Technical Notes
013

Exceeding Expectations

A stands for **A**PI Gravity

The API Gravity of a product is very important in determining the characteristics of the petroleum product. To learn more about this property, let's apply the **AmSpec** approach.

A = Application

API Gravity, or The American Petroleum Institute gravity, is a measure of how light or heavy a petroleum liquid is compared to water. If a product has an API gravity of less than 10, it sinks. If the product has an API gravity greater than 10, it floats. API gravity is referred to as being in "degrees" (°) and can be determined by hydrometer or a digital density meter. Once the API is determined, you can also find the density and specific gravity.

Density is defined as weight per unit volume by the United States Oil and gas industry. Temperature and pressure affect the results and must be specified for both the sample and the reference. Density is reported as g/mL at the specified temperature (g/mL @ 20°C).

Specific gravity (Relative density) is the ratio of the density of a substance to the density of a reference substance. This is almost always water for liquids and air for gases. Temperature and pressure must be specified for both the sample and the reference as this will affect the results. Relative density is dimensionless, but has to include the temperature of the sample and the temperature of the standard used (0.XXXX @ 20/20°C).

Figure 1 - This shows the density of various products relating to water.

Typical Values for Various Products

Product	Typical API Gravity (°)	Typical Density (@ 60°F)	Typical Specific Gravity (@ 60/60°F)
Asphalt	11	0.9920	0.9930
Crude (Heavy)	18	0.9465	0.9456
Diesel	35	0.8498	0.8490
Ethanol	48	0.7883	0.7875
Gasoline	60	0.7389	0.7382
Jet Fuel	45	0.8017	0.8009

M = Methods

These are the most common methods that AmSpec uses to determine API gravity, density and specific gravity:

D287 - API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)

D1298 - Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

D4052 - Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

D5002 - Density and Relative Density of Crude Oils by Digital Density Analyzer

*** Please note below, **Turnaround Time** is defined as the actual length of time, on average, it takes to perform a particular method once the sample has arrived and logged in the lab, and prepared for testing.*

S = Scope

Method	Products	Turnaround Time**
D287	crude petroleum and petroleum products normally handled as liquids and having a Reid vapor pressure (D 323) of 26 psi (180 kPa) or less.	30 minutes
D1298	crude petroleum, petroleum products, or mixtures of petroleum and nonpetroleum products normally handled as liquids, and having a Reid vapor pressure of 101.325 kPa (14.696 psi) or less	30 minutes
D4052	gasoline and gasoline-oxygenate blends, diesel, jet, basestocks, waxes, and lubricating oils	15 minutes
D5002	crude oils that can be handled in a normal fashion as liquids at	15 minutes

	test temperatures between 15 and 35°C	

P = Procedure Notes

Method	Procedural Notes	Reported As
D287	This procedure uses a hydrometer.	API ° or API Gravity
D1298	This procedure uses a hydrometer.	API Gravity, Density, or Relative Density
D4052	This procedure uses a digital density meter.	API Gravity, Density, or Relative Density
D5002	This procedure uses a digital density meter.	Density and Relative Density

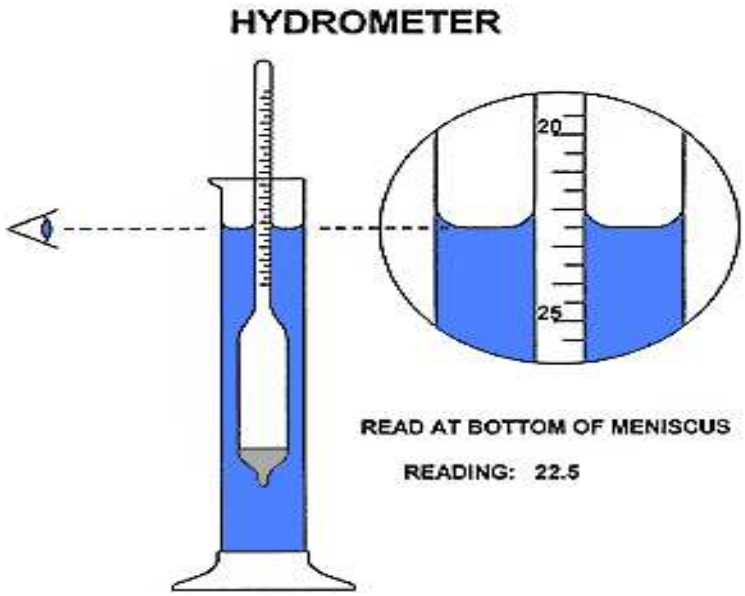

Figure 2 - Operation of the hydrometer is based on the principle that a solid suspended in a fluid will be buoyed up by a force equal to the weight of the fluid displaced by the submerged part of the suspended solid. Thus, the lower the density of the substance, the farther the hydrometer will sink.

E = Equivalents

ASTM	IP	ISO	DIN	JIS	AFNOR
D287					
D1298	160	3675	51757H	K2249H	T60-101
D4052	**365**	**12185**	**51757D**	**K2249D**	**T60-172**
D5002					

C = Cause & Effect

Density is a physical property that can be used with other properties to characterize both the light and heavy fractions of petroleum and petroleum products. Determination of the density of petroleum and products is necessary for the conversion of measured volumes to volumes at the standard temperature of 15°C. The lower the API gravity of a sample, the higher viscosity and carbon residue content. The higher the API gravity of a sample, the lower the viscosity, carbon residue content, and the greater the heat of combustion.

For any questions about these methods, please contact Jennifer Nesci at JNesci@amspecllc.com

Also, please download the new & improved AmSpec Smart Phone app for a number of useful conversion tools and information.