

Total Kjeldahl Nitrogen determination in wastewater *SpeedDigester K-439, Kjel Line and MultiDist*

1. Introduction

Nitrogen in water and wastewater can be found in several forms, organic and inorganic. A wastewater treatment plant removes different nitrogen sources until the regulatory standards are met. Therefore, the determination of Total Kjeldahl Nitrogen (TKN) is of great importance. An easy and reliable method for the determination of TKN in wastewater according to ISO 5663 [1], DIN EN 25 663 [2] and the methods listed in 40 CFR part 136.3 [3] is introduced.

2. Experimental

Equipment: MultiKjel or MultiDist with titrator, for example Metrohm Eco Titrator

Procedure: Samples are digested with the SpeedDigester K-439. A steam distillation protocol followed by a colorimetric titration in boric acid is performed with the MultiKjel and Metrohm Eco Titrator, respectively, applying the parameters specified in Table 1.

Table 1: Parameters for distillation and titration with the MultiKjel and Eco Titrator, respectively.

Method parameters MultiKjel		Instrument Settings	
Reaction Detection	Off	MaxAccuracy mode	On
H ₂ O Volume	30 mL	Chiller/Tap water	Chiller F-314
NaOH Volume	32 mL	Chiller temperature	10°C
Reaction Time	5 s	AutoDist mode	On
Steam Steps	Fixed time		
Steam Power	100 %	Automated Titration on Eco Titrator	
Level Detection	Off	Eco Titrator Method	MET (Blanks) / DET (Samples)
Distillation Time	180 s	Titration	H ₂ SO ₄ 0.01 M
Stirrer Speed Distillation	5	Sensor type	Colorimetric
Titration Type	Boric acid titration	Volume increment	0.05 mL for blanks
H ₃ BO ₃ Volume	60 mL (2%)	Titration rate	Fast for samples
Stirrer Speed Titration	8	Stop EP	1
Titration start time	180 s	Volume after EP	0.7 mL
Sample Tube Aspiration	40s	EP Criterion	20 mV
Receiver Aspiration	30s		



3. Results

The determination of TKN of raw sewage, primary and secondary effluent were performed. The results are listed in Table 2.

Table 2: Results of the TKN determination. Sample volume: 100 mL (n = 2).

Sample	V _{sample} [mL]	N _{measured} [mg]	TKN conc. [mg/L]	Filtered
Raw sewage sample	10.5684	2.8709	28.709	-
Primary effluent sample	9.60140	2.5998	25.998	Yes
Secondary effluent sample	12.6596	3.4573	34.573	-
	10.7702	2.9275	29.275	Yes
Secondary effluent sample	1.3174	0.2768	2.768	-
	1.2532	0.2588	2.588	Yes

4. Conclusion

The determination of TKN (Total Kjeldahl Nitrogen) in wastewater using the SpeedDigester K-439 and MultiKjel system provides reliable and reproducible results.

5. References

- [1] ISO 5663, Water quality – Determination of Kjeldahl nitrogen – Method after mineralization with selenium
- [2] DIN EN 25 663, Determination of Kjeldahl Nitrogen in Water
- [3] 40 CFR Part 136.3 table IB, Guidelines Establishing Test Procedures for the Analysis of Pollutants: Total Kjeldahl Nitrogen, <https://ecfr.io/Title-40/pt40.25.136>, accessed on October 11th 2023.

For more information, please refer to Application Note 831/2023.