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APPENDIX A

THE RESULT OF EXPERIMENT

Table A1 : Physical properties of lubricating base oils

Properties	ASTM method	150 SN A	150 SN B	150 SN C	150 SN E	150 SN G	150 SN P	150 SN T
Viscosity @25°C ,cSt	D-445	59.90	60.85	61.15	60.50	58.12	58.36	58.30
Viscosity @40°C, cSt	D-445	29.54	30.04	30.11	29.90	28.96	29.08	29.04
Viscosity @100°C,cSt	D-445	5.13	5.22	5.22	5.21	5.12	5.13	5.14
Viscosity index	D-2270	101.4	102.5	103.3	104.1	104.8	104.6	105.5
Density @30°C, kg/l	D-4052	0.8600	0.8618	0.8619	0.8600	0.8602	0.8577	0.8581
Flash point, °C	D-92	222	220	226	214	230	222	212
Pour point, °C	D-97	-6.0	-9.0	-6.0	-9.0	-9.0	-6.0	-6.0

Properties	ASTM method	500 SN A	500 SN B	500 SN C	500 SN G	500 SN P	500 SN T
Viscosity @25°C ,cSt	D-445	220.53	223.30	227.18	227.14	235.71	236.32
Viscosity @40°C, cSt	D-445	93.38	94.14	95.60	95.55	98.83	99.12
Viscosity @100°C,cSt	D-445	10.77	10.80	10.85	10.86	11.03	11.13
Viscosity index	D-2270	98.6	98.1	97.0	97.2	95.9	97.1
Density @30°C, kg/l	D-4052	0.8739	0.8770	0.8788	0.8770	0.8761	0.8759
Flash point, °C	D-92	262	270	260	268	274	262
Pour point, °C	D-97	-6.0	-9.0	-9.0	-12.0	-9.0	-6.0

Properties	ASTM method	150 BS A	150 BS B	150 BS C	150 BS D	150 BS J	150 BS P	150 BS T
Viscosity @25°C ,cSt	D-445	1341.04	1446.83	1444.68	1375.51	1462.51	1333.04	1372.11
Viscosity @40°C, cSt	D-445	459.53	490.46	489.71	472.53	498.85	459.64	470.52
Viscosity @100°C,cSt	D-445	30.65	31.88	31.78	31.36	31.91	30.50	31.24
Viscosity index	D-2270	96.2	95.9	95.6	96.7	94.8	95.7	96.6
Density @30°C, kg/l	D-4052	0.8914	0.8951	0.8951	0.8920	0.8951	0.8919	0.8927
Flash point, °C	D-92	316	324	320	320	318	314	312.0
Pour point, °C	D-97	-6.0	-9.0	-9.0	-12.0	-9.0	-6.0	-6.0

Table A2.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : A	1	0	0	59.90	29.54	5.13	-8.00	3588.05	0.9972
M : A	0	1	0	220.53	93.38	10.77	-9.47	4412.47	0.9975
H : A	0	0	1	1341.04	459.53	30.65	-11.41	5524.26	0.9977
Two component blends									
A1	0.75	0.25	0	81.15	38.72	6.14	-8.31	3770.20	0.9973
A2	0.50	0.50	0	111.62	51.17	7.37	-8.66	3968.67	0.9973
A3	0.25	0.75	0	156.11	68.60	8.84	-9.08	4193.79	0.9973
A4	0.75	0	0.25	117.00	53.71	7.67	-8.65	3980.77	0.9974
A5	0.50	0	0.50	242.75	102.66	11.70	-9.44	4432.90	0.9976
A6	0.25	0	0.75	541.86	207.88	18.51	-10.33	4936.27	0.9976
A7	0	0.75	0.25	333.76	134.77	13.76	-9.89	4660.35	0.9976
A8	0	0.50	0.50	516.87	198.83	17.73	-10.36	4930.90	0.9977
A9	0	0.25	0.75	821.76	299.17	23.30	-10.83	5208.83	0.9976
Three component blends									
A10	0.25	0.50	0.25	233.95	99.50	11.17	-9.53	4450.65	0.9979
A11	0.50	0.25	0.25	163.79	71.80	9.24	-9.05	4198.66	0.9973
A12	0.25	0.25	0.50	348.78	140.94	14.33	-9.86	4666.18	0.9976
A13	0.375	0.375	0.25	194.00	83.36	10.16	-9.25	4307.88	0.9973
A14	0.375	0.25	0.375	235.45	99.78	11.42	-9.44	4423.82	0.9976
A15	0.25	0.375	0.375	283.67	117.17	12.65	-9.67	4545.78	0.9976
A16	0.333	0.333	0.333	235.08	99.70	11.35	-9.47	4431.49	0.9977

Table A2.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-847.18	4401.14	0.9987	1.54	-9.45	0.9973	-824.42	4412.47	1.47	-9.47
L - H	x_L	-1911.00	5405.48	0.9990	3.36	-11.15	0.9988	-1936.21	5524.26	3.41	-11.41
M - H	x_M	-1096.96	5481.84	0.9999	1.88	-11.30	1.0000	-1111.79	5524.26	1.94	-11.41
Three component blends (first type)											
(A8) - L	x_L	-1389.30	4893.52	1.0000	2.49	-10.29	0.9999	-1380.32	4968.36	2.44	-10.44
(A5) - M	x_M	108.39	4396.19	0.9974	-0.36	-9.35	1.0000	-143.69	4556.16	0.23	-9.71
(A2) - H	x_H	1429.18	3952.58	0.9998	-2.42	-8.65	0.9990	1524.00	4000.26	-2.68	-8.74
Three component blends (second type)											
(x_M = 0.25)	x_L	-1870.08	5130.83	0.9995	3.24	-10.66	0.9995	-1936.21	5246.31	3.41	-10.93
(x_H = 0.25)	x_L	-1007.96	4697.05	0.9941	1.92	-10.00	0.9908	-824.42	4690.42	1.47	-9.96
(x_L = 0.25)	x_M	-862.12	4877.50	0.9954	1.32	-10.18	0.9924	-1111.79	5040.21	1.94	-10.56

Table A3.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : B	1	0	0	60.85	30.04	5.22	-7.97	3585.90	0.9972
M : B	0	1	0	223.30	94.14	10.80	-9.50	4425.88	0.9975
H : B	0	0	1	1446.83	490.46	31.88	-11.51	5577.54	0.9976
Two component blends									
B1	0.75	0.25	0	82.44	39.24	6.19	-8.33	3781.27	0.9973
B2	0.50	0.50	0	113.17	54.43	7.41	-8.74	4004.79	0.9990
B3	0.25	0.75	0	157.91	69.29	8.87	-9.11	4206.00	0.9974
B4	0.75	0	0.25	123.19	56.37	7.92	-8.70	4010.35	0.9975
B5	0.50	0	0.50	254.79	107.29	12.06	-9.48	4459.77	0.9977
B6	0.25	0	0.75	576.07	220.60	19.08	-10.43	4984.71	0.9978
B7	0	0.75	0.25	341.67	142.78	13.87	-9.99	4701.31	0.9987
B8	0	0.50	0.50	537.24	205.39	18.11	-10.41	4955.82	0.9976
B9	0	0.25	0.75	865.52	313.76	23.90	-10.92	5249.04	0.9977
Three component blends									
B10	0.25	0.50	0.25	237.63	100.20	11.31	-9.52	4451.60	0.9976
B11	0.50	0.25	0.25	167.77	73.55	9.38	-9.07	4213.01	0.9974
B12	0.25	0.25	0.50	366.67	147.84	14.68	-9.95	4706.46	0.9978
B13	0.375	0.375	0.25	203.66	87.80	10.46	-9.30	4340.57	0.9977
B14	0.375	0.25	0.375	246.50	101.40	11.81	-9.43	4429.31	0.9966
B15	0.25	0.375	0.375	293.69	121.60	12.88	-9.72	4573.57	0.9978
B16	0.333	0.333	0.333	242.88	100.60	11.62	-9.46	4434.84	0.9969

Table A3.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-849.46	4422.08	0.9991	1.56	-9.51	0.9991	-839.98	4425.88	1.53	-9.50
L - H	x_L	-1948.72	5459.30	0.9980	3.46	-11.27	0.9968	-1991.64	5577.54	3.54	-11.51
M - H	x_M	-1095.46	5516.45	0.9983	1.86	-11.37	0.9969	-1151.66	5577.54	2.01	-11.51
Three component blends (first type)											
(B8) - L	x_L	-1425.81	4921.86	0.9965	2.56	-10.34	0.9941	-1415.81	5001.71	2.54	-10.51
(B5) - M	x_M	90.77	4405.81	0.9917	-0.36	-9.34	1.0000	-155.84	4581.72	0.24	-9.74
(B2) - H	x_H	1487.05	3957.13	0.9934	-2.65	-8.61	0.9913	1571.65	4005.89	-2.78	-8.74
Three component blends (second type)											
(x_M = 0.25)	x_L	-1973.80	5189.77	0.9950	3.52	-10.80	0.9891	-1991.64	5289.62	3.54	-11.01
(x_H = 0.25)	x_L	-954.36	4692.95	0.9984	1.80	-9.97	0.9998	-839.98	4713.80	1.53	-10.00
(x_L = 0.25)	x_M	-1019.44	4959.50	0.9994	1.72	-10.38	0.9984	-1151.66	5079.63	2.01	-10.63

Table A4.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : C	1	0	0	61.15	30.11	5.22	-7.99	3592.52	0.9972
M : C	0	1	0	227.18	95.60	10.85	-9.55	4445.13	0.9975
H : C	0	0	1	1444.68	489.71	31.78	-11.52	5580.16	0.9977
Two component blends									
C1	0.75	0.25	0	83.10	39.43	6.23	-8.32	3782.23	0.9972
C2	0.50	0.50	0	114.04	52.12	7.42	-8.71	3990.67	0.9973
C3	0.25	0.75	0	160.09	70.24	8.89	-9.16	4224.24	0.9975
C4	0.75	0	0.25	120.56	55.00	7.75	-8.72	4009.10	0.9974
C5	0.50	0	0.50	254.58	107.07	12.02	-9.49	4463.17	0.9976
C6	0.25	0	0.75	576.09	219.98	19.06	-10.43	4985.09	0.9978
C7	0	0.75	0.25	346.91	139.90	14.00	-9.96	4693.83	0.9977
C8	0	0.50	0.50	543.87	207.30	18.18	-10.44	4967.81	0.9976
C9	0	0.25	0.75	868.56	316.39	24.00	-10.91	5250.27	0.9979
Three component blends									
C10	0.25	0.50	0.25	240.10	100.84	11.43	-9.51	4449.38	0.9975
C11	0.50	0.25	0.25	168.86	74.17	9.41	-9.08	4219.16	0.9975
C12	0.25	0.25	0.50	365.75	146.86	14.73	-9.91	4695.06	0.9976
C13	0.375	0.375	0.25	202.90	87.26	10.47	-9.28	4331.92	0.9975
C14	0.375	0.25	0.375	247.03	102.40	11.85	-9.43	4430.98	0.9969
C15	0.25	0.375	0.375	298.35	122.68	13.02	-9.72	4578.17	0.9976
C16	0.333	0.333	0.333	246.42	102.02	11.76	-9.45	4438.61	0.9969

