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
8/15/2007	90% = 18.000 g 18 g	9.9% = 1.9889 g 1.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/15/2007	90% = 18.0011 g 18 g	9.5% = 1.90 g 1.90 g	0.5% = 0.1 g	Separation to two phase	Separation to two phase
8/15/2007	85% = 17.0050 g 17 g	15% = 3.009 g 3 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	85% = 17.0006 g 17 g	14.95% = 2.9926 g 2.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
8/15/2007	85% = 17.0005 g 17 g	14.5% = 2.9012g 2.9 g	0.5% = 0.1 g	Separation to two phase	Separation to two phase
8/15/2007	80% = 16.0017 g 16 g	20% = 4.0006 g 4 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	80% = 16.0036 g 16 g	19.9% = 3.9846 g 3.98 g	0.1% = 0.02	Homogeneous solution	Homogeneous solution
8/15/2007	80% = 16.0014 g 16 g	19.5% = 3.9061 g 3.9 g	0.5% = 0.1 g	Separation to two phase	Homogeneous solution and turbid
8/15/2007	75% = 15.0042 g 15 g	25% = 5.01 g 5 g	0%	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/15/2007	75% = 15.0010 g 15 g	24.9% = 4.9805 g 4.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/15/2007	75% = 15.0000 g 15 g	24.8% = 4.9633 g 4.96 g	0.2% = 0.04 g	Homogeneous solution	Homogeneous solution
8/15/2007	75% = 15.0025 g 15 g	24.5% = 4.9015 g 4.90 g	0.5% = 0.1	Separation to two phase	Separation to two phase
8/15/2007	70% = 14.0026 g 14 g	30% = 6.0026 g 6 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	70% = 14.0004 g 14 g	29.9% = 5.9917 g 5.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/15/2007	70% = 14.0019 g 14 g	29.5% = 5.9017 g 5.90 g	0.5% = 0.1	Separation to two phase and turbid in lower layer	Separation to two phase clear solution
8/15/2007	65% = 13.0015 g 13 g	35% = 7.0011 g 7 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	65% = 13.0002 g 13 g	34.9% = 6.9872 g 6.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/15/2007	65% = 13.0024 g 13 g	34.8% = 6.9624 g 6.96 g	0.2% = 0.04 g	Homogeneous solution	Homogeneous solution
8/15/2007	65% = 13.000 g 13 g	34.5% = 6.9022 g 6.90 g	0.5% = 0.1	Homogeneous solution and turbid	Homogeneous solution and turbid
8/15/2007	60% = 12.0026 g 12 g	40% = 8.0000 g 8 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	60% = 12.0037 g 12 g	39.9% = 7.985 g 7.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/15/2007	60% = 12.0016 g 12 g	39% = 7.8016 g 7.8 g	1% = 0.2 g	Separation to two phase	Homogeneous solution
8/15/2007	55% = 11.0002 g 11 g	45% = 9.0018 g 9 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	55% = 11.0027 g 11 g	44.5% = 8.9013 g 8.9 g	0.5% = 0.1 g	Homogeneous solution	Homogeneous solution
8/15/2007	55% = 11.0016 g 11 g	44% = 8.8032 g 8.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/15/2007	55% = 11.0016 g 11 g	43% = 8.6032 g 8.6 g	2% = 0.4 g	Separation to two phase	Homogeneous solution
8/15/2007	50% = 10.0030 g 10 g	50% = 10.003 g 10 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	50% = 10.0016 g 10 g	49.9% = 9.9806 g 9.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/15/2007	50% = 10.0012 g 11 g	49.5% = 9.9025 g 9.9 g	0.5% = 0.1 g	Homogeneous solution	Homogeneous solution
8/15/2007	50% = 10.0012 g 11 g	49% = 9.8035 g 9.8 g	1% = 0.2 g	Separation to two phase	Separation to two phase
8/15/2007	45% = 9.0002 g 9 g	55% = 11.0048 g 11 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	45% = 9.0010 g 9 g	54.5% = 10.9005 g 10.9 g	0.5% = 0.1 g	Homogeneous solution	Homogeneous solution
