Viscosity & Specific Gravity Of Common Liquids

Viscosity Types

Viscosity, commonly known as thickness, is a measure of how much a liquid resists deformation when a force is applied. There are four types of liquid behavior relating to viscosity.

Newtonian - The viscosity of Newtonian liquids remains constant regardless of the force applied to it. Water is a Newtonian liquid.

Non-Newtonian - The viscosity of non-Newtonian fluids drops as the force applied and the resulting velocity both increase. Ketchup is an example of a non-Newtonian fluid. Ketchup's high viscosity prevents it from flowing very fast at first, but as its flow rate increases, it becomes much thinner and flows even faster.

Plastic - Plastic liquids have a high static or rest viscosity, but once in motion the viscosity drops to a lower value and remains constant. Some latex adhesives and caulking com-pounds exhibit plastic behavior.

Thixotropic - Like plastic liquids, thixotropic liquids have a very high static (rest) viscosity that becomes much thinner once they are in motion. However, the viscosity continues to change as the flow rate increases. Most thixotropic liquids contain solids that contribute to its changing viscosity.

Viscosity units

The English units of viscosity is 1 pound-second per square-foot or 1 slug per foot-second. The SI units of viscosity are the kilogram per meter second and the most common unit is called the poise (P) which is equal to 1 gram per centimeter-second. The SI unit is 10-times greater than the poise. More often we see viscosity described in centipoise (cP) which is one-hundredth of a poise. In any case, the viscosity in these units is the absolute or dynamic viscosity.

There are a variety of other units of viscosity measurement that have been developed over the years. Most of these units are based on some dynamic test on the liquid using a specific test apparatus. These units include Shell cup, Ford cup, Redwood, Zahn, Engler and Kreb Stormer to name a few.

Viscosity is also commonly given as centistokes (cstks) and Saybold Universal Seconds (SSU or SUS). These two units describe the kinematic viscosity, which is the ratio of viscosity to mass density. For the centistoke the relationship is:

$$cP = cSt \times SG$$

$$cP = (0.22 \times SSU \times SG) - \frac{180 \times SG}{SSU}$$

cP = centipoise
SG = Specific Gravity
SSU = Saybolt second units (also SUS)
cSt = centistokes

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Liquid	Specific Gravity	Viscosity, Saybolt Second Units						
		40 °F	60 °F	80 °F	100 °F	120 °F	140 °F	160 °F
Miscellaneous Liquids								
Water	1.0	31.5	31.5	31.5	31.5	31.5	31.5	31.5
Gasoline	.68-.74	30	30	30	30	30	30	30
Jet Fuel	.74-.85	35	35	35	35	35	35	35
Kerosene	.78- 72	42	38	34	33	31	30	30
Turpentine	.86-.87	34	33	32.8	32.6	32.4	32	32
Varnish Spar	.9	3500	1600	1000	650	530	250	230
Fuel Oil & Diesel Oil (Not for Lubrication)								
No. 1 Fuel Oil	.82-.95	40	38	35	33	31	30	30
No. 2 Fuel Oil	.82-.95	70	50	45	40	-	-	-
No. 3 Fuel Oil	.82-.95	90	68	53	45	40	-	-
No. 5A Fuel Oil	.82-.95	1000	400	200	100	75	60	40
No. 4B Fuel Oil	.82-.95	1300	600	490	400	330	290	240
No. 6 Fuel Oil	.82-.95	-	70000	20000	9000	1900	900	500
No. 2D Diesel	.82-.95	100	68	53	45	40	36	35
No. 3D Diesel	.82-.95	200	120	80	60	50	44	40
No. 4D Diesel	.82-.95	1600	600	280	140	90	68	54
No. 5D Diesel	.82-.95	15000	5000	2000	900	400	260	160
Crankcase Oils – Lubricating Oils								
SAE 10	.88-.935	1500-2400	600-900	300-400	170-220	110-130	75-90	60-65
SAE 20	.88-.935	2400-9000	900-3000	400-1100	220-550	130-280	90-170	65-110
SAE 30	.88-.935	9000-14000	3000-4400	1100-1800	550-800	280-400	170-240	110-150
SAE 40	.88-.935	14000-19000	4400-6000	1800-2400	800-1100	400-550	240-320	150-200
SAE 50	.88-.935	19000-45000	6000-10000	2400-4000	1100-1800	550-850	320-480	200-280
SAE 60	.88-.935	45000-60000	10000-17000	4000-6000	1800-2500	850-1200	480-580	280-380
SAE 70	.88-.935	60000-120000	17000-45000	6000-10000	2500-4000	1200-1800	580-900	380-500
Transmission Oils – Transmission Gear Lubricants								
SAE 90	.88-.935	14000	5500	2200	1100	650	380	240
SAE 140	.88-.935	35000	12000	5000	2200	1200	650	400
SAE 250	.88-.935	160000	50000	18000	7000	3300	1700	1000
Other Oils								
Castor Oil	.96	36000	9000	3000	14000	900	400	300
Chinawood	.943	4000	1800	1000	580	400	300	200
Cocoanut	.925	1500	500	250	140	100	70	60
Cod	.928	1800	600	300	175	110	80	70
Corn	.924	1600	700	400	250	175	100	80
Cotton Seed	.88-.925	1500	600	300	175	125	80	70
Cylinder	.82-.95	60000	14000	6000	2700	14000	1000	400
Navy #1 Fuel Oil	.989	4000	1100	600	380	200	170	90
Navy #2 Fuel Oil	1.0	-	24000	8700	3500	1500	900	480
Gas	.887	180	90	60	50	45	-	-
Insulating		350	150	90	65	50	45	40
Lard	.912-.925	1100	600	380	287	180	140	90
Linseed	.925-.939	1500	500	250	143	110	85	70
Raw Menhadden	.933	1500	550	250	140	110	80	70
Neats Foot	.917	-	1000	430	230	160	100	80
Olive	.912-.918	1500	550	320	200	150	100	80
Palm	.924	1700	700	380	221	160	120	90
Peanut	.920	1200	500	300	195	150	100	80

