

Supplemental Information:

Isothermal compressibility (κ_T) has been calculated for each of the four fluids studied in this work.

$$\kappa_T = \frac{1}{\rho} \left(\frac{\delta \rho}{\delta p} \right)_T \text{ where } \rho \text{ is the Tait equation.}$$

Table A. Isothermal compressibility of POE5.

270 K		290 K		310 K		330 K		350 K		370 K	
p/ MPa	$10^{-4} \kappa_T /$ MPa $^{-1}$	p/ MPa	$10^{-4} \kappa_T /$ MPa $^{-1}$	p/ MPa	$10^{-4} \kappa_T /$ MPa $^{-1}$	p/ MPa	$10^{-4} \kappa_T /$ MPa $^{-1}$	p/ MPa	$10^{-4} \kappa_T /$ MPa $^{-1}$	p/ MPa	$10^{-4} \kappa_T /$ MPa $^{-1}$
50.0	4.50	49.9	4.94	50.0	5.43	50.0	5.97	50.0	6.57	50.0	7.22
45.0	4.60	45.0	5.07	45.0	5.58	45.0	6.16	45.0	6.79	45.0	7.48
40.0	4.72	40.0	5.20	40.0	5.75	40.0	6.35	40.0	7.03	40.0	7.76
35.0	4.84	35.0	5.35	35.0	5.92	35.0	6.56	35.0	7.28	35.0	8.07
30.0	4.96	30.0	5.50	30.0	6.10	30.0	6.79	30.0	7.55	30.0	8.39
25.0	5.09	25.0	5.66	25.0	6.30	25.0	7.03	25.0	7.84	25.0	8.76
20.0	5.23	20.0	5.83	20.0	6.51	20.0	7.28	20.0	8.16	19.9	9.15
15.0	5.38	15.0	6.01	15.0	6.73	15.0	7.56	15.0	8.50	15.0	9.57
10.0	5.53	10.0	6.20	10.0	6.97	10.0	7.86	10.0	8.88	10.0	10.04
5.01	5.69	5.03	6.40	5.05	7.22	5.04	8.18	5.04	9.29	5.02	10.56
4.04	5.73	4.00	6.44	4.01	7.28	4.02	8.25	4.01	9.37	4.01	10.67
3.01	5.76	3.03	6.49	3.02	7.33	3.03	8.32	3.02	9.46	3.05	10.78
2.01	5.80	2.03	6.53	2.05	7.39	2.01	8.39	2.00	9.55	2.02	10.90
1.01	5.83	1.02	6.57	1.02	7.44	1.01	8.46	1.02	9.64	1.01	11.01
0.53	5.85	0.51	6.60	0.53	7.47	0.50	8.50	0.52	9.69	0.51	11.07
390 K		410 K		430 K		450 K		470 K			
49.9	7.90	50.0	8.62	50.0	9.35	50.0	10.06	50.0	10.72		
45.0	8.21	45.0	8.99	45.0	9.78	45.0	10.55	45.0	11.27		
40.0	8.55	40.0	9.38	40.0	10.24	40.0	11.09	40.0	11.87		
35.0	8.92	35.0	9.82	35.0	10.76	35.0	11.68	35.0	12.55		
30.0	9.32	30.0	10.30	30.0	11.33	30.0	12.34	30.0	13.31		
25.0	9.76	25.0	10.83	25.0	11.96	25.0	13.09	25.0	14.16		
20.0	10.24	20.0	11.42	20.0	12.66	20.0	13.93	20.0	15.14		
15.0	10.76	15.0	12.07	15.0	13.46	15.0	14.88	15.0	16.25		
10.0	11.35	10.0	12.81	10.0	14.37	10.0	15.98	10.0	17.55		
5.02	12.01	5.03	13.63	5.04	15.39	5.04	17.24	5.02	19.06		
4.02	12.15	4.01	13.81	4.03	15.62	4.01	17.52	4.01	19.40		
3.02	12.29	3.01	13.99	3.01	15.85	3.01	17.81	3.01	19.75		
2.03	12.44	2.03	14.18	2.01	16.09	2.01	18.11	2.02	20.11		
1.03	12.59	1.04	14.37	1.03	16.33	1.03	18.41	1.03	20.48		
0.54	12.67	0.51	14.47	0.52	16.46	0.53	18.57	0.54	20.67		

Table B. Isothermal compressibility of POE7.