8/15/2007	45% = 9.0027 g 9 g	54% = 10.8008 g 10.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/15/2007	45% = 9.0027 g 9 g	53% = 10.6000 g 10.6 g	2% = 0.4 g	Homogeneous solution and turbid	Homogeneous solution and turbid
8/15/2007	40% = 8.0012 g 8 g	60% = 12.0035 g 12 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	40% = 8.0029 g 8 g	59.5% = 11.9248 g 11.9 g	0.5% = 0.1 g	Homogeneous solution	Homogeneous solution
8/15/2007	40% = 8.0003 g 8 g	58% = 11.6034 g 11.6 g	2% = 0.4 g	Homogeneous solution	Homogeneous solution
8/15/2007	40% = 8.0003 g 8 g	55% = 11.0123 g 11.00 g	5% = 0.4 g	Homogeneous solution and turbid	Homogeneous solution
8/15/2007	35% = 7.0023 g 7 g	65% = 13.000 g 13 g	0%	Homogeneous solution	Homogeneous solution
8/15/2007	35% = 7.0016 g 7 g	64.9% = 12.98 g 12.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/15/2007	35% = 7.0026 g 7 g	64% = 12.8023 g 12.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/15/2007	35% = 7.0019 g 7 g	60% = 12.003 g 12 g	5% = 1 g	Separation to two phase	Homogeneous solution
8/16/2007	30% = 6.0020 g 6 g	70% = 14.0074 g 14 g	0%	Homogeneous solution	Homogeneous solution
8/16/2007	30% = 6.0030 g 6 g	69% = 13.8069 g 13.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
8/16/2007	30% = 6.0012 g 6 g	55% = 11.0025 g 11 g	15% = 3 g	Separation to two phase	Separation to two phase
8/16/2007	25% = 5.0005 g 5 g	75% = 15.003 g 15 g	0%	Homogeneous solution	Homogeneous solution
8/16/2007	25% = 5.0020 g 5 g	74% = 14.8049 g 14.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
8/16/2007	25% = 5.0006 g 5 g	60% = 12.0008 g 12 g	15% = 3 g	Separation to two phase	Separation to two phase
8/16/2007	20% = 4.0040 g 4 g	80% = 16.0025 g 16 g	0%	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/16/2007	20% = 4.0020 g 4 g	79% = 15.8079 g 15.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
8/16/2007	20% = 4.0050 g 4 g	75% = 14.9990 g 15 g	5% = 1 g	Homogeneous solution	Homogeneous solution
8/16/2007	20% = 4.0044 g 4 g	65% = 13.0015 g 13 g	15% = 3 g	Separation to two phase	Homogeneous solution
8/16/2007	15% = 3.0026 g 3 g	85% = 17.0004 g 17 g	0%	Homogeneous solution	Homogeneous solution
8/16/2007	15% = 3.0002 g 3 g	84% = 16.8028 g 16.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
8/16/2007	15% = 3.0044 g 3 g	75% = 15.0024 g 15 g	10% = 2 g	Homogeneous solution	Homogeneous solution
8/16/2007	15% = 3.0005 g 3 g	60% = 12.0015 g 12 g	15% = 3 g	Separation to two phase	Homogeneous solution
8/16/2007	10% = 2.0024 g 2 g	90% = 18.001 g 18 g	0%	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 0.75 (%)	Water (%)	Properties	18/1/2008 (7 month)
8/16/2007	10% = 2.0004 g 2 g	89% = 17.8387 g 17.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
8/16/2007	10% = 2.0047 g 2 g	85% = 17.0038 g 17 g	5% = 1 g	Homogeneous solution	Homogeneous solution
8/16/2007	10% = 2.0012 g 2 g	80% = 16.0019 g 16 g	10% = 2 g	Separation to two phase	Separation to two phase
8/16/2007	5% = 1.0056 g 1 g	95% = 19.003 g 19 g	0%	Homogeneous solution	Homogeneous solution
8/16/2007	5% = 1.0038 g 1 g	94% = 18.8003 g 18.8 g	1% = 0.2 g	clear solution	Homogeneous solution
8/16/2007	5% = 1.0021 g 1 g	90% = 18.001 g 18 g	5% = 1 g	Homogeneous solution	Homogeneous solution
8/16/2007	5% = 1.0002 g 1 g	85% = 17.0019 g 17 g	10% = 2 g	Separation to two phase	Separation to two phase