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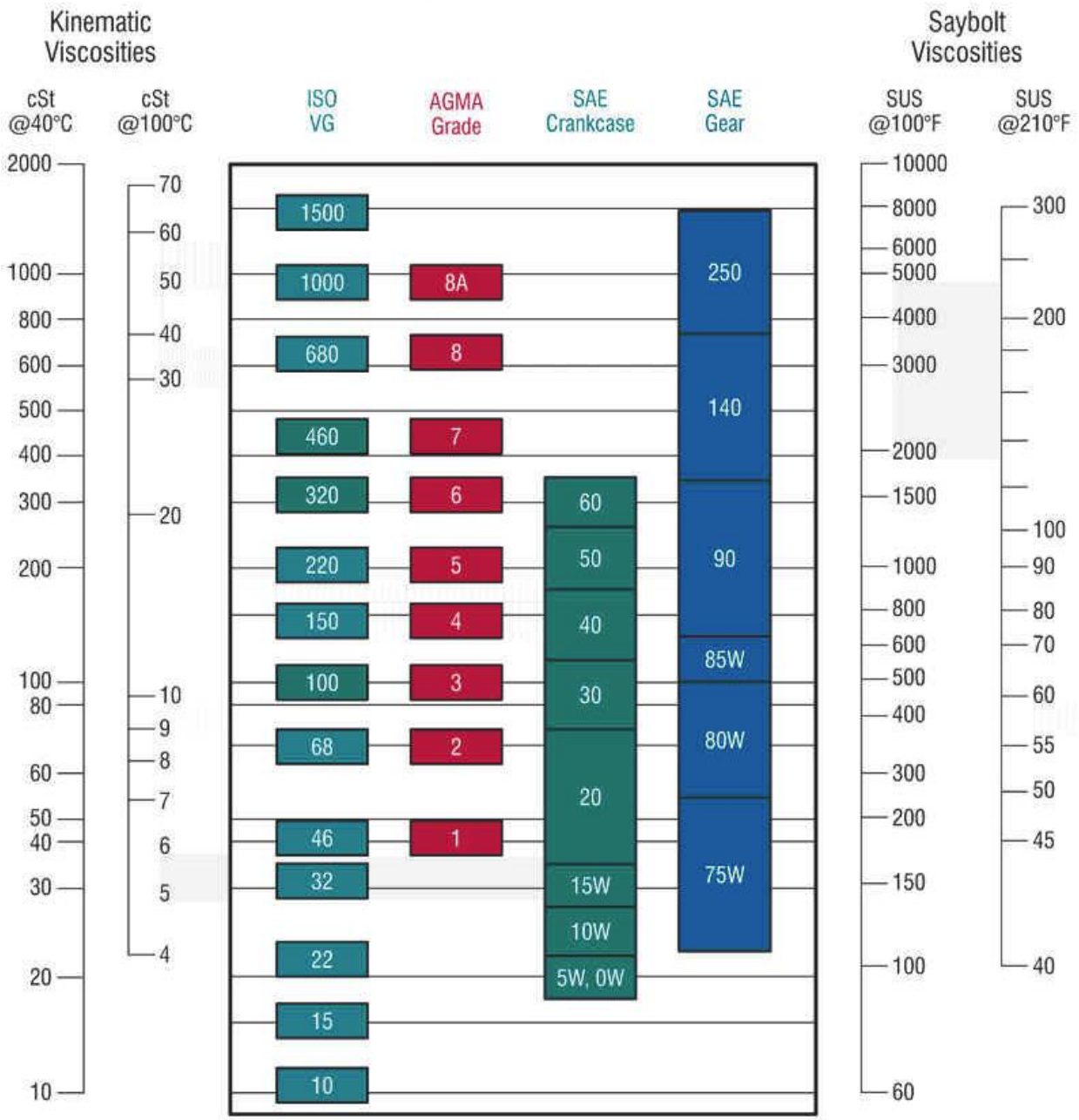
		40 °F	60 °F	80 °F	100 °F	120 °F	140 °F	160 °F
Other Oils (continued)								
Quenching	-	2400	900	450	250	180	130	90
Rape Seed	.919	2400	900	450	250	180	130	90
Rosin	.980	28000	7800	3200	1500	900	500	300
Rosin (Wood)	1.09	Extremely Viscose						
Sesame	.923	1100	500	290	184	130	90	60
Soya Bean	.927-.98	1200	475	270	165	120	80	70
Sperm	.883	360	250	170	110	90	70	60
Turbine (Light)	.91	500	350	230	150	-	-	-
Trubine (Heavy)	.91	3000	1400	700	330	200	150	100
Whale	.925	900	450	275	170	140	100	80