Table A4.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-884.02	4441.05	0.9989	1.68	-9.57	0.9983	-852.61	4445.13	1.56	-9.55
L - H	x_L	-1951.98	5461.78	0.9984	3.42	-11.26	0.9967	-1987.64	5580.16	3.53	-11.52
M - H	x_M	-1112.88	5527.07	0.9999	1.90	-11.38	1.0000	-1135.03	5580.16	1.97	-11.52
Three component blends (first type)											
(C8) - L	x_L	-1418.45	4924.04	0.9959	2.51	-10.32	0.9897	-1420.13	5012.65	2.55	-10.54
(C5) - M	x_M	72.29	4413.56	0.9913	-0.33	-9.35	0.9920	-141.21	4586.34	0.20	-9.76
(C2) - H	x_H	1464.54	3959.83	0.9982	-2.55	-8.62	0.9954	1561.34	4018.83	-2.75	-8.77
Three component blends (second type)											
(x_M = 0.25)	x_L	-1903.60	5162.25	0.9960	3.32	-10.72	0.9919	-1987.64	5296.40	3.53	-11.03
(x_H = 0.25)	x_L	-920.88	4678.82	0.9999	1.72	-9.93	0.9984	-852.61	4728.89	1.56	-10.04
(x_L = 0.25)	x_M	-982.72	4942.72	0.9992	1.60	-10.31	0.9992	-1135.03	5083.25	1.97	-10.64

Table A5.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	a	b	r^2
Lubricating oils									
L : B	1	0	0	60.85	30.04	5.22	-7.97	3585.90	0.9972
M : B	0	1	0	223.30	94.14	10.80	-9.50	4425.88	0.9975
H : D	0	0	1	1375.51	472.53	31.36	-11.40	5529.41	0.9977
Two component blends									
D1	0.75	0.25	0	82.44	39.24	6.19	-8.33	3781.27	0.9973
D2	0.50	0.50	0	113.17	54.43	7.41	-8.74	4004.79	0.9990
D3	0.25	0.75	0	157.91	69.29	8.87	-9.11	4206.00	0.9974
D4	0.75	0	0.25	119.40	54.80	7.77	-8.67	3992.41	0.9975
D5	0.50	0	0.50	248.22	104.65	11.89	-9.45	4441.30	0.9976
D6	0.25	0	0.75	556.75	213.94	18.82	-10.36	4953.80	0.9978
D7	0	0.75	0.25	339.14	137.05	13.87	-9.96	4673.54	0.9977
D8	0	0.50	0.50	527.67	202.77	17.97	-10.38	4941.95	0.9977
D9	0	0.25	0.75	840.35	306.40	23.63	-10.86	5222.81	0.9978
Three component blends									
D10	0.25	0.50	0.25	236.74	104.52	11.42	-9.51	4451.96	0.9989
D11	0.50	0.25	0.25	166.25	73.24	9.36	-9.05	4204.20	0.9975
D12	0.25	0.25	0.50	357.41	144.69	14.59	-9.88	4677.36	0.9977
D13	0.375	0.375	0.25	196.96	85.06	10.27	-9.26	4317.26	0.9976
D14	0.375	0.25	0.375	238.02	105.20	11.65	-9.43	4429.25	0.9988
D15	0.25	0.375	0.375	292.12	129.50	13.15	-9.67	4564.29	0.9993
D16	0.333	0.333	0.333	237.46	104.97	11.57	-9.46	4436.57	0.9988

Table A5.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	d	r^2	p	q	r^2	c	d	p	q
Two component blends											
L - M	x_L	-849.46	4422.08	0.9991	1.56	-9.51	0.9991	-839.98	4425.88	1.53	-9.50
L - H	x_L	-1922.78	5423.89	0.9985	3.38	-11.18	0.9980	-1943.51	5529.41	3.43	-11.40
M - H	x_M	-1098.54	5495.37	0.9998	1.88	-11.32	0.9998	-1103.53	5529.41	1.90	-11.40
Three component blends (first type)											
(D8) - L	x_L	-1433.31	4919.11	0.9994	2.48	-10.29	0.9999	-1391.75	4977.65	2.48	-10.45
(D5) - M	x_M	91.03	4406.40	0.9999	-0.32	-9.35	0.9977	-131.78	4557.66	0.19	-9.69
(D2) - H	x_H	1440.61	3957.00	1.0000	-2.49	-8.64	0.9999	1523.52	4005.89	-2.67	-8.74
Three component blends (second type)											
(x_M = 0.25)	x_L	-1892.64	5146.68	0.9992	3.32	-10.70	0.9976	-1943.51	5253.53	3.43	-10.92
(x_H = 0.25)	x_L	-991.04	4696.11	0.9975	1.84	-9.96	0.9975	-839.98	4701.76	1.53	-9.98
(x_L = 0.25)	x_M	-901.60	4902.64	1.0000	1.48	-10.24	0.9939	-1103.53	5043.53	1.90	-10.54

Table A6.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : E	1	0	0	60.50	29.90	5.21	-7.96	3580.27	0.9972
M : C	0	1	0	227.18	95.60	10.85	-9.55	4445.13	0.9975
H : C	0	0	1	1444.68	489.70	31.78	-11.52	5580.16	0.9977
Two component blends									
E1	0.75	0.25	0	82.35	39.44	6.19	-8.33	3782.46	0.9976
E2	0.50	0.50	0	113.52	51.93	7.39	-8.71	3990.27	0.9974
E3	0.25	0.75	0	159.18	69.93	8.92	-9.11	4210.37	0.9974
E4	0.75	0	0.25	118.88	54.49	7.75	-8.66	3988.93	0.9974
E5	0.50	0	0.50	250.46	105.34	11.87	-9.49	4457.18	0.9976
E6	0.25	0	0.75	568.90	217.92	18.96	-10.41	4974.94	0.9978
E7	0	0.75	0.25	346.91	139.90	14.00	-9.96	4693.83	0.9977
E8	0	0.50	0.50	543.87	207.30	18.18	-10.44	4967.81	0.9976
E9	0	0.25	0.75	868.56	316.39	24.00	-10.91	5250.27	0.9979
Three component blends									
E10	0.25	0.50	0.25	238.73	106.82	11.54	-9.51	4454.99	0.9992
E11	0.50	0.25	0.25	167.80	73.71	9.38	-9.07	4214.24	0.9975
E12	0.25	0.25	0.50	363.88	147.02	14.72	-9.90	4690.91	0.9978
E13	0.375	0.375	0.25	199.14	85.86	10.31	-9.28	4327.84	0.9976
E14	0.375	0.25	0.375	244.20	107.90	11.94	-9.41	4430.78	0.9988
E15	0.25	0.375	0.375	295.09	121.04	13.00	-9.68	4561.91	0.9974
E16	0.333	0.333	0.333	243.04	107.07	11.82	-9.44	4437.90	0.9988

Table A6.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-855.82	4422.27	0.9997	1.56	-9.49	0.9998	-864.86	4445.13	1.59	-9.55
L - H	x_L	-1972.02	5459.69	0.9992	3.50	-11.27	0.9991	-1999.89	5580.16	3.56	-11.52
M - H	x_M	-1112.88	5527.07	0.9999	1.90	-11.38	1.0000	-1135.03	5580.16	1.97	-11.52
Three component blends (first type)											
(E8) - L	x_L	-1383.27	4904.04	0.9992	2.41	-10.27	0.9952	-1432.38	5012.65	2.58	-10.54
(E5) - M	x_M	97.63	4405.98	0.9983	-0.40	-9.31	0.9988	-135.09	4580.22	0.19	-9.74
(E2) - H	x_H	1461.33	3958.01	0.9990	-2.52	-8.63	0.9935	1567.46	4012.70	-2.77	-8.76
Three component blends (second type)											
(x_M = 0.25)	x_L	-1906.68	5160.32	0.9972	3.32	-10.71	0.9892	-1999.89	5296.40	3.56	-11.03
(x_H = 0.25)	x_L	-963.00	4693.48	0.9989	1.76	-9.95	0.9993	-864.86	4728.89	1.59	-10.04
(x_L = 0.25)	x_M	-943.68	4923.15	0.9971	1.56	-10.28	0.9946	-1135.03	5080.19	1.97	-10.63

Table A7.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : E	1	0	0	60.50	29.90	5.21	-7.96	3580.27	0.9972
M : C	0	1	0	227.18	95.60	10.85	-9.55	4445.13	0.9975
H : D	0	0	1	1375.51	472.53	31.36	-11.40	5529.41	0.9977
Two component blends									
F1	0.75	0.25	0	82.35	39.44	6.20	-8.32	3779.88	0.9975
F2	0.50	0.50	0	113.42	51.93	7.41	-8.70	3984.97	0.9973
F3	0.25	0.75	0	159.18	69.93	8.92	-9.11	4210.37	0.9974
F4	0.75	0	0.25	119.02	54.49	7.74	-8.67	3992.32	0.9974
F5	0.50	0	0.50	248.01	104.37	11.81	-9.48	4449.86	0.9976
F6	0.25	0	0.75	556.22	213.21	18.77	-10.37	4955.36	0.9977
F7	0	0.75	0.25	344.82	138.84	13.98	-9.94	4685.72	0.9976
F8	0	0.50	0.50	534.39	204.91	18.11	-10.39	4948.74	0.9977
F9	0	0.25	0.75	845.86	307.42	23.78	-10.85	5221.62	0.9977
Three component blends									
F10	0.25	0.50	0.25	237.12	103.08	11.39	-9.51	4451.38	0.9985
F11	0.50	0.25	0.25	166.77	73.29	9.36	-9.06	4208.03	0.9974
F12	0.25	0.25	0.50	359.68	145.05	14.60	-9.89	4684.55	0.9977
F13	0.375	0.375	0.25	197.94	85.38	10.28	-9.27	4323.05	0.9976
F14	0.375	0.25	0.375	241.84	101.96	11.69	-9.43	4426.81	0.9975
F15	0.25	0.375	0.375	291.02	119.86	12.87	-9.68	4557.73	0.9976
F16	0.333	0.333	0.333	240.77	101.38	11.57	-9.46	4435.60	0.9975

