APPLICATION NOTE

F&F-K-001-2016/A1

Alcoholic Strength in Spirits Drinks

Reference: COMMISSION REGULATION (EC)N° 2870/2000

Tested with **VELP Scientifica UDK 129 Kjeldahl Distillation Unit** (Code F30200120)

ALCOHOLIC STRENGTH IN SPIRITS DRINKS

Introduction

A spirit, or liquor, is an alcoholic distilled beverage containing ethanol, produced by distilling it. Ethanol derives from the fermentation of grain, fruit, or vegetables and adding different aromatic compounds. Spirits drinks are legally consumed in most countries with over 100 countries having laws regulating their production, sale, and consumption.
The ethylic alcohol, produced during the fermentation, determines the alcoholic strength and it can be measured by volume as "*the number of liters of ethanol contained in 100 liters of spirits, both volumes being measured at temperature of 20°C. It is expressed by the symbol %vol".*

Alcoholic Determination in Spirits Drinks

Steam distillation is a method to determine the alcoholic strength in spirits drinks: the distillate obtained is an ethanol-water mixture and the measurement is performed by a digital density meter.

Sample

Vodka infused with natural flavors	Alcoholic strength by volume (labeled value): 35% vol
American Whiskey	Alcoholic strength by volume (labeled value): 40% vol

Equipment

- Alcoholic strength kit (code A00000285) composed by:
  - -Tweezer for closing the NaOH tube
  - -Kjeldahl balloon 500 ml for the distillation of sample (Code A00000082)
- Digital density meter (i.e. Rudolph model DDM 2911 PLUS)
- Cooled Incubator (VELP Scientifica FOC Series i.e. code F10400320)
- 200 ml volumetric flasks with stopper

Procedure

Measure out 200 ml of the spirits drinks using a graduated flask and thermostat it at 20°C. Let the sample adjust to temperature, this will take about 15 minutes*. Bring down the volume of the sample exactly 200 ml by taking away excess sample by a small pipette. Transfer the liquids to the 500 ml test tube.
Rinse the volumetric flask with distilled water (3 x 10ml) in order to collect all the mixture residues and add 10 ml of distilled water as receiving solution in the same volumetric flask. Place the volumetric flask in a beaker filled with cold water and ice. Insert the distillate outlet tube (it must be put in contact with the receiving solution) and fix it well using parafilm.

Distillation

Collect the distillate in the 200 ml graduated flask used to measure the sample quantity.
Preheat the UDK 129 performing a wash down (about 7 minutes).
Start the distillation according to the parameters below:

- NaOH: 0 ml**
- Sample volume: 200 ml
- Sample tube: 500 ml
- Distillation time : 7-9 minutes

** Close the NaOH tube using the tweezer received inside the Alcoholic strength kit.
In UDK 129 settings, set a distillation time to obtain a maximum of 200 ml of distillate. After the distillation, position the receiving flask in the thermostat for about 15 min and finally bring up to volume (200 ml) using distilled water at 20 °C.

Density of the Distillate

Measure the density of the distillate by the electronic density meter. For diluted samples the result should be doubled.

* The samples having a alcohol concentration higher than 25v/v% need to diluted 1:1.

Typical Results on Vodka infused with natural flavors

***Average ± SD%**	**35.14 ± 0.28**
RSD% **	**0.80**

Typical Results on American Whiskey

***Average ± SD%**	**40.310 ± 0.15**
RSD% **	**0.38**

*Run of three samples
**RSD% = (Standard Deviation x 100) / Average

For the verification of the distillation apparatus, the Reg. EC 2870/2000 specifies that, distilling 200 ml of an ethanol water mixture with an alcoholic strength of 50% vol., the loss of alcohol must be smaller than 0,1% vol.
The UDK 129 satisfies completely the Reg. EC 2870/2000.

Conclusion

The obtained results are reliable and reproducible in accordance with the expected values, with a low relative standard deviation (RSD < 1%), that means high repeatability of the results.

Benefits of UDK 129 are:

- High level of precision and reproducibility
- High productivity
- Reliable and easy method
- Time saving
- Affordable equipment cost
- Moderate running costs