

## Numerical based on viscosity index

### Theory

Viscosity index of oil is determined with the help of standard oil like Pennsylvanian oils and Gulf oils. These oils have standard viscosity indexes 100 and 0 respectively.

Viscosity index can be calculated by formula,

$$\text{Viscosity index (VI)} = (L-u) / (L-H) \times 100$$

Where,

L = Viscosity of Gulf oil i.e. 0

u = Viscosity of oil under test.

H = Viscosity of Pennsylvanian oils i.e. 100.

**Problem 1.** An oil of unknown viscosity index has saybolt universal viscosity of 60 Sec. at 210°F and 600 Sec. at 100°F. The high viscosity index standard (i.e. Pennsylvanian) oil has saybolt viscosity of 60 Sec. at 210°F. and 500 Sec. at 100°F. The low viscosity index standard (i.e. Gulf) oil has a saybolt universal viscosity of 60 Sec. at 210°F. and 800 Sec. at 100°F. Calculate the viscosity index of unknown oil.

**Sol<sup>n</sup>.** Given data,

L= 800 Sec.

H= 500 Sec.

u= 600 Sec.

$$\begin{aligned}\text{Viscosity index (VI)} &= (L-u) / (L-H) \times 100 \\ &= (800-600) / (800-500) \times 100 \\ &= 66.67\end{aligned}$$

**Problem 2.** An oil sample under test has saybolt universal viscosity of 64 Sec. at 210°F and 564 Sec. at 100°F. The low viscosity index standard (i.e. Gulf) oil has a saybolt universal viscosity of 64 Sec. at 210°F. and 774 Sec. at 100°F. The high viscosity index standard (i.e. Pennsylvanian) oil has saybolt viscosity of 60 Sec. at 210°F. and 414 Sec. at 100°F. Calculate the viscosity index of unknown oil.

**Sol<sup>n</sup>.** Given data,

L= 774 Sec.

H= 414 Sec.

u= 564 Sec.

$$\begin{aligned}\text{Viscosity index (VI)} &= (L-u) / (L-H) \times 100 \\ &= (774-564) / (774-414) \times 100 \\ &= 58.33\end{aligned}$$

### Practice examples:-

- i) An oil sample under test has a Saybolt universal Viscosity of 64 sec at 210°F & 500 second at 100 °F. The low viscosity standard (Gulf oil) possesses a Saybolt viscosity of 64 seconds at 210°F & 700 seconds at 100 °F & 400 seconds at 100 °F. Calculate the viscosity – index of the oil sample under test.
- ii) An oil sample under Test has a say bolt universal viscosity same as that of standard Gulf oil (low viscosity standard)& Pennsylvanian oil (high viscosity index standard)) at 210°F Their say bolt universal viscosities at 100°F are 50, 740 & 400 respectively. Calculate viscosity index of the sample oil.