Table A7.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-860.98	4422.23	0.9993	1.58	-9.50	0.9995	-864.86	4445.13	1.59	-9.55
L - H	x_L	-1926.08	5428.88	0.9992	3.40	-11.20	0.9993	-1949.14	5529.41	3.44	-11.40
M - H	x_M	-1071.80	5487.92	0.9999	1.82	-11.30	1.0000	-1084.28	5529.41	1.85	-11.40
Three component blends (first type)											
(F8) - L	x_L	-1393.59	4903.54	0.9996	2.47	-10.29	0.9993	-1407.00	4987.22	2.52	-10.48
(F5) - M	x_M	97.73	4402.65	0.9992	-0.32	-9.35	0.9977	-109.71	4554.84	0.13	-9.68
(F2) - H	x_H	1452.45	3956.73	0.9995	-2.49	-8.64	0.9992	1516.71	4012.70	-2.65	-8.76
Three component blends (second type)											
(x_M = 0.25)	x_L	-1906.08	5154.58	0.9978	3.32	-10.71	0.9961	-1949.14	5258.34	3.44	-10.94
(x_H = 0.25)	x_L	-973.40	4692.51	0.9990	1.80	-9.95	0.9985	-864.86	4716.20	1.59	-10.01
(x_L = 0.25)	x_M	-932.68	4914.31	0.9974	1.52	-10.26	0.9963	-1084.28	5042.13	1.85	-10.54

Table A8.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : G	1	0	0	58.12	28.96	5.12	-7.89	3547.91	0.9973
M :G	0	1	0	227.14	95.55	10.86	-9.54	4443.22	0.9975
H : B	0	0	1	1446.83	490.46	31.88	-11.51	5577.54	0.9976
Two component blends									
G1	0.75	0.25	0	79.43	38.04	6.10	-8.25	3748.19	0.9973
G2	0.50	0.50	0	111.03	50.92	7.33	-8.66	3969.09	0.9973
G3	0.25	0.75	0	157.05	69.11	8.88	-9.08	4196.84	0.9974
G4	0.75	0	0.25	115.43	53.05	7.65	-8.61	3963.92	0.9973
G5	0.50	0	0.50	245.18	103.14	11.82	-9.42	4430.00	0.9974
G6	0.25	0	0.75	563.26	215.26	18.86	-10.39	4966.37	0.9977
G7	0	0.75	0.25	347.34	139.75	14.02	-9.96	4692.43	0.9976
G8	0	0.50	0.50	542.84	207.81	18.23	-10.42	4962.47	0.9977
G9	0	0.25	0.75	871.94	316.28	24.00	-10.93	5254.46	0.9978
Three component blends									
G10	0.25	0.50	0.25	238.98	103.12	11.45	-9.51	4451.94	0.9983
G11	0.50	0.25	0.25	162.78	71.90	9.23	-9.04	4194.10	0.9975
G12	0.25	0.25	0.50	357.41	144.55	14.58	-9.88	4678.00	0.9977
G13	0.375	0.375	0.25	195.34	84.45	10.20	-9.26	4315.49	0.9976
G14	0.375	0.25	0.375	246.50	104.75	11.88	-9.43	4435.29	0.9978
G15	0.25	0.375	0.375	289.63	119.73	12.76	-9.71	4565.54	0.9977
G16	0.333	0.333	0.333	244.90	103.80	11.75	-9.46	4441.23	0.9977

Table A8.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-897.30	4420.02	0.9999	1.66	-9.49	1.0000	-895.31	4443.22	1.65	-9.54
L - H	x_L	-2004.90	5455.88	0.9984	3.56	-11.25	0.9973	-2029.63	5577.54	3.62	-11.51
M - H	x_M	-1124.06	5531.81	0.9995	1.94	-11.40	0.9991	-1134.32	5577.54	1.97	-11.51
Three component blends (first type)											
(G8) - L	x_L	-1484.90	4936.34	1.0000	2.66	-10.36	0.9979	-1462.47	5010.38	2.64	-10.53
(G5) - M	x_M	66.24	4418.91	0.9992	-0.32	-9.35	0.9977	-119.51	4562.73	0.16	-9.70
(G2) - H	x_H	1445.39	3956.45	0.9997	-2.49	-8.64	0.9999	1581.98	3995.57	-2.80	-8.72
Three component blends (second type)											
(x_M = 0.25)	x_L	-1935.60	5161.65	1.0000	3.36	-10.71	0.9983	-2029.63	5293.96	3.62	-11.02
(x_H = 0.25)	x_L	-1031.36	4707.27	0.9989	1.88	-9.97	0.9986	-895.31	4726.80	1.65	-10.03
(x_L = 0.25)	x_M	-904.24	4904.25	1.0000	1.48	-10.26	0.9978	-1134.32	5070.13	1.97	-10.61

Table A9.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : G	1	0	0	58.12	28.96	5.12	-7.89	3547.91	0.9973
M : G	0	1	0	227.14	95.55	10.86	-9.54	4443.22	0.9975
H : D	0	0	1	1375.51	472.53	31.36	-11.40	5529.41	0.9977
Two component blends									
H1	0.75	0.25	0	79.43	38.04	6.10	-8.25	3748.19	0.9973
H2	0.50	0.50	0	111.03	50.92	7.33	-8.66	3969.09	0.9973
H3	0.25	0.75	0	157.05	69.11	8.88	-9.08	4196.84	0.9974
H4	0.75	0	0.25	114.48	52.75	7.62	-8.60	3958.23	0.9974
H5	0.50	0	0.50	240.21	102.22	11.75	-9.38	4412.26	0.9977
H6	0.25	0	0.75	544.14	209.94	18.59	-10.33	4938.77	0.9978
H7	0	0.75	0.25	344.24	138.47	13.98	-9.93	4682.57	0.9976
H8	0	0.50	0.50	534.36	204.69	17.97	-10.43	4960.56	0.9977
H9	0	0.25	0.75	846.40	308.22	23.69	-10.87	5229.62	0.9978
Three component blends									
H10	0.25	0.50	0.25	234.17	106.89	11.42	-9.51	4455.12	0.9994
H11	0.50	0.25	0.25	162.36	71.61	9.21	-9.04	4192.75	0.9975
H12	0.25	0.25	0.50	352.47	142.45	14.46	-9.86	4668.63	0.9976
H13	0.375	0.375	0.25	194.28	83.85	10.21	-9.31	4344.45	0.9998
A14	0.375	0.25	0.375	242.30	108.47	11.84	-9.43	4437.94	0.9991
H15	0.25	0.375	0.375	286.43	118.05	12.72	-9.68	4551.39	0.9975
H16	0.333	0.333	0.333	240.00	107.50	11.69	-9.46	4443.33	0.9991

Table A9.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-897.30	4420.02	0.9999	1.66	-9.49	1.0000	-895.31	4443.22	1.65	-9.54
L - H	x_L	-1961.08	5416.96	0.9982	3.46	-11.16	0.9968	-1981.50	5529.41	3.51	-11.40
M - H	x_M	-1094.10	5504.63	0.9999	1.61	-11.26	0.9963	-1086.19	5529.41	1.86	-11.40
Three component blends (first type)											
(H8) - L	x_L	-1444.07	4917.13	0.9988	2.55	-10.32	0.9998	-1438.41	4986.32	2.58	-10.47
(H5) - M	x_M	68.99	4420.56	0.9996	-0.32	-9.35	0.9977	-95.44	4538.66	0.11	-9.65
(H2) - H	x_H	1304.27	4014.63	0.9991	-2.23	-8.74	0.9958	1533.85	3995.57	-2.69	-8.72
Three component blends (second type)											
(x_M = 0.25)	x_L	-1903.52	5146.93	0.9997	3.28	-10.67	0.9992	-1981.50	5257.86	3.51	-10.94
(x_H = 0.25)	x_L	-1049.48	4724.33	0.9919	1.88	-9.99	0.9927	-895.31	4714.77	1.65	-10.01
(x_L = 0.25)	x_M	-854.04	4878.64	0.9968	1.40	-10.21	0.9997	-1086.19	5034.04	1.86	-10.52

Table A10.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : G	1	0	0	58.12	28.96	5.12	-7.89	3547.91	0.9973
M : G	0	1	0	227.14	95.55	10.86	-9.54	4443.22	0.9975
H : J	0	0	1	1462.51	498.85	31.91	-11.56	5596.18	0.9979
Two component blends									
J1	0.75	0.25	0	79.43	38.04	6.10	-8.25	3748.19	0.9973
J2	0.50	0.50	0	111.03	53.70	7.33	-8.72	3994.30	0.9990
J3	0.25	0.75	0	157.05	69.11	8.88	-9.08	4196.84	0.9974
J4	0.75	0	0.25	121.04	57.23	7.86	-8.70	4009.91	0.9985
J5	0.50	0	0.50	243.68	103.51	11.81	-9.52	4476.92	0.9990
J6	0.25	0	0.75	561.73	215.34	18.88	-10.45	4992.82	0.9986
J7	0	0.75	0.25	345.52	149.18	13.96	-10.04	4724.35	0.9994
J8	0	0.50	0.50	543.96	207.92	18.17	-10.44	4970.30	0.9977
J9	0	0.25	0.75	860.16	316.31	23.93	-10.90	5243.91	0.9981
Three component blends									
J10	0.25	0.50	0.25	238.80	99.92	11.34	-9.52	4451.56	0.9974
J11	0.50	0.25	0.25	165.88	72.89	9.35	-9.04	4201.14	0.9974
J12	0.25	0.25	0.50	358.88	144.78	14.53	-9.91	4688.84	0.9977
J13	0.375	0.375	0.25	195.85	84.60	10.25	-9.25	4311.46	0.9975
J14	0.375	0.25	0.375	241.02	101.90	11.65	-9.43	4428.19	0.9976
J15	0.25	0.375	0.375	291.42	120.24	12.80	-9.72	4569.48	0.9977
J16	0.333	0.333	0.333	239.20	101.40	11.53	-9.46	4433.88	0.9977

Table A10.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-897.30	4428.43	0.9969	1.66	-9.51	0.9942	-895.31	4443.22	1.65	-9.54
L - H	x_L	-1965.83	5476.13	0.9992	3.50	-11.31	0.9987	-2048.27	5596.18	3.67	-11.56
M - H	x_M	-1039.12	5499.08	0.9991	1.72	-11.32	0.9984	-1152.92	5596.18	2.02	-11.56
Three component blends (first type)											
(J8) - L	x_L	-1461.87	4929.23	0.9984	2.69	-10.38	0.9968	-1471.79	5019.70	2.66	-10.55
(J5) - M	x_M	95.27	4403.49	0.9907	-0.36	-9.34	1.0000	-128.83	4572.05	0.19	-9.73
(J2) - H	x_H	1512.00	3932.23	0.9999	-2.65	-8.58	0.9998	1600.62	3995.57	-2.85	-8.72
Three component blends (second type)											
(x_M = 0.25)	x_L	-1950.80	5170.94	0.9984	3.48	-10.77	0.9964	-2048.27	5307.94	3.67	-11.06
(x_H = 0.25)	x_L	-1001.68	4697.02	0.9953	1.92	-9.99	0.9948	-895.31	4731.46	1.65	-10.05
(x_L = 0.25)	x_M	-949.12	4925.88	1.0000	1.56	-10.30	0.9998	-1152.96	5084.11	2.02	-10.64

