

# Evaporasi Internal pada Peralatan Uji Tabung Vertikal untuk Penentuan Batas Bawah Flamabilitas Uap Bensin dengan Metoda Propagasi ke Atas dan ke Bawah = Internal Evaporation in Vertical Tube Test Apparatus for Determination of Lower Flammability Limit of Gasoline Vapor with Upward and Downward Propagation Method

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## Abstrak

Kebakaran stasiun pompa bahan bakar umum akibat nyala uap bahan bakar tahun 2020 terekam 38 kali di wilayah Indonesia. Konsentrasi uap bahan bakar yang flamabel pada area diantara batas bawah flamabilitas (Low Flammability Level, LFL) dan batas atas flamabilitas (Upper Flammability Level, UFL) merupakan faktor penyebab kebakaran. Tujuan penelitian: perancangan peralatan pengujian LFL bensin dengan metoda tabung menggunakan evaporasi internal untuk menghasilkan uap bensin. Alat ukur berupa tabung kaca vertikal  $d=80$  mm  $t=300$  mm, permukaan atas terbuka dan pemantik api listrik tegangan tinggi 10 J. Dua metoda pengukuran: arah propagasi ke atas (upward propagation) dan propagasi ke bawah (downward propagation) dilakukan terhadap enam sampel pada temperatur 28°C. Hasil pengujian: konsentrasi LFL propagasi ke atas untuk sampel RON\_88 adalah 1,63%, RON\_90-1; 1,77%, RON\_90-2; 1,61%, RON\_92; 1,65%, RON\_95; 1,61% dan IO\_100; 1,05%. Sedangkan arah propagasi ke bawah RON\_88 adalah 2,49%, RON\_90-1; 2,42%, RON\_90-2; 2,4%, RON\_92; 2,31%, RON\_95; 2,12% dan IO\_100; 1,58%.

Pengujian LFL Iso-octane metoda propagasi ke atas 1,15% (tabung  $d=5,3$  cm) dan 0,98% (tabung  $d=2,5$  cm) (Coward, 1952)

Angka oktan tidak banyak berpengaruh pada hasil pengujian LFL dengan metoda propagasi ke atas. Akan tetapi pada metoda propagasi ke bawah hasil LFL akan menurun dengan naiknya angka oktan.

.....Public fuel pump station fires due to fuel vapor flames in 2020 were recorded 38 times in Indonesian. The flammability of the fuel vapor concentration in the area between the lower flammability level (LFL) and the upper flammability level (UFL) is a cause of fire. The purpose of the study: the design of gasoline LFL testing equipment with the tube method using internal vaporization to produce gasoline vapor. The measuring instrument is a vertical glass tube  $d=80$  mm  $t=300$  mm, the top surface is open and a high voltage electric lighter 10 J. Two measurement methods: the direction of upward propagation and downward propagation were carried out on six sample at a temperature of 28°C. Test results: the concentration of LFL propagation upwards for samples RON\_88 is 1.63%, RON\_90-1; 1.77%, RON\_90-2; 1.61%, RON\_92; 1.65%, RON\_95; 1.61% and IO\_100; 1.05%. While the downward propagation direction of RON\_88 is 2.49%, RON\_90-1; 2.42%, RON\_90-2; 2.4%, RON\_92; 2.31%, RON\_95; 2.12% and IO\_100; 1.58%. LFL Iso-octane testing with upward propagation method is 1.15% (tube  $d=5.3$  cm) and 0.98% (tube  $d=2.5$  cm) (Coward, 1952)

The octane number does not have much effect on the LFL test results with the upward propagation method. However, in the downward propagation method, the LFL results will decrease with increasing octane number.