

NITROGEN CONTENT
COMBUSTION (DUMAS) METHOD
LECO TruSpec N
Up-dated September 2013

I. Principle:

The LECO TruSpec N- Nitrogen/Protein Analyzer is a microprocessor based, software-controlled instrument that determines the nitrogen content in a variety of materials, including grain, stock feed, oil, rubber, and soil.

- A. Sample ranging from 0.2500 g to 0.2540 g is combusted /analyzed after being weighed into veggies caps.
- B. There are three phases during an analyze cycle:
 - 1. Purge
 - a. Sample drops and is encapsulated in the loading head, sealed, and purged of any atmospheric gases that have entered during the sample loading.
 - b. Ballast volume and gas lines are also purged.
 - 2. Burn
 - a. Samples drops into a hot furnace (950°C) and flushed with pure oxygen for a very rapid combustion.
 - b. Products of combustion are mainly:
 - (1) CO₂
 - (2) H₂O
 - (3) NO₂
 - (4) N₂
 - c. Products are passed through the furnace filter and thermoelectric cooler to remove moisture and then collected in the ballast volume.
 - 3. Combustion gasses in the ballast are allowed to become homogeneous by passive mixing.
 - 4. Aliquot (3cc) is captured in a loop before the before the ballast piston is forced down to evacuate the ballast.
 - 5. Sample aliquot is swept through hot copper to remove oxygen and change NO₂ to N₂
 - 6. Sample aliquot is then swept through Lecosorb to remove CO₂ and Anhydrone to remove H₂O.
 - 7. Remaining combustion product, nitrogen in a helium carrier, is measured by the thermal conductivity cell
- C. Analyze
- D. Final result is displayed as weight percentage of nitrogen
- E. Typical Protein Factors:

II. Calculations:

- 1. **Nitrogen %** - Nitrogen mg / mass
- 2. **Nitrogen mg** – adjusted area passed through the calibration curve
- 3. **Adjusted area** – ((area* (correction factor) – blank) * drift * sensitivity factor))
- 4. **Drift** – theoretical adjusted area * old drift factor / adjusted area

III. Example N

- 1. Wheat products 5.70

2. Almonds 5.18
3. Peanuts 5.46
4. Tree Nuts 5.30
5. Coconuts 5.30
6. Dairy Products 6.38
7. **Other Products 6.25**

IV. Personal Protective Equipment:

- A. Lab coat
- B. Safety glasses/goggles

V. Sample Preparation

- A. Grind sample thoroughly first through a 2mm screen and second into a 1 mm screen. Mix well to insure a uniform and representative sample.
- B. Weigh sample to 0.2500g to 0.2540g to four significant digits into a tarred veggie capsule. Urine or other high moisture samples are pipetted at the time of analysis into a tarred tin capsule.
- C. Run all samples in duplicate or triplicate.
- D. Every eighteenth sample (or as needed) two EDTA standards should be weighed to 0.2000g to 0.2040g for drift calibration (Technicians only).

VI. Sample Analysis

- A. The laboratory technician will load samples into the loading head of the protein analyzer.
- B. Type weights into the computer program ensuring that the weights match up to the correct sample

VII. Results

- A. Results will be displayed as %N and %CP.