Table A11.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	a	b	r^2
Lubricating oils									
L : G	1	0	0	58.12	28.96	5.12	-7.89	3547.91	0.9973
M : B	0	1	0	223.30	94.14	10.80	-9.50	4425.88	0.9975
H : J	0	0	1	1462.51	498.85	31.91	-11.56	5596.18	0.9979
Two component blends									
K1	0.75	0.25	0	79.01	38.02	6.24	-8.12	3705.76	0.9971
K2	0.50	0.50	0	109.53	50.65	7.32	-8.62	3953.48	0.9975
K3	0.25	0.75	0	155.64	131.82	8.86	-9.79	4496.57	0.9685
K4	0.75	0	0.25	115.18	52.97	7.63	-8.61	3964.95	0.9974
K5	0.50	0	0.50	243.60	102.84	11.74	-9.44	4432.21	0.9976
K6	0.25	0	0.75	561.54	214.95	18.82	-10.39	4965.65	0.9977
K7	0	0.75	0.25	341.13	137.84	13.90	-9.93	4679.39	0.9977
K8	0	0.50	0.50	538.96	205.91	18.04	-10.44	4966.79	0.9977
K9	0	0.25	0.75	867.42	314.14	23.89	-10.93	5252.75	0.9977
Three component blends									
K10	0.25	0.50	0.25	232.31	108.23	11.38	-9.51	4452.90	0.9997
K11	0.50	0.25	0.25	162.69	71.75	9.24	-9.03	4190.76	0.9974
K12	0.25	0.25	0.50	356.70	144.76	14.52	-9.89	4683.04	0.9978
K13	0.375	0.375	0.25	194.07	84.35	10.20	-9.24	4307.61	0.9977
K14	0.375	0.25	0.375	238.90	111.05	11.82	-9.43	4435.93	0.9997
K15	0.25	0.375	0.375	288.67	119.28	12.74	-9.70	4562.54	0.9977
K16	0.333	0.333	0.333	237.98	108.90	11.67	-9.46	4442.72	0.9995

Table A11.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	d	r^2	p	q	r^2	c	d	p	q
Two component blends											
L - M	x_L	-860.55	4400.83	0.9956	1.54	-9.43	0.9941	-877.27	4425.88	1.61	-9.50
L - H	x_L	-2001.40	5454.97	0.9985	3.56	-11.26	0.9985	-2048.27	5596.18	3.67	-11.56
M - H	x_M	-1146.72	5539.67	1.0000	2.00	-11.43	0.9999	-1170.30	5596.18	2.06	-11.56
Three component blends (first type)											
(K8) - L	x_L	-1490.24	4936.65	0.9999	2.66	-10.36	0.9991	-1463.12	5011.03	2.64	-10.53
(K5) - M	x_M	66.88	4419.71	0.9941	-0.32	-9.35	0.9977	-146.17	4572.05	0.23	-9.73
(K2) - H	x_H	1492.68	3938.93	0.9990	-2.60	-8.58	0.9999	1609.29	3986.90	2.87	-8.70
Three component blends (second type)											
(x_M = 0.25)	x_L	-1969.12	5175.00	1.0000	3.44	-10.74	0.9984	-2048.27	5303.61	3.67	-11.05
(x_H = 0.25)	x_L	-1048.56	4710.30	0.9961	1.92	-9.98	0.9948	-877.97	4718.46	1.61	-10.02
(x_L = 0.25)	x_M	-920.56	4911.37	0.9993	1.52	-10.27	1.0000	-1170.30	5084.11	2.06	-10.64

Table A12.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : B	1	0	0	60.85	30.40	5.22	-7.97	3585.90	0.9972
M : G	0	1	0	227.14	95.55	10.86	-9.54	4443.22	0.9975
H : J	0	0	1	1462.51	498.85	31.91	-11.56	5596.18	0.9979
Two component blends									
L1	0.75	0.25	0	82.74	39.54	6.22	-8.32	3781.24	0.9975
L2	0.50	0.50	0	112.76	52.04	7.42	-8.67	3977.27	0.9976
L3	0.25	0.75	0	155.20	69.91	8.95	-9.02	4176.46	0.9981
L4	0.75	0	0.25	120.40	54.90	7.75	-8.71	4006.75	0.9974
L5	0.50	0	0.50	252.04	105.98	11.95	-9.48	4456.39	0.9976
L6	0.25	0	0.75	572.39	218.65	19.01	-10.42	4979.18	0.9977
L7	0	0.75	0.25	345.52	142.56	13.96	-9.98	4702.83	0.9984
L8	0	0.50	0.50	543.96	211.01	18.17	-10.46	4977.29	0.9981
L9	0	0.25	0.75	870.16	319.08	23.93	-10.95	5261.02	0.9981
Three component blends									
L10	0.25	0.50	0.25	239.28	101.20	11.40	-9.52	4451.42	0.9977
L11	0.50	0.25	0.25	168.06	74.04	9.37	-9.09	4219.80	0.9976
L12	0.25	0.25	0.50	366.14	147.38	14.68	-9.94	4703.36	0.9977
L13	0.375	0.375	0.25	200.74	86.30	10.37	-9.29	4329.98	0.9975
L14	0.375	0.25	0.375	240.10	101.73	11.61	-9.44	4428.60	0.9977
L15	0.25	0.375	0.375	295.12	121.65	12.95	-9.71	4570.56	0.9977
L16	0.333	0.333	0.333	239.39	101.60	11.54	-9.46	4434.32	0.9977

Table A12.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-790.44	4373.54	1.0000	1.40	-9.37	1.0000	-857.32	4443.22	1.57	-9.54
L - H	x_L	-1944.86	5453.20	0.9981	3.42	-11.24	0.9967	-2010.28	5596.18	3.59	-11.56
M - H	x_M	-1116.38	5538.57	0.9999	1.94	-11.43	1.0000	-1152.96	5596.18	2.02	-11.56
Three component blends (first type)											
(L8) - L	x_L	-1385.95	4908.56	0.9960	2.44	-10.30	0.9936	-1433.80	5019.70	2.58	-10.55
(L5) - M	x_M	92.88	4404.58	0.9921	-0.33	-9.36	0.9920	-147.82	4591.04	0.23	-9.77
(L2) - H	x_H	1501.46	3943.94	0.9967	-2.64	-8.61	0.9941	1581.62	4014.56	-2.81	-8.76
Three component blends (second type)											
(x_M = 0.25)	x_L	-1934.24	5175.93	0.9938	3.40	-10.77	0.9897	-2010.28	5307.94	3.59	-11.06
(x_H = 0.25)	x_L	-926.48	4681.16	0.9992	1.72	-9.94	0.9984	-857.32	4731.46	1.57	-10.05
(x_L = 0.25)	x_M	-1007.76	4953.02	0.9990	1.68	-10.35	0.9970	-1152.96	5093.61	2.02	-10.66

Table A13.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : C	1	0	0	61.15	30.11	5.22	-7.99	3592.52	0.9972
M : G	0	1	0	227.14	95.55	10.86	-9.54	4443.22	0.9975
H : J	0	0	1	1462.51	498.85	31.91	-11.56	5596.18	0.9979
Two component blends									
M1	0.75	0.25	0	82.92	39.56	6.22	-8.33	3783.92	0.9974
M2	0.50	0.50	0	114.25	52.40	7.44	-8.71	3990.98	0.9975
M3	0.25	0.75	0	159.39	70.24	8.95	-9.11	4208.59	0.9975
M4	0.75	0	0.25	120.88	55.20	7.81	-8.69	4001.48	0.9974
M5	0.50	0	0.50	253.31	106.61	11.98	-9.49	4460.84	0.9976
M6	0.25	0	0.75	572.78	219.65	19.01	-10.43	4982.11	0.9979
M7	0	0.75	0.25	345.52	142.56	13.96	-9.98	4702.83	0.9984
M8	0	0.50	0.50	543.96	211.01	18.17	-10.46	4977.29	0.9981
M9	0	0.25	0.75	870.16	319.08	23.93	-10.95	5261.02	0.9981
Three component blends									
M10	0.25	0.50	0.25	240.23	103.50	11.47	-9.52	4456.75	0.9983
M11	0.50	0.25	0.25	169.20	74.12	9.42	-9.08	4219.40	0.9974
M12	0.25	0.25	0.50	366.00	147.63	14.80	-9.90	4690.74	0.9977
M13	0.375	0.375	0.25	199.90	86.36	10.32	-9.30	4333.32	0.9977
M14	0.375	0.25	0.375	247.12	105.90	11.95	-9.42	4433.91	0.9980
M15	0.25	0.375	0.375	297.01	122.57	13.00	-9.72	4575.15	0.9977
M16	0.333	0.333	0.333	244.82	104.00	11.74	-9.46	4443.13	0.9978

Table A13.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-849.34	4419.16	0.9998	1.56	-9.49	0.9998	-850.70	4443.22	1.55	-9.54
L - H	x_L	-1961.26	5462.10	0.9987	3.48	-11.27	0.9978	-2003.66	5596.18	3.57	-11.56
M - H	x_M	-1116.38	5538.57	0.9999	1.94	-11.43	1.0000	-1152.96	5596.18	2.02	-11.56
Three component blends (first type)											
(M8) - L	x_L	-1410.99	4921.93	0.9981	2.52	-10.33	0.9930	-1427.18	5019.70	2.56	-10.55
(M5) - M	x_M	89.95	4412.13	0.9935	-0.39	-9.32	0.9941	-151.13	4594.35	0.24	-9.78
(M2) - H	x_H	1437.31	3970.19	0.9992	-2.43	-8.67	0.9949	1578.31	4017.87	-2.80	-8.77
Three component blends (second type)											
(x_M = 0.25)	x_L	-1885.35	5155.02	0.9973	3.28	-10.70	0.9904	-2003.66	5307.94	3.57	-11.06
(x_H = 0.25)	x_L	-949.40	4692.52	0.9995	1.76	-9.96	1.0000	-850.70	4731.46	1.55	-10.05
(x_L = 0.25)	x_M	-935.96	4925.20	1.0000	1.52	-10.28	0.9991	-1152.96	5095.27	2.02	-10.67