Note: The data in the table represents example of preparation for each composition. In the real experiments for the system with C/S = 0.75, more than 88 samples composition ratio were prepared in order to obtain ternary-diagram.

Table B-3: The Characteristic of Microemulsion Biofuel at C/S 1.0

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
7/13/2007	95% = 19.009 g 19 g	5% = 1.0095 g 1 g	0%	Homogeneous solution	Homogeneous solution
7/13/2007	95% = 19.0012 g 19 g	4.95% = 1.0065 g 0.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
7/13/2007	95% = 19.0027 g 19 g	4.925% = 1.007 g 0.985 g	0.075% = 0.015 g	Homogeneous solution	Homogeneous solution
7/13/2007	95% = 19.0028 g 19 g	4.8% = 0.9614 g 0.96 g	0.2% = 0.04g	Separation to two phase	Homogeneous solution
7/16/2007	90% = 18.0011 g 18 g	10% = 2.01 g 2 g	0%	Homogeneous solution	Homogeneous solution
7/16/2007	90% = 18.0014 g 18 g	9.95% = 2.0024 g 1.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
7/16/2007	90% = 18.0018 g 18 g	9.9% = 1.9857 g 1.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
7/16/2007	90% = 18.0009 g 18 g	9.75% = 1.9555 g 1.95 g	0.25% = 0.05 g	Separation to two phase and turbid	Homogeneous solution
7/16/2007	85% = 17.0008 g 17 g	15% = 3.0099 g 3 g	0%	Homogeneous solution	Homogeneous solution
7/16/2007	85% = 17.0008 g 17 g	14.95% = 3.0001 g 2.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
7/16/2007	85% = 17.0018 g 17 g	14.9% = 2.9825 g 2.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
7/16/2007	85% = 17.0012 g 17 g	14.7% = 2.9515 g 2.94 g	0.3% = 0.06 g	Separation to two phase	Homogeneous solution
7/16/2007	80% = 16.0019 g 16 g	20% = 4.0033 g 4 g	0%	Homogeneous solution	Homogeneous solution
7/16/2007	80% = 16.0005 g 16 g	19.9% = 3.995 g 3.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
7/16/2007	80% = 15.9985 g 16 g	19.5% = 3.9087 g 3.9 g	0.5% = 0.1 g	Separation to two phase	Homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
7/16/2007	80% = 16 g 16 g	19.25% = 3.8528 g 3.85 g	0.75% = 0.15 g	Separation to two phase	Homogeneous solution
7/17/2007	75% = 15.0013 g 15 g	25% = 5.021 g 5 g	0%	Homogeneous solution	Homogeneous solution
7/17/2007	75% = 15.0009 g 15 g	24.95% = 5.0031 g 4.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
17/7/2007	75% = 15.0019 g 15 g	24.9% = 4.9829 g 4.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
24/7/2007	75% = 15 g 15 g	24.5% = 4.9043 g 4.9 g	0.5% = 0.1 g	Separation to two phase	Separation to two phase
24/7/2007	75% = 15.0039 g 15 g	24% = 4.81 g 4.8 g	1% = 0.2 g	Separation to two phase	Separation to two phase upper layer form turbid
7/17/2007	70% = 14.0007 g 14 g	30% = 6.0027 g 6 g	0%	Homogeneous solution	Homogeneous solution
7/17/2007	70% = 14.0003 g 14 g	29.95% = 6.0025 g 5.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
17/7/2007	70% = 14.0013 g 14 g	29.9% = 5.987 g 5.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
7/18/2007	70% = 14.0004 g 14 g	29.7% = 5.9449 g 5.94 g	0.3% = 0.06 g	Homogeneous solution	Homogeneous solution
24/7/2007	70% = 14.0020 g 14 g	29.5% = 5.9068 g 5.9 g	0.5% = 0.1 g	Separation to two phase	Homogeneous solution
24/7/2007	70% = 14.0019 g 14 g	29% = 5.8028 g 5.8 g	1% = 0.2 g	Separation to two phase	Separation to two phase upper layer form turbid
7/18/2007	65% = 13 g 13 g	35% = 7.0069 g 7 g	0%	Homogeneous solution	Homogeneous solution
7/18/2007	65% = 13.0016 g 13 g	34.9% = 6.9842 g 6.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
7/18/2007	65% = 13.0024 g 13 g	34.8% = 6.9716 g 6.96 g	0.2% = 0.04 g	Homogeneous solution	Homogeneous solution
7/18/2007	65% = 13.0003 g 13 g	34.5% = 6.9106 g 6.9 g	0.5% = 0.1 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
7/18/2007	65% = 13.0019 g 13 g	34% = 6.8095 g 6.8 g	1% = 0.2 g	Separation to two phase	turbid formation
7/18/2007	60% = 11.9999 g 12 g	40% = 8.0067 g 8 g	0%	homogeneous solution	homogeneous solution
7/18/2007	60% = 12.0016 g 12 g	39.9% = 7.9907 g 7.98 g	0.1% = 0.02 g	homogeneous solution	homogeneous solution
7/18/2007	60% = 12.0005 g 12 g	39% = 7.8127 g 7.8 g	1% = 0.2 g	homogeneous solution	homogeneous solution
7/18/2007	60% = 12.0019 g 12 g	38% = 7.6096 g 7.6 g	2% = 0.4 g	Separation to two phase	homogeneous solution
7/18/2007	60% = 12.0010 g 12 g	35% = 7.0145 g 7 g	5% = 1 g	Separation to two phase	Separation to two phase