270 K		290 K		310 K		330 K		350 K		370 K	
p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹
		50.0	4.67	50.0	5.04	50.0	5.44	50.0	5.87	50.0	6.33
		45.0	4.79	45.0	5.18	45.0	5.60	45.0	6.05	45.0	6.54
		40.0	4.92	40.0	5.32	39.9	5.77	40.0	6.25	40.0	6.78
		35.0	5.05	35.0	5.48	35.0	5.95	35.0	6.47	35.0	7.03
29.9	4.78	30.0	5.19	30.0	5.65	29.9	6.15	30.0	6.70	30.0	7.30
25.0	4.90	25.0	5.34	25.0	5.82	25.0	6.36	25.0	6.95	25.0	7.60
20.0	5.03	20.0	5.50	20.0	6.01	20.0	6.58	20.0	7.22	20.0	7.92
15.0	5.18	15.0	5.66	15.0	6.21	15.0	6.82	15.0	7.51	15.0	8.27
10.0	5.32	10.0	5.84	10.0	6.43	9.99	7.09	10.0	7.83	10.0	8.65
5.01	5.48	5.02	6.04	5.01	6.66	5.02	7.37	5.03	8.17	5.03	9.08
4.00	5.52	4.01	6.08	4.02	6.71	4.00	7.43	4.06	8.24	4.02	9.17
3.01	5.55	3.06	6.11	3.01	6.76	3.02	7.49	3.03	8.32	3.04	9.26
2.02	5.58	2.02	6.16	2.03	6.81	2.03	7.55	2.01	8.40	2.03	9.36
1.02	5.62	1.02	6.20	1.01	6.86	1.04	7.61	1.02	8.48	1.03	9.46
0.54	5.63	0.55	6.22	0.51	6.89	0.53	7.65	0.52	8.51	0.53	9.50
390 K		410 K		430 K		450 K		470 K			
50.0	6.81	50.0	7.32	50.0	7.84	50.0	8.36	50.0	8.87		
45.0	7.06	45.0	7.61	45.0	8.17	45.0	8.73	45.0	9.29		
40.0	7.33	40.0	7.92	40.0	8.53	40.0	9.15	40.0	9.76		
35.0	7.63	35.0	8.27	35.0	8.93	35.0	9.61	35.0	10.28		
30.0	7.95	30.0	8.64	30.0	9.37	30.0	10.11	30.0	10.86		
25.0	8.30	25.0	9.06	25.0	9.86	25.0	10.68	25.0	11.52		
20.0	8.69	20.0	9.51	20.0	10.40	20.0	11.33	20.0	12.26		
15.0	9.11	15.0	10.03	15.0	11.01	14.9	12.06	15.0	13.11		
10.0	9.58	10.0	10.60	10.0	11.71	10.0	12.88	10.0	14.10		
5.02	10.10	5.04	11.24	5.03	12.49	5.05	13.84	5.02	15.27		
4.04	10.21	4.01	11.38	4.02	12.67	4.01	14.06	4.02	15.52		
3.03	10.33	3.03	11.52	3.01	12.85	3.02	14.28	3.05	15.78		
2.03	10.45	2.02	11.67	2.02	13.03	2.01	14.51	2.04	16.06		
1.01	10.57	1.01	11.82	1.01	13.22	1.03	14.74	1.05	16.35		
0.52	10.63	0.53	11.90	0.52	13.31	0.53	14.85	0.52	16.50		

Table C. Isothermal compressibility of POE9.

290 K		310 K		330 K		350 K		370 K		390 K	
p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T$ / MPa ⁻¹
		50.0	4.98	50.0	5.37	49.9	5.79	50.0	5.87	50.0	6.33
		45.0	5.12	45.0	5.53	45.0	5.97	45.0	6.05	45.0	6.54
		40.0	5.26	40.0	5.70	40.0	6.17	40.0	6.25	40.0	6.78
		35.0	5.41	35.0	5.88	35.0	6.38	35.0	6.47	35.0	7.03
		30.0	5.57	30.0	6.07	30.0	6.60	30.0	6.70	30.0	7.30
25.0	5.27	25.0	5.75	25.0	6.27	25.0	6.85	25.0	6.95	25.0	7.60
20.0	5.43	20.0	5.93	20.0	6.49	20.0	7.10	20.0	7.22	20.0	7.92
15.0	5.59	15.0	6.13	15.0	6.72	15.0	7.39	15.0	7.51	15.0	8.27
10.0	5.77	10.0	6.34	10.0	6.98	10.0	7.70	10.0	7.83	10.0	8.65
5.01	5.95	5.03	6.56	5.01	7.25	5.03	8.03	5.01	8.17	5.03	9.08
4.04	5.99	4.01	6.61	4.02	7.31	4.03	8.10	4.02	8.24	4.00	9.17
3.05	6.03	3.01	6.66	3.01	7.37	3.04	8.18	3.02	8.32	3.03	9.26
2.04	6.07	2.02	6.71	2.03	7.43	2.04	8.25	2.02	8.40	2.02	9.36
1.02	6.11	1.03	6.76	1.01	7.49	1.02	8.33	1.02	8.48	1.04	9.46
0.51	6.13	0.51	6.78	0.51	7.52	0.52	8.36	0.53	8.51	0.53	9.50
410 K		430 K		450 K		470 K					
49.9	6.81	50.0	7.32	50.0	7.84	50.0	8.36				
45.0	7.06	45.0	7.61	45.0	8.17	45.0	8.73				
40.0	7.33	40.0	7.92	40.0	8.53	40.0	9.15				
35.0	7.63	35.0	8.27	35.0	8.93	35.0	9.61				
30.0	7.95	30.0	8.64	30.0	9.37	30.0	10.11				
24.9	8.30	25.0	9.06	25.0	9.86	25.0	10.68				
20.0	8.69	20.0	9.51	20.0	10.40	20.0	11.33				
15.0	9.11	15.0	10.03	15.0	11.01	15.0	12.06				
10.0	9.58	10.0	10.60	10.0	11.71	10.0	12.88				
5.03	10.10	5.02	11.24	5.01	12.49	5.00	13.84				
4.01	10.21	4.02	11.38	4.01	12.67	4.03	14.06				
3.03	10.33	3.03	11.52	3.04	12.85	3.01	14.28				
2.04	10.45	2.01	11.67	2.02	13.03	2.01	14.51				
1.03	10.57	1.02	11.82	1.04	13.22	1.01	14.74				
0.53	10.63	0.52	11.90	0.51	13.31	0.53	14.85				