Table A14.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : C	1	0	0	61.15	30.11	5.22	-7.99	3592.52	0.9972
M : B	0	1	0	223.30	94.14	10.80	-9.50	4425.88	0.9975
H : C	0	0	1	1444.68	489.71	31.78	-11.52	5580.16	0.9977
Two component blends									
N1	0.75	0.25	0	82.80	39.47	6.23	-8.32	3778.65	0.9973
N2	0.50	0.50	0	113.74	51.99	7.42	-8.70	3986.53	0.9973
N3	0.25	0.75	0	157.87	69.87	8.91	-9.09	4202.48	0.9976
N4	0.75	0	0.25	120.76	55.17	7.79	-8.70	4004.20	0.9974
N5	0.50	0	0.50	252.90	107.09	12.04	-9.46	4453.18	0.9978
N6	0.25	0	0.75	573.83	219.34	19.09	-10.41	4976.79	0.9977
N7	0	0.75	0.25	342.04	138.83	13.96	-9.92	4678.89	0.9978
N8	0	0.50	0.50	537.70	206.43	18.08	-10.42	4961.82	0.9978
N9	0	0.25	0.75	867.81	315.38	23.92	-10.92	5253.12	0.9978
Three component blends									
N10	0.25	0.50	0.25	239.46	100.81	11.39	-9.52	4451.84	0.9976
N11	0.50	0.25	0.25	168.03	73.92	9.39	-9.08	4215.43	0.9975
N12	0.25	0.25	0.50	364.32	146.92	14.64	-9.93	4700.64	0.9978
N13	0.375	0.375	0.25	202.84	87.05	10.43	-9.30	4336.56	0.9975
N14	0.375	0.25	0.375	242.10	102.40	11.70	-9.43	4428.69	0.9976
N15	0.25	0.375	0.375	293.70	121.13	12.93	-9.70	4565.59	0.9976
N16	0.333	0.333	0.333	239.96	102.00	11.57	-9.46	4434.71	0.9978

Table A14.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-847.66	4413.05	0.9999	1.54	-9.47	0.9999	-833.36	4425.88	1.51	-9.50
L - H	x_L	-1945.18	5450.64	0.9980	3.42	-11.23	0.9959	-1987.64	5580.16	3.53	-11.52
M - H	x_M	-1148.46	5538.84	0.9999	2.00	-11.42	1.0000	-1154.28	5580.16	2.02	-11.52
Three component blends (first type)											
(N8) - L	x_L	-1388.01	4906.31	0.9978	2.45	-10.30	0.9962	-1410.50	5003.02	2.52	-10.51
(N5) - M	x_M	94.04	4404.47	0.9938	-0.36	-9.34	1.0000	-160.46	4586.34	0.25	-9.76
(N2) - H	x_H	1475.94	3957.82	0.9953	-2.56	-8.64	0.9928	1570.96	4009.20	-2.78	-8.75
Three component blends (second type)											
(x_M = 0.25)	x_L	-1940.84	5176.07	0.9951	3.40	-10.76	0.9897	-1987.64	5291.59	3.53	-11.02
(x_H = 0.25)	x_L	-945.64	4689.23	0.9998	1.76	-9.96	1.0000	-833.36	4714.45	1.51	-10.01
(x_L = 0.25)	x_M	-995.20	4945.89	0.9976	1.64	-10.33	0.9951	-1154.28	5083.25	2.02	-10.64

Table A15.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : P	1	0	0	58.36	29.08	5.13	-7.90	3551.38	0.9973
M : P	0	1	0	235.71	98.83	11.03	-9.61	4475.99	0.9976
H : P	0	0	1	1333.04	459.64	30.50	-11.41	5525.49	0.9978
Two component blends									
P1	0.75	0.25	0	80.65	38.61	6.15	-8.28	3759.31	0.9974
P2	0.50	0.50	0	112.87	51.94	7.43	-8.67	3975.30	0.9975
P3	0.25	0.75	0	161.49	70.91	9.04	-9.10	4211.81	0.9974
P4	0.75	0	0.25	114.23	52.71	7.62	-8.59	3955.41	0.9974
P5	0.50	0	0.50	237.48	101.31	11.62	-9.39	4412.95	0.9978
P6	0.25	0	0.75	536.28	206.51	18.34	-10.34	4936.24	0.9977
P7	0	0.75	0.25	352.62	141.43	14.06	-10.00	4710.48	0.9976
P8	0	0.50	0.50	536.17	205.66	17.94	-10.45	4969.26	0.9978
P9	0	0.25	0.75	833.04	305.16	23.44	-10.87	5223.97	0.9979
Three component blends									
P10	0.25	0.50	0.25	236.80	100.00	11.28	-9.52	4450.97	0.9998
P11	0.50	0.25	0.25	162.42	71.97	9.26	-9.01	4186.90	0.9976
P12	0.25	0.25	0.50	350.75	142.24	14.32	-9.90	4677.97	0.9978
P13	0.375	0.375	0.25	194.86	84.45	10.23	-9.24	4308.04	0.9976
P14	0.375	0.25	0.375	236.93	100.72	11.48	-9.44	4426.93	0.9977
P15	0.25	0.375	0.375	285.83	118.64	12.68	-9.69	4556.43	0.9978
P16	0.333	0.333	0.333	236.91	100.25	11.42	-9.46	4432.98	0.9976

Table A13.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-905.00	4434.64	0.9993	1.64	-9.50	0.9992	-924.61	4475.99	1.71	-9.61
L - H	x_L	-1961.66	5415.69	0.9985	3.50	-11.91	0.9976	-1974.11	5525.49	3.51	-11.41
M - H	x_M	-1026.98	5481.39	1.0000	1.74	-11.31	0.9996	-1049.50	5525.49	1.80	-11.41
Three component blends (first type)											
(P8) - L	x_L	-1477.46	4925.47	1.0000	2.72	-10.37	1.0000	-1449.36	5000.74	2.61	-10.51
(P5) - M	x_M	97.83	4401.64	0.9923	-0.33	-9.36	0.9920	-62.44	4538.44	0.05	-9.66
(P2) - H	x_H	1477.89	3939.48	1.0000	-2.64	-8.58	1.0000	1511.81	4013.69	-2.66	-8.76
Three component blends (second type)											
(x_M = 0.25)	x_L	-1964.28	5167.20	0.9998	3.56	-10.79	0.9996	-1974.11	5263.12	3.51	-10.96
(x_H = 0.25)	x_L	-1056.28	4711.41	0.9977	2.04	-10.02	0.9968	-924.61	4738.37	1.71	-10.06
(x_L = 0.25)	x_M	-908.00	4902.29	0.9983	1.52	-10.27	0.9963	-1049.50	5031.96	1.80	-10.53

Table A16.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : P	1	0	0	58.36	29.08	5.13	-7.90	3551.38	0.9973
M : P	0	1	0	235.71	98.83	11.03	-9.61	4475.99	0.9976
H : B	0	0	1	1446.83	459.64	31.88	-11.51	5577.54	0.9976
Two component blends									
Q1	0.75	0.25	0	80.65	39.40	6.15	-8.30	3768.92	0.9982
Q2	0.50	0.50	0	112.87	51.94	7.43	-8.67	3975.30	0.9975
Q3	0.25	0.75	0	161.49	70.91	9.04	-9.10	4211.81	0.9974
Q4	0.75	0	0.25	123.82	56.64	7.99	-8.67	4004.29	0.9975
Q5	0.50	0	0.50	249.96	105.41	11.77	-9.53	4468.76	0.9978
Q6	0.25	0	0.75	581.71	221.15	19.24	-10.42	4983.50	0.9976
Q7	0	0.75	0.25	357.35	143.72	14.16	-10.02	4721.74	0.9978
Q8	0	0.50	0.50	554.14	211.06	18.30	-10.48	4986.83	0.9977
Q9	0	0.25	0.75	876.23	316.63	24.14	-10.91	5251.21	0.9977
Three component blends									
Q10	0.25	0.50	0.25	239.84	101.20	11.42	-9.51	4451.25	0.9977
Q11	0.50	0.25	0.25	165.33	72.85	9.35	-9.03	4197.15	0.9975
Q12	0.25	0.25	0.50	362.57	146.52	14.61	-9.93	4697.22	0.9978
Q13	0.375	0.375	0.25	198.14	85.44	10.27	-9.28	4326.07	0.9976
Q14	0.375	0.25	0.375	242.00	101.90	11.68	-9.43	4428.64	0.9977
Q15	0.25	0.375	0.375	294.71	121.52	12.88	-9.73	4577.15	0.9977
Q16	0.333	0.333	0.333	241.51	101.86	11.61	-9.46	4435.77	0.9977

Table A16.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-885.78	4428.23	0.9985	1.60	-9.49	0.9981	-924.61	4475.99	1.71	-9.61
L - H	x_L	-1958.42	5464.73	0.9991	3.50	-11.29	0.9999	-2026.16	5577.54	3.61	-11.51
M - H	x_M	-1058.94	5516.06	1.0000	1.78	-11.36	0.9996	-1101.55	5577.54	1.90	-11.51
Three component blends (first type)											
(Q8) - L	x_L	-1506.86	4947.33	0.9980	2.77	-10.41	0.9964	-1475.39	5026.77	2.66	-10.56
(Q5) - M	x_M	90.77	4405.79	0.9997	-0.32	-9.35	0.9977	-88.47	4564.46	0.10	-9.71
(Q2) - H	x_H	1496.28	3946.20	0.9984	-2.63	-8.61	0.9963	1563.86	4013.69	-2.76	-8.76
Three component blends (second type)											
(x_M = 0.25)	x_L	-2000.28	5191.11	0.9982	3.60	-10.81	0.9959	-2026.16	5302.15	3.61	-11.04
(x_H = 0.25)	x_L	-1016.40	4705.97	0.9999	1.92	-9.99	0.9994	-924.61	4751.38	1.71	-10.09
(x_L = 0.25)	x_M	-983.88	4944.16	0.9998	1.68	-10.35	0.9992	-1101.55	5071.00	1.90	-10.61

Table A17.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : E	1	0	0	60.50	29.90	5.21	-7.96	3580.27	0.9997
M : P	0	1	0	235.71	98.83	11.03	-9.61	4475.99	0.9976
H : P	0	0	1	1333.04	459.64	30.50	-11.41	5525.49	0.9978
Two component blends									
R1	0.75	0.25	0	82.64	39.34	6.21	-8.32	3780.05	0.9973
R2	0.50	0.50	0	114.72	52.62	7.48	-8.70	3989.01	0.9974
R3	0.25	0.75	0	163.39	71.44	9.03	-9.16	4230.23	0.9974
R4	0.75	0	0.25	117.72	53.94	7.68	-8.67	3987.60	0.9974
R5	0.50	0	0.50	242.85	102.63	11.64	-9.47	4441.44	0.9977
R6	0.25	0	0.75	543.46	208.83	18.40	-10.38	4951.25	0.9978
R7	0	0.75	0.25	352.62	141.43	14.06	-10.00	4710.48	0.9976
R8	0	0.50	0.50	536.17	205.66	17.94	-10.45	4969.26	0.9978
R9	0	0.25	0.75	833.04	305.16	23.44	-10.87	5223.97	0.9979
Three component blends									
R10	0.25	0.50	0.25	239.09	107.00	11.52	-9.52	4460.24	0.9992
R11	0.50	0.25	0.25	166.25	73.24	9.32	-9.07	4211.04	0.9975
R12	0.25	0.25	0.50	356.03	143.98	14.39	-9.93	4692.72	0.9978
R13	0.375	0.375	0.25	198.53	85.72	10.28	-9.29	4328.28	0.9976
R14	0.375	0.25	0.375	242.95	108.30	11.87	-9.43	4436.16	0.9990
R15	0.25	0.375	0.375	289.40	119.34	12.68	-9.74	4573.14	0.9977
R16	0.333	0.333	0.333	241.30	107.90	11.73	-9.46	4445.70	0.9991