7/18/2007	55% = 11.0009 g 11 g	45% = 9.0001 g 9 g	0%	homogeneous solution	homogeneous solution
7/18/2007	55% = 11.0001 g 11 g	44.9% = 8.9815 g 8.98 g	0.1% = 0.02 g	homogeneous solution	homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
7/18/2007	55% = 11.0009 g 11 g	44% = 8.8002 g 8.8 g	1% = 0.2 g	homogeneous solution .	homogeneous solution
24/7/2007	55% = 11.0011 g 11 g	43% = 8.6238 g 8.6 g	2% = 0.4 g	Separation to two phase	homogeneous solution
7/19/2007	50% = 10.0007 g 10 g	50% = 10.0004 g 10 g	0%	Homogeneous solution	Homogeneous solution
7/19/2007	50% = 10.0010 g 10 g	49.5% = 9.9027 g 9.9 g	0.5% = 0.1 g	Homogeneous solution	Homogeneous solution
7/19/2007	50% = 10.0003 g 10 g	49% = 9.8 g 9.8 g	1% = 0.2 g	Separation to two phase	Homogeneous solution
7/19/2007	45% = 9.0005 g 9 g	55% = 11.0069 g 11 g	0%	Homogeneous solution	Homogeneous solution
7/19/2007	45% = 9.0010 g 9 g	54.9% = 10.9833 g 10.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
7/19/2007	45% = 9.0004 g 9 g	54.5% = 10.9016 g 10.9 g	0.5% = 0.1 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
7/19/2007	45% = 9.0015 g 9 g	54% = 10.8063 g 10.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
7/19/2007	45% = 9.0020 g 9 g	50% = 10.008 g 10 g	5% = 1 g	Separation to two phase and turbid in upper layer	Homogeneous solution
7/19/2007	40% = 8.0012 g 8 g	60% = 12.0058 g 12 g	0%	Homogeneous solution	Homogeneous solution
7/19/2007	40% = 8.0022 g 8 g	59.9% = 11.9816 g 11.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
7/19/2007	40% = 8.0015 g 8 g	58% = 11.6088 g 11.6 g	2% = 0.4 g	Homogeneous solution	Homogeneous solution
24/7/2007	40% = 8.0025 g 8 g	55% = 11.01065 g 11 g	5% = 1 g	Separation to two phase	Separation to two phase
7/19/2007	35% = 7.0005 g 7 g	65% = 13.0135 g 13 g	0%	Homogeneous solution	Homogeneous solution
7/19/2007	35% = 7.0008 g 7 g	64.9% = 12.9805 g 12.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
7/19/2007	35% = 7.0011 g 7 g	64% = 12.804 g 12.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
7/19/2007	35% = 7.0011 g 7 g	62% = 12.4072 g 12.4 g	3% = 0.6 g	Homogeneous solution	Homogeneous solution
24/7/2007	35% = 7.0008 g 7 g	60% = 12.0152 g 12 g	5% = 1 g	Separation to two phase	Homogeneous solution
7/20/2007	30% = 6.0025 g 6 g	70% = 14.0108 g 14 g	0%	Homogeneous solution	Homogeneous solution
7/20/2007	30% = 6.0009 g 6 g	69.9% = 14.0454 g 13.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
24/7/2007	30% = 6.0013 g 6 g	60% = 12.0047 g 12 g	10% = 2 g	Homogeneous solution	Homogeneous solution
24/7/2007	30% = 6.0013 g 6 g	55% = 11.0007 g 11 g	15% = 3 g	Separation to two phase	Separation to two phase and turbid in lower layer
7/20/2007	25% = 5.0011 g 5 g	75% = 15.0136 g 15 g	0%	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
7/20/2007	25% = 5.0001 g 5 g	74% = 14.8035 g 14.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
24/7/2007	25% = 5.0013 g 5 g	60% = 12.0007 g 12 g	15% = 3 g	Separation to two phase	Separation to two phase
7/20/2007	20% = 4.0018 g 4 g	80% = 16.0084 g 16 g	0%	Homogeneous solution	Homogeneous solution
24/7/2007	20% = 4.0022 g 4 g	70% = 14.0138 g 14 g	10% = 2 g	Homogeneous solution	Homogeneous solution
24/7/2007	20% = 4.0022 g 4 g	65% = 13.0005 g 13 g	15% = 3 g	Separation to two phase	Separation to two phase
7/20/2007	15% = 3.0001 g 3 g	85% = 17.0076 g 17 g	0%	Homogeneous solution	Homogeneous solution
7/20/2007	15% = 3.0011 g 3 g	84% = 16.802 g 16.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
7/20/2007	15% = 3.0030 g 3 g	80% = 16.0036 g 16 g	5% = 1 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.0 (%)	Water (%)	Properties	23/1/2008 (6 month)
24/7/2007	15% = 3.0060 g 3 g	70% = 14.0028g 14 g	15% = 3 g	Separation to two phase	Separation to two phase
7/20/2007	10% = 2.0041 g 2 g	90% = 18.0044 g 18 g	0%	Homogeneous solution	Homogeneous solution
7/20/2007	10% = 2.0014 g 2 g	89% = 17.8089 g 17.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
7/20/2007	10% = 2.0032 g 4 g	70% = 14.0005 g 14 g	10% = 2 g	Separation to two phase	Separation to two phase
7/20/2007	5% = 1.0010 g 1 g	95% = 19.106 g 19 g	0%	Homogeneous solution	Homogeneous solution
7/20/2007	5% = 1.0057 g 1 g	94% = 18.8015 g 18.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
7/20/2007	5% = 1.0008 g 1 g	85% = 17.0019 g 17 g	10% = 2 g	Separation to two phase	Separation to two phase

