

Kjeldahl

Infrared Rapid Digestion Unit

First time in India Thermal Shock Resistant Quartz Digestion Tubes



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Traditionally soils, sediments, sludge's, foods and other materials have been digested using Sulphuric acid in large round-bottomed flasks for Kjeldahl analysis. These were heated on heating mantles and notoriously took up a lot of room in the fume cupboard. In order to maximize the number of digestions in a given space, systems were designed to use tall straight **Quartz digestion tubes** in racks on a rectangular heating Chamber.

The Kjeldahl method is the official method for determining nitrogen and protein contents in :

- ◀ Foods (Raw materials and finished products)
- ◀ Animal feeds
- ◀ Soils, Fertilizers, etc.
- ◀ Waste water, sludge, etc.
- ◀ Lubricants, fuel oils, etc

Kjeldahl Method:

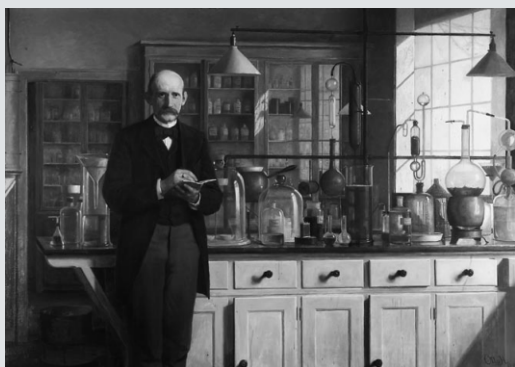
Johan Kjeldahl a Danish Chemist in 1883 while studying the changes of protein content during the transformation of barley into malt process developed the method for determining Nitrogen which then took its name from him. Because of its high degree of precision, reproducibility and versatility, the Kjeldahl method is used today to determine content of Nitrogen and Proteins according to official methods. **(AOAC, EPA, DIN, ISO)** .

Seldom in human history has an invention remained basically unchanged for such a long time as Kjeldahl's method for Nitrogen determination.

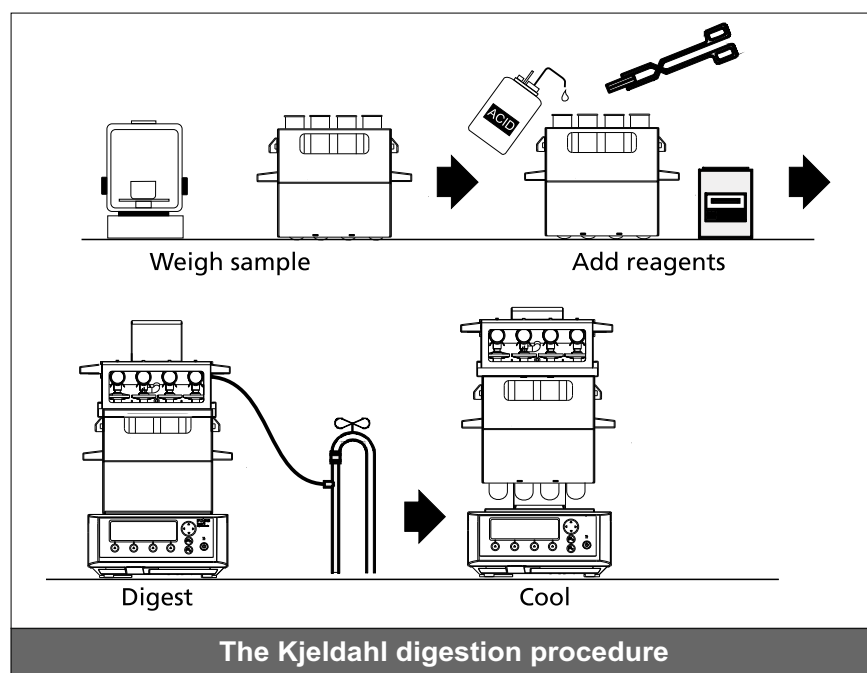
More than 90% of Protein containing samples and over 60% of all Nitrogen containing samples can be analyzed by using this basic procedure.

The food industry processes raw material in numerous ways and into many different products, from cheese and bakery products or ice cream production through to uses in meat processing or in the production of ready meals. Hence the overall protein content plays an important role both for the payment of raw material delivered and for determining the value of the product.