Table A17.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-900.36	4449.94	0.9983	-1.68	-9.57	0.9970	-895.72	4475.99	1.65	-9.61
L - H	x_L	-1927.30	5423.75	0.9989	3.42	-11.22	0.9986	-1945.22	5525.49	3.45	-11.41
M - H	x_M	-1026.98	5481.39	1.0000	1.74	-11.31	0.9996	-1049.50	5525.49	1.80	-11.41
Three component blends (first type)											
(R8) - L	x_L	-1442.16	4930.58	0.9995	2.63	-10.37	0.9906	-1420.47	5000.74	2.55	-10.51
(R5) - M	x_M	94.99	4413.08	0.9948	-0.36	-9.34	1.0000	-76.89	4552.88	0.08	-9.69
R2) - H	x_H	1460.85	3961.53	0.9999	-2.60	-8.62	0.9947	1497.36	4028.13	-2.63	-8.79
Three component blends (second type)											
(x_M = 0.25)	x_L	-1926.72	5169.16	0.9986	3.44	-10.77	0.9912	-1945.22	5263.12	3.45	-10.96
(x_H = 0.25)	x_L	-996.80	4706.99	0.9988	1.80	-9.97	0.9998	-895.72	4738.37	1.65	-10.06
(x_L = 0.25)	x_M	-929.92	4924.09	0.9997	1.64	-10.35	0.9982	-1049.50	5039.19	1.80	-10.55

Table A18.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : P	1	0	0	58.36	29.08	5.13	-7.90	3551.38	0.9973
M : C	0	1	0	227.18	95.60	10.85	-9.55	4445.13	0.9975
H : P	0	0	1	1333.04	459.64	30.50	-11.41	5525.49	0.9978
Two component blends									
S1	0.75	0.25	0	79.95	38.30	6.12	-8.26	3753.51	0.9973
S2	0.50	0.50	0	111.30	51.08	7.34	-8.67	3971.12	0.9973
S3	0.25	0.75	0	158.21	69.28	8.86	-9.12	4209.86	0.9973
S4	0.75	0	0.25	114.23	52.71	7.62	-8.59	3955.41	0.9974
S5	0.50	0	0.50	237.48	101.31	11.62	-9.39	4412.95	0.9978
S6	0.25	0	0.75	536.28	206.51	18.34	-10.34	4936.24	0.9977
S7	0	0.75	0.25	341.71	138.15	13.81	-9.97	4692.73	0.9978
S8	0	0.50	0.50	527.06	202.24	17.76	-10.43	4958.18	0.9978
S9	0	0.25	0.75	826.12	302.29	23.20	-10.88	5226.56	0.9979
Three component blends									
S10	0.25	0.50	0.25	231.00	110.25	11.35	-9.52	4459.54	0.9999
S11	0.50	0.25	0.25	161.35	71.40	9.09	-9.08	4205.29	0.9977
S12	0.25	0.25	0.50	348.30	141.39	14.25	-9.89	4675.09	0.9978
S13	0.375	0.375	0.25	194.44	84.91	10.15	-9.28	4320.73	0.9979
S14	0.375	0.25	0.375	236.10	110.81	11.71	-9.44	4436.60	0.9998
S15	0.25	0.375	0.375	284.08	117.61	12.62	-9.69	4552.97	0.9977
S16	0.333	0.333	0.333	234.11	110.43	11.58	-9.46	4443.30	0.9998

Table A18.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-912.70	4434.51	0.9993	1.72	-9.54	0.9993	-893.75	4445.13	1.65	-9.55
L - H	x_L	-1961.66	5415.69	0.9985	3.50	-11.19	0.9976	-1975.11	5525.49	3.51	-11.41
M - H	x_M	-1067.66	5492.98	1.0000	1.82	-11.33	1.0000	-1080.36	5525.49	1.86	-11.41
Three component blends (first type)											
(S8) - L	x_L	-1395.69	4904.37	0.9997	2.42	-10.28	0.9974	-1433.93	4985.31	2.58	-10.48
(S5) - M	x_M	92.55	4413.07	0.9981	-0.33	-9.36	0.9920	-93.30	4538.44	0.11	-9.66
(S2) - H	x_H	1413.19	3969.55	0.9998	-2.46	-8.66	0.9983	1527.24	3998.26	-2.69	-8.73
Three component blends (second type)											
(x_M = 0.25)	x_L	-1879.20	5143.69	0.9999	3.24	-10.69	0.9959	-1974.11	5255.40	3.51	-10.95
(x_H = 0.25)	x_L	-1017.00	4709.90	0.9972	1.76	-9.95	0.9973	-893.75	4715.22	1.65	-10.02
(x_L = 0.25)	x_M	-862.20	4885.86	0.9941	1.48	-10.26	0.9978	-1080.36	5031.96	1.86	-10.53

Table A19.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : T	1	0	0	58.30	29.04	5.14	-7.88	3546.46	0.9973
M : T	0	1	0	236.32	99.12	11.13	-9.58	4465.87	0.9976
H : T	0	0	1	1372.11	470.52	31.24	-11.40	5530.73	0.9977
Two component blends									
T1	0.75	0.25	0	80.78	38.58	6.14	-8.29	3763.35	0.9973
T2	0.50	0.50	0	113.46	52.08	7.42	-8.69	3984.58	0.9974
T3	0.25	0.75	0	162.28	71.54	9.05	-9.12	4219.71	0.9976
T4	0.75	0	0.25	115.10	53.93	7.76	-8.54	3945.72	0.9979
T5	0.50	0	0.50	240.83	102.10	11.73	-9.40	4417.31	0.9976
T6	0.25	0	0.75	545.72	209.87	18.69	-10.31	4933.30	0.9977
T7	0	0.75	0.25	355.69	144.28	14.14	-10.02	4720.61	0.9980
T8	0	0.50	0.50	545.88	208.52	18.25	-10.43	4968.60	0.9977
T9	0	0.25	0.75	852.00	311.10	23.79	-10.88	5234.77	0.9979
Three component blends									
T10	0.25	0.50	0.25	239.53	100.58	11.39	-9.52	4451.08	0.9975
T11	0.50	0.25	0.25	165.43	72.82	9.38	-9.02	4192.52	0.9974
T12	0.25	0.25	0.50	358.94	144.89	14.60	-9.89	4681.71	0.9977
T13	0.375	0.375	0.25	203.44	87.28	10.52	-9.26	4327.41	0.9974
T14	0.375	0.25	0.375	239.81	101.42	11.59	-9.44	4428.55	0.9976
T15	0.25	0.375	0.375	294.78	121.43	12.93	-9.71	4570.88	0.9976
T16	0.333	0.333	0.333	239.36	101.12	11.52	-9.46	4434.70	0.9976

Table A19.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-912.72	4445.57	0.9997	1.66	-9.53	0.9996	-919.41	4465.87	1.70	-9.58
L - H	x_L	-1975.16	5419.69	0.9993	3.54	-11.19	0.9997	-1984.27	5530.73	3.52	-11.40
M - H	x_M	-1028.32	5488.82	0.9996	1.72	-11.30	0.9993	-1064.86	5530.73	1.82	-11.40
Three component blends (first type)											
(T8) - L	x_L	-1502.60	4941.94	0.9990	2.74	-10.39	0.9988	-1451.84	4998.30	2.61	-10.49
(T5) - M	x_M	91.27	4405.16	0.9958	-0.32	-9.36	0.9920	-72.72	4538.60	0.06	-9.64
(T2) - H	x_H	1426.13	3966.44	0.9990	-2.53	-8.62	0.9997	1524.57	4006.17	-2.67	-8.73
Three component blends (second type)											
(x_M = 0.25)	x_L	-1956.76	5168.04	0.9996	3.48	-10.76	0.9996	-1984.27	5264.52	3.52	-10.95
(x_H = 0.25)	x_L	-1034.24	4711.51	0.9994	2.00	-10.02	0.9995	-919.41	4732.09	1.70	-10.04
(x_L = 0.25)	x_M	-922.52	4913.84	0.9995	1.48	-10.26	0.9998	-1064.86	5034.66	1.82	-10.52

Table A20.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : T	1	0	0	58.30	29.04	5.14	-7.88	3546.46	0.9973
M : T	0	1	0	236.32	99.12	11.13	-9.58	4465.87	0.9976
H : C	0	0	1	1444.68	489.71	31.78	-11.52	5580.16	0.9977
Two component blends									
U1	0.75	0.25	0	80.78	38.55	6.14	-8.29	3762.98	0.9973
U2	0.50	0.50	0	113.46	51.88	7.42	-8.69	3982.76	0.9973
U	0.25	0.75	0	162.28	70.95	9.05	-9.12	4215.78	0.9973
U4	0.75	0	0.25	115.89	53.32	7.70	-8.59	3960.39	0.9973
U5	0.50	0	0.50	244.70	103.12	11.77	-9.44	4434.48	0.9975
U6	0.25	0	0.75	563.35	215.29	18.87	-10.39	4965.77	0.9977
U7	0	0.75	0.25	358.67	143.16	14.18	-10.02	4721.77	0.9976
U8	0	0.50	0.50	556.95	211.93	18.41	-10.54	5008.48	0.9978
U9	0	0.25	0.75	883.72	319.05	24.08	-10.96	5268.35	0.9977
Three component blends									
U10	0.25	0.50	0.25	240.56	106.14	11.55	-9.52	4459.14	0.9989
U11	0.50	0.25	0.25	165.36	72.84	9.34	-9.04	4199.00	0.9975
U12	0.25	0.25	0.50	363.88	146.48	14.63	-9.93	4698.95	0.9977
U13	0.375	0.375	0.25	199.32	85.47	10.33	-9.27	4323.60	0.9974
U14	0.375	0.25	0.375	250.28	107.70	12.04	-9.44	4444.18	0.9982
U15	0.25	0.375	0.375	295.20	121.23	12.97	-9.70	4566.76	0.9975
U16	0.333	0.333	0.333	249.56	107.16	11.97	-9.46	4447.88	0.9982

Table A20.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-905.60	4439.97	0.9997	1.66	-9.53	0.9996	-919.41	4465.87	1.70	-9.58
L - H	x_L	-2010.76	5458.93	0.9989	3.60	-11.27	0.9990	-2033.70	5580.16	3.64	-11.52
M - H	x_M	-1093.16	5546.11	0.9992	1.88	-11.45	0.9962	-1114.29	5580.16	1.94	-11.52
Three component blends (first type)											
(U8) - L	x_L	-1473.82	4936.59	0.9999	2.62	-10.35	0.9987	-1476.56	5023.02	2.67	-10.55
(U5) - M	x_M	60.93	4428.40	0.9915	-0.33	-9.36	0.9920	-97.44	4563.31	0.12	-9.70
(U2) - H	x_H	1501.69	3948.03	1.0000	-2.67	-8.59	0.9976	1574.00	4006.17	-2.79	-8.73
Three component blends (second type)											
(x_M = 0.25)	x_L	-1999.80	5197.30	0.9999	3.56	-10.81	0.9966	-2033.70	5301.59	3.64	-11.04
(x_H = 0.25)	x_L	-1040.56	4717.46	0.9994	1.92	-10.00	0.9994	-919.41	4744.44	1.70	-10.07
(x_L = 0.25)	x_M	-959.24	4934.67	0.9965	1.64	-10.33	0.9951	-1114.29	5071.74	1.94	-10.61

Table A21.1 : Kinematic viscosities and the parameters of the individual lubricating base oils and their blends at three temperatures.