Note: The data in the table represents example of preparation for each composition. In the real experiments for the system with C/S = 1.0, more than 104 samples composition ratio were prepared in order to obtain ternary-diagram.

Table B-4: The Characteristic of Microemulsion Biofuel at C/S 1.25

Date	Palm oil (%)	C/S = 1.25	Water (%)	Properties	23/2/2008 (6 month)
3/8/2007	95% = 19.0010 g 19 g	5% = 1.015 g 1 g	0%	Homogeneous solution	Homogeneous solution
3/8/2007	95% = 19.0012 g 19 g	4.95% = 0.9975 g 0.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
3/8/2007	95% = 19.0004 g 19 g	4.85% = 0.9852 g 0.97 g	0.15% = 0.03 g	Turbid formation	Homogeneous solution
3/8/2007	90% = 18.0020 g 18 g	10% = 2.0167 g 2 g	0%	Homogeneous solution	Homogeneous solution
3/8/2007	90% = 18.0030 g 18 g	9.95% = 2.0017 g 1.99 g	0.05% = 0.01 g	Homogeneous solution	Homogeneous solution
3/8/2007	90% = 18.0032 g 18 g	9.7% = 1.9420 g 1.94 g	0.3% = 0.06 g	Separation to two phase	Separation to two phase
3/8/2007	85% = 17.0007 g 17 g	15% = 3.0041 g 3 g	0%	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.25	Water (%)	Properties	23/2/2008 (6 month)
3/8/2007	85% = 17.0018 g 17 g	14.9% = 2.9844 g 2.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
3/8/2007	85% = 17.0032 g 17 g	14.7% = 2.9405 g 2.94 g	0.3% = 0.06 g	Separation to two phase	Separation to two phase
6/8/2007	80% = 16.0022 g 16 g	20% = 4.0044 g 4 g	0%	Homogeneous solution	Homogeneous solution
6/8/2007	80% = 16.0009 g 16 g	19.9% = 3.9981 g 3.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
6/8/2007	80% = 16.0000 g 16 g	19.8% = 3.9637 g 3.96 g	0.2% = 0.04 g	Turbid formation	Homogeneous solution
6/8/2007	75% = 15.0006 g 15 g	25% = 5.0098 g 5 g	0%	Homogeneous solution	Homogeneous solution
6/8/2007	75% = 15.0003 g 15 g	24.9% = 5.1094 g 4.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
6/8/2007	75% = 15.0010 g 15 g	24.8% = 4.9659 g 4.96 g	0.2% = 0.04 g	Separation to two phase	Homogeneous solution

Date	Palm oil (%)	C/S = 1.25	Water (%)	Properties	23/2/2008 (6 month)
6/8/2007	70% = 14.0025 g 14 g	30% = 6.0161 g 6 g	0%	Homogeneous solution	Homogeneous solution
6/8/2007	70% = 14.0005 g 14 g	29.9% = 5.981 g 5.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
6/8/2007	70% = 14.0013 g 14 g	29.8% = 5.9705 g 5.96 g	0.2% = 0.04 g	Separation to two phase	Homogeneous solution
6/8/2007	65% = 13.0011 g 13 g	35% = 7.0003 g 7 g	0%	Homogeneous solution	Homogeneous solution
6/8/2007	65% = 13.0008 g 13 g	34.9% = 7.0044 g 6.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
6/8/2007	65% = 13.0028 g 13 g	34.8% = 6.9612 g 6.96 g	0.2% = 0.04 g	Separation to two phase	Homogeneous solution
6/8/2007	65% = 13.0028 g 13 g	34.5 % = 6.9042 g 6.9 g	0.5% = 0.1 g	Separation to two phase	Homogeneous solution
6/8/2007	60% = 12.0020 g 12 g	40% = 8.0103 g 7 g	0%	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.25	Water (%)	Properties	23/2/2008 (6 month)
6/8/2007	60% = 12.0007 g 12 g	39.9% = 7.9878 g 7.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
6/8/2007	60% = 12.0020 g 12 g	39.5% = 7.9052 g 7.9 g	0.5% = 0.1 g	Separation to two phase	Homogeneous solution
6/8/2007	55% = 11.0042 g 11 g	45% = 9.0001 g 9 g	0%	Homogeneous solution	Homogeneous solution
6/8/2007	55% = 11.0030 g 11 g	44.5% = 8.9077 g 8.9 g	0.5% = 0.1 g	Homogeneous solution	Homogeneous solution
6/8/2007	55% = 11.0030 g 11 g	44% = 8.8024 g 8.8 g	1% = 0.2 g	Separation to two phase	Homogeneous solution
7/8/2007	50% = 10.0025 g 10 g	50% = 10.0151 g 10 g	0%	Homogeneous solution	Homogeneous solution
7/8/2007	50% = 10.0022 g 10 g	49.9% = 9.9856 g 9.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
7/8/2007	50% = 10.0028 g 10 g	49% = 9.842 g 9.8 g	1% = 0.2 g	Separation to two phase	Homogeneous solution