- ◀ The Digestion Units are compact and well insulated to minimize heat transfer to the surroundings and allow fast, even heating thus giving good working conditions as well as saving energy.
- ◀ The Digestion block consists of Quartz Infrared heaters on either sides .
- ◀ Energy efficient **Quartz Heater** and ceramic insulation to retain heat inside the tube.
- ◀ Insert rack with handle for easy loading and removal of digestion tubes.
- ◀ Exhaust system with glass Manifold and water jet pump (glass filter pump).
- ◀ A console to hold the insert rack and exhaust manifold during cooling. This saves time and bench space.
- ◀ Digestion tubes 250 ml capacity **(Quartz)**.
- ◀ PID Controller with auto tuning to obtain precise temperature.



Johan Kjeldahl in his laboratory at Carlsberg Brewery in Copenhagen in the year 1880
(image by courtesy of Carlsberg Archives, Copenhagen)



A comparison of acid consumption between a classical Kjeldahl system and Infrared digester system.

	Infrared Digester	Classical Kjeldahl
Acid volume used	12-15 ml	25 ml
Loss by evaporation	1.2 ml	7.2 ml
Consumption by 1 g sample	3.6 – 7 ml	3.6 – 7 ml
Consumption by reagents	2.1 ml	4.2 ml
Remaining in digestion tube	1.7 – 5.1 ml	6.6 – 10.0 ml
Alkali volume used	40 ml	100 ml

The table shows 3 major advantages:

- ◀ Acid loss by evaporation is minimized.
- ◀ Volume of NaOH that needs to be added during distillation is reduced
- ◀ Exact temperature controller can be achieved.

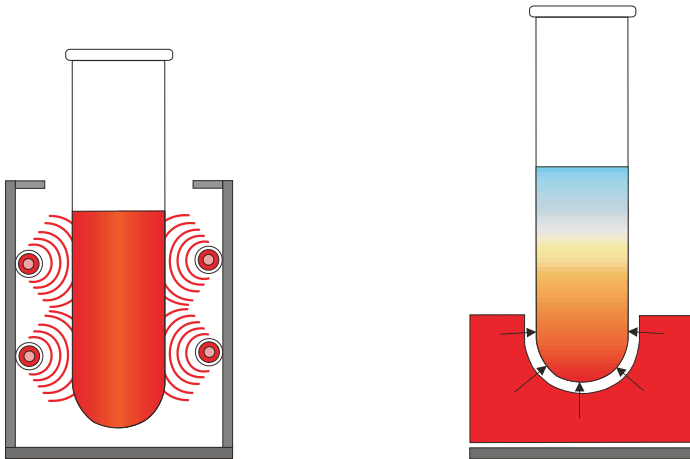
Quartz Digestion tubes : Quartz Digestion tubes are excellent for use in Kjeldahl analysis. Unlike borosilicate glass, Quartz can withstand sudden heating and cooling. Quartz tubes can withstand temperatures up to 1000°C and hence boiling of Sulfuric acid at 420°C can be easily done without the fear of breakage.

Quartz is better resistant to sulfuric acid attack at elevated temperature than borosilicate glass.

Infrared digestion compared to block digestion

Particularly uniform heating of the samples using side heaters, therefore no zones with different temperatures. Hardly any boiling delays.

Samples are heated from underneath, therefore higher requirements for users to prevent boiling delays.



Specifications

Model Number	BKL- 6
Number of Positions	6 x250ml
Temperature Range	Ambient to 450°C
Stability & Precision of Heating Chamber	+/-1°C
Exhaust manifold	Yes
Sample Rack	Yes
Heating Chamber unit	Completely Stainless Steel
Digestion Tubes	Quartz
Electrical Requirement	230v 50 Hz 1.5 kw

Spare parts

Cat. No.	Spare Part
BKL/QT	Quartz Digestion Tube 250 ml
BKL/GM	Glass Manifold
BKL/GFP	Glass Filter Pump
BKL/ART	Acid resistant Tubing 5mtr /pack

Temperature indicator/ Controller



Most digestions require only the control of a single temperature and time for example 420°C for 60 minutes. In such a case PID controller with auto tuning is used. When Quartz digestion tubes are used PID controllers with auto tuning serves the purpose.