Blend number	Composition (weight fraction)			Kinematic viscosity (cSt)			Correlation parameters		
	x_L	x_M	x_H	25°C	40°C	100°C	*a*	*b*	r^2
Lubricating oils									
L : T	1	0	0	58.30	29.04	5.14	-7.88	3546.46	0.9973
M : P	0	1	0	235.71	98.83	11.03	-9.61	4475.99	0.9976
H : T	0	0	1	1372.11	470.52	31.24	-11.40	5530.73	0.9977
Two component blends									
V1	0.75	0.25	0	80.46	38.52	6.16	-8.26	3752.96	0.9973
V2	0.50	0.50	0	113.20	51.76	7.42	-8.68	3979.08	0.9973
V3	0.25	0.75	0	161.44	70.75	9.02	-9.11	4213.92	0.9974
V4	0.75	0	0.25	115.10	53.93	7.76	-8.54	3945.72	0.9979
V5	0.50	0	0.50	240.83	102.10	11.73	-9.40	4417.31	0.9976
V6	0.25	0	0.75	545.72	209.87	18.69	-10.31	4933.30	0.9977
V7	0	0.75	0.25	353.92	142.19	14.11	-10.00	4711.49	0.9977
V8	0	0.50	0.50	545.17	207.59	18.13	-10.46	4975.55	0.9976
V9	0	0.25	0.75	849.72	310.08	23.80	-10.87	5229.47	0.9978
Three component blends									
V10	0.25	0.50	0.25	237.96	100.25	11.32	-9.52	4451.98	0.9976
V11	0.50	0.25	0.25	164.04	72.20	9.30	-9.03	4192.67	0.9974
V12	0.25	0.25	0.50	356.17	144.04	14.54	-9.88	4676.80	0.9977
V13	0.375	0.375	0.25	196.83	84.93	10.27	-9.26	4315.79	0.9975
V14	0.375	0.25	0.375	239.39	101.07	11.56	-9.44	4429.08	0.9975
V15	0.25	0.375	0.375	293.00	120.50	12.86	-9.71	4569.10	0.9976
V16	0.333	0.333	0.333	238.94	100.81	11.49	-9.47	4435.44	0.9976

Table A21.2 : Linear parameters obtained from experimental and prediction

Blend number	x_i	Experimental						Prediction			
		c	*d*	r^2	*p*	*q*	r^2	*c*	*d*	*p*	*q*
Two component blends											
L - M	x_L	-921.92	4442.95	0.9999	1.70	-9.53	1.0000	-929.53	4475.99	1.73	-9.61
L - H	x_L	-1975.16	5419.69	0.9993	3.54	-11.19	0.9997	-1984.27	5530.73	3.52	-11.40
M - H	x_M	-1035.96	5490.15	0.9999	1.74	-11.31	0.9989	-1054.74	5530.73	1.79	-11.40
Three component blends (first type)											
(T8) - L	x_L	-1498.22	4939.93	0.9993	2.71	-10.38	0.9995	-1456.90	5003.36	2.63	-10.51
(T5) - M	x_M	92.67	4405.38	0.9964	-0.32	-9.36	0.9977	-62.60	4538.60	0.03	-9.64
(T2) - H	x_H	1444.22	3954.65	1.0000	-2.48	-8.64	0.9999	1519.51	4011.23	-2.66	-8.75
Three component blends (second type)											
(x_M = 0.25)	x_L	-1936.52	5159.05	0.9998	3.40	-10.73	0.9996	-1984.27	5267.05	3.52	-10.95
(x_H = 0.25)	x_L	-1037.24	4709.11	0.9992	1.96	-10.01	0.9988	-929.53	4739.68	1.73	-10.06
(x_L = 0.25)	x_M	-899.28	4903.19	0.9994	1.44	-10.24	0.9990	-1054.74	5034.66	1.79	-10.52

Table A22 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : B	60.99	30.04	5.22
M : B	223.30	94.14	10.80
H : B	1446.83	490.46	31.88
Two component blends			
VB1	82.72	39.41	6.23
VB2	113.29	54.68	7.42
VB3	158.24	69.78	8.89
VB4	120.35	54.73	7.74
VB5	252.48	105.65	11.94
VB6	571.41	218.19	18.97
VB7	354.20	152.74	14.16
VB8	541.90	207.66	18.12
VB9	867.21	316.00	23.94
Three component blends			
VB10	236.88	99.70	11.29
VB11	166.02	73.28	9.32
VB12	363.25	145.64	14.66
VB13	198.55	85.48	10.31
VB14	244.34	100.12	11.79
VB15	293.34	120.42	12.84
VB16	242.35	100.54	11.61

Table A23 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : C	61.15	30.11	5.22
M : C	227.18	95.60	10.85
H : C	1444.68	489.71	31.78
Two component blends			
VC1	84.63	40.31	6.30
VC2	115.02	52.74	7.44
VC3	128.91	70.63	8.94
VC4	149.43	54.91	7.76
VC5	254.58	107.07	12.02
VC6	576.09	219.98	19.05
VC7	353.32	142.47	14.10
VC8	540.42	206.81	18.07
VC9	832.56	304.03	23.03
Three component blends			
VC10	237.17	99.78	11.33
VC11	168.86	73.93	9.40
VC12	324.32	132.19	13.63
VC13	202.90	87.16	10.39
VC14	247.06	103.86	11.67
VC15	298.35	122.68	13.02
VC16	249.48	104.88	11.70

Table A24 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : E	60.50	29.90	5.21
M : C	227.18	95.60	10.85
H : D	1375.51	472.53	31.37
Two component blends			
VF1	83.63	39.74	6.28
VF2	113.39	51.86	7.39
VF3	159.37	70.13	8.91
VF4	114.90	52.88	7.59
VF5	238.24	101.66	11.67
VF6	547.80	211.32	18.70
VF7	340.24	137.92	13.86
VF8	523.52	201.68	17.83
VF9	815.32	299.55	23.20
Three component blends			
VF10	235.44	99.40	11.32
VF11	164.40	72.33	9.28
VF12	353.14	143.46	14.40
VF13	195.31	84.40	10.26
VF14	239.95	101.58	11.58
VF15	283.23	117.46	12.64
VF16	240.15	101.68	11.49

Table A25 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : G	58.12	28.96	5.12
M : G	227.14	95.55	10.86
H : J	1462.51	498.85	31.91
Two component blends			
VJ1	79.52	37.93	6.10
VJ2	109.51	50.25	7.28
VJ3	155.57	68.41	8.80
VJ4	121.04	55.23	7.86
VJ5	243.68	103.51	11.81
VJ6	561.73	215.34	18.88
VJ7	354.16	142.56	14.15
VJ8	553.16	211.01	18.29
VJ9	875.59	319.08	24.11
Three component blends			
VJ10	234.16	99.01	11.29
VJ11	165.88	72.89	9.35
VJ12	358.33	144.63	14.48
VJ13	195.85	84.60	10.25
VJ14	242.14	102.31	11.61
VJ15	291.42	120.24	12.80
VJ16	238.93	101.07	11.47

Table A26 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperature

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : B	60.85	30.04	5.22
M : G	227.14	95.55	10.86
H : J	1462.51	498.85	31.91
Two component blends			
VL1	82.74	39.32	6.22
VL2	112.76	51.57	7.37
VL3	155.20	68.33	8.80
VL4	116.82	53.52	7.66
VL5	245.10	103.31	11.75
VL6	540.74	207.79	18.44
VL7	354.16	142.56	14.15
VL8	553.16	211.01	18.29
VL9	875.59	319.08	24.11
Three component blends			
VL10	232.66	98.06	11.22
VL11	166.56	73.18	9.30
VL12	356.77	143.79	14.42
VL13	200.74	86.30	10.37
VL14	240.01	100.92	11.49
VL15	286.97	118.33	12.70
VL16	239.39	100.89	11.43

Table A27 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : C	61.15	30.11	5.22
M : B	223.30	94.14	10.80
H : C	1444.68	489.71	31.78
Two component blends			
VN1	83.86	39.88	6.26
VN2	112.92	51.68	7.46
VN3	159.54	70.28	8.96
VN4	149.43	54.91	7.76
VN5	254.58	107.07	12.02
VN6	576.09	219.98	19.05
VN7	353.81	142.14	14.18
VN8	551.40	210.08	18.29
VN9	862.35	312.68	23.87
Three component blends			
VN10	239.46	100.81	11.46
VN11	170.64	74.81	9.48
VN12	367.20	147.78	14.68
VN13	202.84	87.05	10.43
VN14	239.96	101.45	11.56
VN15	297.48	122.06	12.96
VN16	244.72	102.83	11.62

Table A28 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : P	58.36	29.08	5.13
M : P	235.71	98.83	11.03
H : P	1333.04	459.64	30.50
Two component blends			
VP1	82.72	39.40	6.24
VP2	114.74	96.71	7.45
VP3	163.44	71.42	9.09
VP4	114.74	52.62	7.62
VP5	236.18	100.25	11.52
VP6	537.13	206.47	18.35
VP7	351.25	141.22	14.04
VP8	532.08	154.65	17.91
VP9	805.29	293.85	22.90
Three component blends			
VP10	239.12	100.43	11.40
VP11	163.41	71.85	9.27
VP12	352.71	142.43	14.32
VP13	195.44	84.62	10.23
VP14	238.24	100.43	11.46
VP15	290.82	119.74	12.84
VP16	236.99	100.16	11.38

