What Does SAE Value Actually Mean?

We all know to check the owner's manual to find out which weight oil should be used in the engine of a vehicle, and also generally know to only use motor oils with **American Petroleum Institute** (**API**) standard, indicated and displayed clearly on the container. But what really is the difference between a SAE 10W-30 and a SAE 10W-40, or for that case, SAE 0W-20 motor oil?

To better understand the numerical code used, a brief explanation is in order. When referencing motor oil weight, you are actually referring to the viscosity grade or the tendency of a liquid to flow slowly or quickly. The **Society of Automotive Engineers** (**SAE**) developed a grading system to designate the viscosity level of single grade and multigrade motor oils. In single/mono grade oils, the lower the number, the better it flows at cold temperatures. Likewise, **the higher the number, the thicker the oil**. In regard to multigrade oils, the first number in the code, such as "10W" in SAE 10W-30, means that the oil can still be pumped by the engine at a temperature as low as a single grade 10W oil. A "5W," like in SAE 5W-30, can be pumped at an even lower temperature, and a "0W," like in SAE 0W-30, will pump at the lowest tested temperatures. The W in the designation is commonly thought to represent Weight, but in fact stands for Winter. The second number, "30", indicates how well the oil will flow when heated to 100° C/212° F or higher.

As engines have become more technologically advanced, engine clearance levels and viscosity grade recommendations may have been reduced, hence the reason your father swore by SAE 20W-50 and your engine calls for SAE 5W-30. If a thicker oil is used in some of today's high-tech, small clearance engines, oil pressure may increase, but the possibility of improper lubrication can result if the oil cannot adequately flow through the engine. Thus, increasing engine temperature, fuel consumption as well, degrade the performance, and increase the engine wear and tear condition. Engine manufacturers carefully select the recommended motor oil viscosity grade for each specific engine, the car owner and driver, including the workshop mechanic as well should always ensure the right and proper lubricant oil is selected for the particular vehicle to ensure the total protection is achieved, which is why the owner's manual recommended viscosity should always be used.

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美國汽車工程師學會(The Society of Automotive Engineer - SAE)

美國汽車工程師學會(The Society of Automotive Engineer)簡稱 SAE，自 1911 年開始所訂立的一套「曲軸箱機油 SAE 黏度等級分類」，對於車輛用的引擎油及齒輪油的黏度，由稀到厚加以分類，供汽車製造廠及使用者採用。SAE 並以號數表示之，其號數與品質無關。不加 W 字的黏度等級是一般氣溫用的，它的定義是以 100℃黏度來限制，並要在某一範圍之內。有 W 字的是氣溫較低時用的(W 字即由 Winter 而來)，它的定義除 100℃黏度要在某一數值之上外，更須加上低溫黏度限制，即在低溫時要有某一程度的流動性，不論有 W 或無 W 之黏度，數字愈大黏度愈高。

黏度(Viscosity)

黏度(Viscosity)爲潤滑油最主要之性質。黏度爲牛頓型流體流動時其應變與切應力之比例常數。簡言之，黏度亦爲流體流動時之阻力。一般所謂油料之厚薄，即指黏度之大小。潤滑油油膜之強度與黏度大致呈正比例。黏度愈高，其潤滑油通常愈強韌，故黏度爲機械選用正確油料必須考慮之最主要因素之一，通常我們也稱作黏度號數」，也就是機油罐上的 5W-50、10W-40、20W-50 等標示。

複級(Multi-grade)指數：

就是機油瓶黏度數值上有加 W 者，W 代表 winter，也就是在一般在冬天低溫下使用之意，它除了 100℃溫度要在某一數值之上，更加上低溫時的黏度限制，即使在低溫下也要有某一程度的流動性好保護引擎，如此數值越低則代表其低溫時的流動性越佳，其低溫的啓動性越好，也就越不容易造成低溫啓動時的磨損。

單級(Single grade)指數：

瓶子黏度數值上沒有加 W 者，其爲一般溫度使用，其定義只有在 100℃的限制，沒有規定低溫的特性。

目前市面上所購買的引擎機油大多爲複級指數，單級指數的油幾乎看不到，即使有也大多應用在懸吊方面，我們一般通稱的前叉油就是單擊指數的油，其實以台灣的氣候條件使用單級指數的機油就夠了，當然這只是指一般的道路騎乘，不過汽機車工業日新月異，引擎越做越好，對機油的要求也就越來越高，所以還是以我們能最方便取得複級指數的機油來使用。

黏度的影響

說完了分級，我們再告訴各位機油黏度對車子的影響，我們使用的機油黏度若是太高，因爲油膜太厚會使機油黏滯使得阻力增加，進而產生不良的影響，而這些包括：

1.車子較難啓動與加速遲緩。
2.引擎動力輸出減少，冷卻效果變差。
3.車子變得較吃油，使得燃料浪費。
4.因爲機油流動性差，不能快速到達汽缸，使得啓動時的磨損增加。

反之，如果機油的黏度太低，則產生的影響包括：
1.引擎各機件消耗增加，因爲無法充分潤滑。
2.引擎的噪音變大。

黏度等級 可耐最低溫度 (℃)
20 (-9.5 ℃), 30 (-1.1℃), 40 (4.4 ℃)
0W (-35℃), 5W (-30℃), 10W (-25℃), 15W (-20℃), 20W (-15℃), 25W (-10℃)

注意：

选择正確黏度对的適用機油可以使尊车引擎各機件充分受保護，以及行驶顺畅。