Date	Palm oil (%)	C/S = 1.25	Water (%)	Properties	23/2/2008 (6 month)
8/7/2007	45% = 9.0019 g 9 g	55% = 11.0021 g 11 g	0%	Homogeneous solution	Homogeneous solution
8/7/2007	45% = 9.000 g 9 g	54.9% = 10.987 g 10.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/7/2007	45% = 9.0016 g 9 g	54% = 10.8014 g 10.8 g	1% = 0.2 g	Separation to two phase	Homogeneous solution
8/7/2007	40% = 8.0023 g 8 g	60% = 12.0004 g 12 g	0%	Homogeneous solution	Homogeneous solution
8/7/2007	40% = 8.0014 g 8 g	59.9% = 11.9841 g 11.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/7/2007	40% = 8.0016 g 8 g	59% = 11.8016 g 11.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
8/8/2007	40% = 8.0022 g 8 g	58% = 11.6006 g 11.6 g	2% = 0.4 g	Separation to two phase	Homogeneous solution
8/7/2007	35% = 7.0016 g 7 g	65% = 13.0064 g 13 g	0%	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.25	Water (%)	Properties	23/2/2008 (6 month)
8/7/2007	35% = 7.0005 g 7 g	64.9% = 12.9863 g 12.98 g	0.1% = 0.02 g	Homogeneous solution	Homogeneous solution
8/7/2007	35% = 7.0030 g 7 g	63% = 12.6000 g 12.6 g	2% = 0.4 g	Homogeneous solution	Homogeneous solution
8/8/2007	35% = 7.0017 g 7 g	60% = 12.0017 g 12 g	5% = 1 g	Separation to two phase	Homogeneous solution
8/7/2007	30% = 6.0003 g 6 g	70% = 14.0021 g 14 g	0%	Homogeneous solution	Homogeneous solution
8/7/2007	30% = 6.0028 g 6 g	69% = 13.8041 g 13.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
8/7/2007	30% = 6.0030 g 6 g	60% = 12.0008 g 12 g	10% = 2 g	Separation to two phase	Homogeneous solution
8/8/2007	25% = 5.0011 g 5 g	75% = 15.0109 g 15 g	0%	Homogeneous solution	Homogeneous solution
8/8/2007	25% = 5.0035 g 5 g	74% = 14.8052 g 14.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.25	Water (%)	Properties	23/2/2008 (6 month)
8/8/2007	25% = 5.0014 g 5 g	70% = 14.0024 g 14 g	5% = 1 g	Homogeneous solution	Homogeneous solution
8/8/2007	25% = 5.0024 g 5 g	65% = 13.0034 g 13 g	10% = 2 g	Turbid formation	Homogeneous solution
8/8/2007	20% = 4.0015 g 4 g	80% = 16.0003 g 16 g	0%	Homogeneous solution	Homogeneous solution
8/8/2007	20% = 4.0020 g 4 g	70% = 14.002 g 14 g	10% = 2 g	Homogeneous solution	Homogeneous solution
8/8/2007	20% = 4.0020 g 4 g	65% = 13.0017 g 13 g	15% = 3 g	Separation to two phase	Homogeneous solution
8/8/2007	15% = 3.0016 g 3 g	85% = 17.014 g 17 g	0%	Homogeneous solution	Homogeneous solution
8/8/2007	15% = 3.0010 g 3 g	84% = 16.8002 g 16.8 g	1% = 0.2 g	Homogeneous solution	Homogeneous solution
8/8/2007	15% = 3.0020 g 3 g	80% = 16.0069 g 16 g	5% = 1 g	Homogeneous solution	Homogeneous solution