Table A29 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : P	58.36	29.08	5.13
M : P	235.71	98.83	11.03
H : B	1446.83	490.46	31.88
Two component blends			
VQ1	82.72	39.40	6.24
VQ2	114.74	96.71	7.45
VQ3	163.44	71.42	9.09
VQ4	123.82	56.64	7.99
VQ5	249.96	105.41	11.92
VQ6	581.71	221.15	19.24
VQ7	369.55	147.57	14.45
VQ8	552.02	210.03	18.24
VQ9	876.23	316.63	24.16
Three component blends			
VQ10	233.14	98.26	11.32
VQ11	161.94	71.54	9.25
VQ12	353.00	142.90	14.40
VQ13	194.99	84.08	10.21
VQ14	238.39	100.57	11.52
VQ15	285.32	117.69	12.68
VQ16	239.87	101.10	11.53

Table A30 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : T	58.30	29.04	5.14
M : T	236.32	99.12	11.13
H : T	1372.11	470.52	31.24
Two component blends			
VT1	80.78	38.55	6.16
VT2	113.70	51.88	7.46
VT3	163.47	70.95	9.09
VT4	114.80	53.19	7.66
VT5	240.34	101.92	11.71
VT6	544.07	209.62	18.61
VT7	359.55	142.76	14.23
VT8	547.16	208.24	18.19
VT9	853.99	310.66	23.89
Three component blends			
VT10	238.64	100.25	11.36
VT11	164.08	72.33	9.29
VT12	356.74	144.24	14.54
VT13	197.85	85.02	10.33
VT14	239.49	101.27	11.57
VT15	291.45	120.16	12.92
VT16	237.70	100.42	11.44

Table A31 : Kinematic viscosities of the individual lubricating base oils and their blends at three temperatures.

Blend number (by volume)	Kinematic viscosity (cSt)		
	25°C	40°C	100°C
Lubricating oils			
L : V	58.30	29.04	5.14
M : V	235.71	98.83	11.03
H : V	1372.11	470.52	31.24
Two component blends			
VV1	81.04	38.62	6.16
VV2	113.68	52.00	7.42
VV3	161.19	62.68	9.05
VV4	117.23	53.93	7.76
VV5	240.83	102.10	11.73
VV6	544.07	209.62	18.61
VV7	356.17	142.80	14.16
VV8	543.34	207.47	18.17
VV9	846.13	308.82	23.67
Three component blends			
VV10	240.75	101.32	11.47
VV11	165.99	72.96	9.37
VV12	363.42	146.48	14.69
VV13	204.13	87.66	10.53
VV14	238.35	100.57	11.55
VV15	291.80	120.16	12.84
VV16	242.15	101.88	11.56

APPENDIX B

PRINCIPLES OF LINEAR REGRESSION ANALYSIS

Principles of linear regression analysis[24-29]

Regression and correlation are actually two different but closely related concepts. Regression is a quantitative expression of the basic nature of the relationship between the dependent and independent variables. Correlation determines the strength of the relationship, measures how strong the relationship is between x and y. Simple regression holds that the dependent variable y is a function of only one independent variable. Linear regression attempts to depict the relationship between x and y by a straight line. This procedure is based on the contention that a change in x is accompanied by a systematic change in y, which can be represented by a line. The nature of linear regression can perhaps be best illustrated by the scatter diagrams that plot the paired observations of x and y on a graph. The dependent variable is placed on the vertical axis, while the independent variable is on the horizontal axis. The objective of regression analysis is to develop a line that passes through the scatter diagram and best represents the data points.

Regression analysis

When two variables are perfectly correlated, all the data points will fall exactly on a straight line defined by an equation of the form $y = a + bx$. However, almost certainly never encounter such a situation in the behavioral sciences. In fact, when the correlation is not perfect, the statistical technique of regression can be used to identify a line that, though imperfect, will fit the data points better than any other line that could try to fit to them, as determined by a statistical criterion known as least squares. This line describes the nature of the linear relationship between the two variables that can be formally represented by a regression line :

$$y_c = a + bx$$

This equation, known as the regression equation, is similar to the linear model,

$$y = a + bx$$

The regression line described by this equation has been drawn in Figure B1.

where :

a = y - intercept

value of y when $x = 0$

b = slope of the line

change in y for a 1-unit increase in x

Deriving a best–fitting regression line

To determine a line through the middle of the scatter that best defines or represents these data points. This regression line must depict the relationship between the dependent and independent variable with accuracy and precision, and must fit these data points better than any other line might be able to draw. It is unique meaning that there is only one least-squares line, and this can be determined by anyone doing the calculations. Consider Figure B1, this shows a scatter of points indicating y relation to x and a regression line fitted to these data denoted by

$$y_c = a + bx$$

where y_c stands for the value of variable y computed from the relationship for a given value of the variable x (y_c is therefore distinguished from y which represents actual, observed values). The line $y_c = a + bx$ expresses the average relationship between the two variables. It is called the linear regression of y on x and the slope coefficient b is referred to as the regression coefficient. The problem remaining is to determine the values of a and b.

The values of a and b must be calculated in such a way that the fitted line is as close as possible to the plotted points corresponding to the observed values of x and y

(x_i, y_i). Consider, for example, point 6 in Figure B1. This point corresponds to a specific pair of observed values of x and y. The computed y value (y_c) corresponding to the given x_i value can be determined from the relationship $y_c = a + bx_i$. There will usually be deviations between the actual values of y and their computed values, depending on the closeness of the relationship. These deviations between the actual and computed y values, referred to as residuals or errors, are measured by

$$e_i = y_i - y_c$$

These deviations e_i are also illustrated in Figure B1. Naturally they can take positive or negative values for different points, i.e. actual points may be above (e_i positive) or below (e_i negative) the fitted line. The relevance of this analysis of deviations is that best-fitting line can be obtained by ensuring that the sum of the squared deviations ($\sum e_i^2$) is as small as possible. The deviations are squared in order to give weight to both positive and negative values.

The least squares method

$$\text{minimize} \sum (y_i - y_c)^2 \equiv \text{minimize} \sum e_i^2$$

where y_i is the observed value of the dependent variable for the ith observation and y_c is the computed value of the dependent variable for the ith observation.

The procedure for finding the values of a and b from first principles, using the method of least squares, involves differential calculus. It leads to the following expressions for determining the values of a and b.

Formula for regression coefficients

$$b = \frac{\sum x_i y_i - n\bar{x}\,\bar{y}}{\sum x_i^2 - n\bar{x}^2}$$

$$a = \bar{y} - b\bar{x}$$

Once a and b have been determined, then can the equation for the best-fitting line, $y_c = a + bx$, be expressed. Note that the coefficients a and b can have negative as well as positive values. A negative value for b indicates an inverse relationship between x and y, so that y decreases as x increases and vice versa. A negative value for a indicates a negative intercept on the y axis. The application of these formula is simple, especially for small data sets, merely involving the summation of x_i^2 and $x_i y_i$ and the calculation of $\bar{x}$ and $\bar{y}$.

Correlation analysis

Correlation analysis is a means of measuring the strength or closeness of the relationship between two variables. It should be clear that the concept of correlation is very closely linked to regression analysis. If all the paired points (x_i , y_i) lie on a straight line then the correlation between the variables x and y is perfect.

Correlation analysis provides a numerical summary measure of the degree of correlation between two variables x and y – a correlation coefficient denoted by r. This is defined so that its value must be within the range from –1 to +1 so that

$r = +1$ denotes perfect positive correlation

$r = 0$ denotes no correlation

$r = -1$ denotes perfect negative correlation

Computing the value of r using this expression is tedious. It reduces to a quicker, convenient formula, expressed as follows :

$$r = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{\sqrt{\left[n\sum x_i^2 - \left(\sum x_i\right)^2\right]\left[n\sum y_i^2 - \left(\sum y_i\right)^2\right]}}$$

This coefficient is often referred to as the product-moment correlation coefficient or Pearson's correlation coefficient.

Another measure of how well the model provides estimates that fit the sample data is given by the coefficient of determination, r^2, is equivalent to

$$r^2 = \frac{\text{explained variation in } y}{\text{total variation in } y} = \frac{\sum (y_c - \bar{y})^2}{\sum (y_i - \bar{y})^2}$$

Thus, r^2 measures the proportion of total variation in y that is explained by the simple linear regression model. Naturally, it is easier to measure r^2 by simply taking the squared value of r.

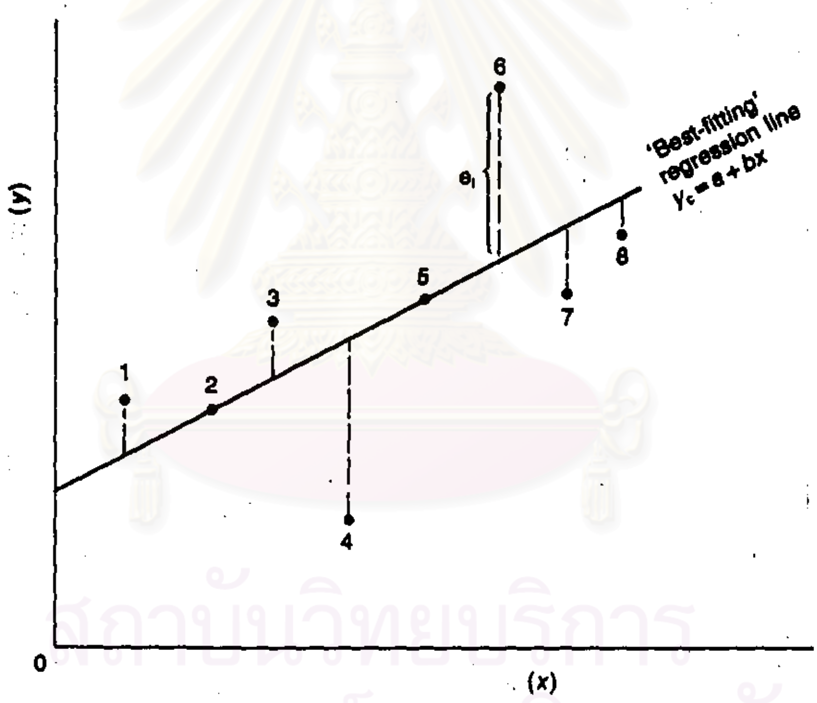

Figure B1 : Deriving the best-fitting regression line

VITA

Miss Chatsaran Wattanadilokkul was born on January 14, 1973 in Bangkok. She received her Bachelor's degree of Science from Department of Chemistry, Faculty of Science, Burapha University in 1994. She is working in the Laboratory, Technical Division, at Thai Petrochemical Industry Public Company Limited. She is enrolled in a Master's Degree program in Petrochemistry and Polymer Science, Graduate School, Chulalongkorn University, in 1999.