Liquid	Specific Gravity	Viscosity, Saybolt Second Units		
		70 °F	100 °F	130 °F
Sugar, Syrups, Molasses, etc.				
Corn Syrups	1.4-1.47	-	5,000-500,000	1,500-60,000
Glucose	1.35-1.44	-	35,000-100,000	10,000-13,000
Honey (Raw)	-	-	340	-
Molasses	1.40-1.49	-	1,300-250,000	700-75,0001
Sugar Syrup 60 Brix	1.29	230	92	-
Sugar Syrup 62 Brix	1.30	310	111	-
Sugar Syrup 64 Brix	1.31	440	148	-
Sugar Syrup 66 Brix	1.33	650	195	-
Sugar Syrup 68 Brix	1.34	1,000	275	-
Sugar Syrup 70 Brix	1.35	1,650	400	-
Sugar Syrup 72 Brix	1.36	2,700	640	-
Sugar Syrup 74 Brix	1.38	5,500	1,100	-
Sugar Syrup 76 Brix	1.39	10,000	2,000	-
Corn Starch 22 Baume	1.18	150	130	-
Corn Starch 24 Baume	1.20	600	440	-
Corn Starch 25 Baume	1.21	1,400	800	-
Ink – Printers	1.0-1.38	-	2,500-10,000	1,100-3,000
Ink - Newspaper	-	-	5,500-8,000	2,400
Tallow	.918	56 S.S.U. @ 212 °F		
Tars				
Coke Oven – Tar	1.12+	3,000-8,000	650-1,400	-
Gas House – Tar	1.16-1.3	15,000-300,000	2,000-20,000	-
Crude Oils				
Texas, Oklahoma	.81-.916	100-700	34-210	-
Wyoming, Montana	.86-.88	100-1,000	46-320	-
California	.78-.92	100-4,500	34-700	-
Pennsylvania	.8-.85	100-200	38-86	-
Glycols				
Propylene	1.038	240.6	-	-
Triethelene	1.125	185.7	-	-
Diethylene	1.12	149.7	-	-
Ethylene	1.125	88.4	-	-
Glycerine (100%)	1.26	2,900	813	-
Phenol (Carbolic Acid)	.95-1.00	60	-	-
Silicate of Soda	-	-	365-640	-
Sulfuric Acid (100%)	1.83	75	-	-

Comparative Viscosity Classifications



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