Date	Palm oil (%)	C/S = 1.25	Water (%)	Properties	23/2/2008 (6 month)
8/8/2007	15% = 3.0018 g 3 g	70% = 14.0012 g 14 g	15% = 3 g	Separation to two phase	Homogeneous solution
8/8/2007	10% = 2.0019 g 2 g	90% = 18.0076 g 18 g	0%	Homogeneous solution	Homogeneous solution
8/8/2007	10% = 2.0000 g 2 g	85% = 17.0083 g 17 g	5% = 1 g	Homogeneous solution	Homogeneous solution
8/8/2007	10% = 2.0000 g 2 g	80% = 16.0003 g 16 g	10% = 2 g	Separation to two phase	Homogeneous solution
8/8/2007	5% = 1.0098 g 1 g	95% = 19.0817 g 19 g	0%	Homogeneous solution	Homogeneous solution
8/8/2007	5% = 1.0039 g 1 g	90% = 18.0051 g 18 g	5% = 1 g	Homogeneous solution	Homogeneous solution
8/8/2007	5% = 1.0039 g 1 g	85% = 17.0004 g 17 g	10% = 1 g	Separation to two phase	Homogeneous solution

Note: The data in the table represents example of preparation for each composition. In the real experiments for the system with C/S = 1.25, more than 77 samples composition ratio were prepared in order to obtain ternary-diagram.

APPENDIX C

Table C-1: The Performance and Exhausted Emission and Data of Condition between Run Diesel Fuel with the Engine

Ideal rpm	Actual rpm	Temperature (°C)				Humidity (%)	V (Volt)	I (Amp.)	Power Gen (kW)	Power Engine (kW)	Torque (N.m)
		Ambient	Water	Oil	Exhaust						
2400	2469	33	62	71	428	43	233	25.0	5.83	7.28	28.18
2200	2171	33	75	83	467	42	227	25.6	5.81	7.26	31.97
2000	1969	33	77	87	469	41	192	27.5	5.28	6.60	32.03
1800	1810	33	78	90	460	40	168	28.7	4.82	6.03	31.81
1600	1625	33	81	91	448	40	142	29.7	4.22	5.27	31.00
1400	1396	33	83	92	419	41	111	29.9	3.32	4.15	28.39

Load(kW)						Fuel Consumption		%Black Smoke	CO-L (ppm)	CO-H (%)	CO2 (%)	NOx (ppm)	O2 (%)	THC (ppm)	AFR	Lamda
2.5	1.5	1.0	0.5	0.3	Total	sec/20 ml	l/kW-hr									
1		1	3		5.0	26.62	0.3715	32.0	567.00	0.04	5.22	187.80	13.89	63.70	41.40	2.85
1	1	1		1	2.0	27.17	0.3648	62.0	Over	0.15	6.08	164.80	12.29	45.00	32.93	2.25
2		1			3.0	29.94	0.3644	72.0	Over	0.30	6.85	177.70	11.06	196.00	29.21	2.05
2		1	2		5.0	30.84	0.3874	92.0	Over	0.65	6.75	152.10	11.15	619.00	27.05	1.90
2		1	4	1	13.0	32.69	0.4178	96.0	Over	0.85	6.37	124.80	11.72	677.00	27.19	1.87
2	1	1	4	2	23.0	36.18	0.4797	99.8	Over	1.69	5.57	100.40	10.68	1930.00	29.88	1.97

Table C-2: The Performance and Exhausted Emission and Data of Condition between Run M100 with the Engine

Ideal rpm	Actual rpm	Temperature (°C)				Humidity (%)	V (Volt)	I (Amp.)	Power Gen (kW)	Power Engine (kW)	Torque (N.m)
		Ambient	Water	Oil	Exhaust						
2400	2423	33	69	71	437	34	234	26.4	6.18	7.72	30.45
2200	2169	33	80	79	455	33	227	26.0	5.90	7.38	32.50
2000	1990	33	82	83	455	33	195	28.2	5.50	6.87	33.00
1800	1805	33	84	87	444	33	168	29.5	4.96	6.20	32.79
1600	1608	33	85	89	430	33	140	30.3	4.24	5.30	31.51
1400	1406	33	87	91	401	33	112	31.0	3.47	4.34	29.49