Table D. Isothermal compressibility of fully qualified lubricant.

270 K		290 K		310 K		330 K		350 K		370 K	
p/ MPa	$10^{-4} \kappa_T /$ MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T /$ MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T /$ MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T /$ MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T /$ MPa ⁻¹	p/ MPa	$10^{-4} \kappa_T /$ MPa ⁻¹
				50.0	5.00	50.0	5.39	49.9	5.82	50.0	6.27
				45.0	5.13	45.0	5.55	45.0	6.00	45.0	6.49
40.0	4.50	39.9	4.88	40.0	5.28	40.0	5.72	40.0	6.20	40.0	6.72
35.0	4.62	35.0	5.00	35.0	5.43	35.0	5.90	35.0	6.41	35.0	6.96
30.0	4.73	30.0	5.14	30.0	5.59	30.0	6.09	30.0	6.64	30.0	7.23
25.0	4.86	25.0	5.29	25.0	5.77	25.0	6.30	25.0	6.88	25.0	7.53
20.0	4.99	20.0	5.45	20.0	5.96	20.0	6.52	20.0	7.15	20.0	7.84
15.0	5.13	15.0	5.61	15.0	6.15	15.0	6.76	15.0	7.44	15.0	8.19
10.0	5.28	10.0	5.79	10.0	6.37	10.0	7.02	10.0	7.75	10.0	8.57
5.01	5.43	5.00	5.98	5.03	6.60	5.01	7.30	5.03	8.09	5.02	8.99
4.04	5.47	4.01	6.02	4.02	6.64	4.02	7.36	4.01	8.16	4.00	9.08
3.01	5.50	3.02	6.06	3.01	6.69	3.01	7.42	3.03	8.24	3.02	9.17
2.01	5.53	2.03	6.10	2.01	6.74	2.02	7.48	2.02	8.31	2.01	9.26
1.03	5.57	1.03	6.14	1.04	6.79	1.03	7.54	1.03	8.39	1.02	9.36
0.52	5.58	0.52	6.16	0.53	6.82	0.53	7.57	0.55	8.43	0.52	9.41
390 K		410 K		430 K		450 K		470 K			
50.0	6.75	50.0	7.25	50.0	7.77	50.0	8.29	49.9	8.80		
45.0	7.00	45.0	7.54	45.0	8.10	44.9	8.66	44.9	9.21		
40.0	7.27	40.0	7.85	40.0	8.46	40.0	9.07	40.0	9.67		
35.0	7.56	35.0	8.19	35.0	8.85	35.0	9.52	35.0	10.19		
30.0	7.88	30.0	8.56	30.0	9.28	30.0	10.02	30.0	10.76		
25.0	8.22	25.0	8.97	25.0	9.77	25.0	10.59	25.0	11.41		
20.0	8.60	20.0	9.42	20.0	10.30	20.0	11.21	20.0	12.14		
15.0	9.02	15.0	9.93	15.0	10.90	15.0	11.93	15.0	12.99		
10.0	9.48	10.0	10.49	10.0	11.58	10.0	12.75	10.0	13.96		
5.02	10.00	5.03	11.12	5.02	12.36	5.00	13.71	5.01	15.11		
4.01	10.11	4.00	11.26	4.04	12.53	4.03	13.91	4.01	15.36		
3.01	10.22	3.04	11.40	3.03	12.70	3.01	14.12	3.03	15.62		
2.04	10.34	2.01	11.55	2.02	12.89	2.01	14.35	2.04	15.89		
1.03	10.46	1.01	11.70	1.02	13.07	1.02	14.57	1.03	16.17		
0.53	10.52	0.53	11.77	0.53	13.16	0.53	14.69	0.54	16.31		