Load(kW)						Fuel Consumption		%Black Smoke	CO-L (ppm)	CO-H (%)	CO2 (%)	NOx (ppm)	O2 (%)	THC (ppm)	AFR	Lamda
2.5	1.5	1.0	0.5	0.3	Total	sec/20 ml	l/kW-hr									
1		1	3	1	5.3	23.72	0.3931	24.0	500	0.06	7.03	200.10	13.31	40.80	31.65	2.12
1		1	3	1	12.0	26.03	0.3749	46.0	Over	0.21	8.94	229.90	11.14	67.20	25.52	1.76
1	1	1	2	2	10.0	27.87	0.3758	70.0	Over	0.47	9.58	221.50	10.05	125.50	23.84	1.62
1	1	1	3	4	17.0	29.66	0.3919	92.0	Over	1.04	9.60	195.50	9.50	284.00	21.77	1.49
1	1	1	5	5	38.0	32.50	0.4178	96.0	Over	1.60	8.40	156.50	10.56	597.00	24.39	1.66
2	1	1	4	3	39.0	33.28	0.4985	99.6	Over	2.70	7.69	134.50	10.35	3418.00	21.94	1.50

Table C-3: The Performance and Exhausted Emission and Data of Condition between Run M20 with the Engine

Ideal rpm	Actual rpm	Temperature (°C)				Humidity (%)	V (Volt)	I (Amp.)	Power Gen (kW)	Power Engine (kW)	Torque (N.m)
		Ambient	Water	Oil	Exhaust						
2400	2408	33	79	88	455	34	234	26.1	6.11	7.63	30.29
2200	2160	33	83	93	462	33	226	25.6	5.79	7.23	31.99
2000	2011	33	83	94	458	33	198	27.4	5.43	6.78	32.22
1800	1794	33	84	96	451	33	166	28.9	4.80	6.00	31.94
1600	1621	33	87	97	440	33	142	29.7	4.22	5.27	31.07
1400	1417	33	88	98	421	32	113	30.7	3.47	4.34	29.24

Load(kW)						Fuel Consumption		%Black Smoke	CO-L (ppm)	CO-H (%)	CO2 (%)	NOx (ppm)	O2 (%)	THC (ppm)	AFR	Lamda
2.5	1.5	1.0	0.5	0.3	Total	sec/20 ml	l/kW-hr									
1		1	1	4	5.2	26.07	0.3618	32.0	Over	0.14	8.40	224.30	11.60	50.00	28.24	1.92
1		1	1	4	19.0	29.75	0.3346	46.0	Over	0.12	8.49	228.10	11.65	70.50	27.80	1.89
1		1	3	4	21.0	31.38	0.3383	69.0	Over	0.23	8.95	234.60	10.89	319.00	25.65	1.76
1		1	5	5	37.0	30.09	0.3990	84.0	Over	0.50	9.08	199.10	10.28	384.00	24.38	1.68
1	1	1	5	4	47.0	35.78	0.3817	93.0	Over	0.80	8.10	159.10	11.30	418.00	27.01	1.85
2	1	1	3	4	35.0	33.53	0.4952	99.5	Over	1.73	7.25	126.20	11.55	1322.00	25.51	1.77



Table C-4: The Performance and Exhausted Emission and Data of Condition between Run M5 with the Engine

Ideal rpm	Actual rpm	Temperature (°C)				Humidity (%)	V (Volt)	I (Amp.)	Power Gen (kW)	Power Engine (kW)	Torque (N.m)
		Ambient	Water	Oil	Exhaust						
2400	2407	33	61	65	360	39	234	23.8	5.57	6.96	27.63
2200	2194	33	73	71	444	38	232	25.4	5.89	7.37	32.08
2000	2014	33	77	75	459	37	199	26.8	5.33	6.67	31.62
1800	1784	33	80	79	452	36	165	28.8	4.75	5.94	31.81
1600	1624	33	84	82	441	36	143	29.3	4.19	5.24	30.81
1400	1414	33	87	84	418	35	114	30.1	3.43	4.29	28.98

Load(kW)						Fuel Consumption		%Black Smoke	CO-L (ppm)	CO-H (%)	CO2 (%)	NOx (ppm)	O2 (%)	THC (ppm)	AFR	Lamda
2.5	1.5	1.0	0.5	0.3	Total	sec/20 ml	l/kW-hr									
1			3	4	5.2	27.22	0.3800	24.0	179.90	0.02	4.38	152.10	14.88	49.30	45.69	3.09
1		1	2	2	15.0	26.18	0.3734	55.0	Over	0.16	6.15	170.40	12.14	105.90	33.09	2.21
1		1	4	2	14.0	28.91	0.3736	69.0	Over	0.22	7.11	192.80	11.07	162.30	29.05	1.99
2		1	1	2	11.0	30.47	0.3978	96.0	Over	1.05	7.12	150.30	10.35	469.00	25.40	1.79
2		1	3	2	12.0	32.37	0.4247	97.0	Over	1.18	6.40	129.00	11.09	1024.00	26.18	1.85
2		1	6	3	29.0	34.62	0.4849	99.5	Over	1.78	5.62	113.50	11.17	1588.00	26.28	1.88

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