**Problem statement**:

In a Recirculating Aquaculture System (RAS), **600 individual boxes** are used to culture **600 crabs**, each initially weighing **200 grams**, and grown up to **1 kg** over a period of **45 days**. The crabs are fed a formulated diet with a feeding rate of **2.5–3% of body weight per day**. The feed contains a defined protein percentage, which contributes to **Total Ammonia Nitrogen (TAN)** production through nitrogenous excretion.

Approach:

1. **Calculate daily TAN generation per crab** based on biomass gain and feed protein metabolism.
2. Multiply the per-crab TAN value by **600** to get **total system TAN load per day**.
3. Incorporate **biofilter efficiency (80%)** to determine the **net TAN** remaining in the system

**Final TAN Formula with System Volume**

TAN (mg/L) = [ Feed (kg)×Protein %×0.16×Excretion Rate × 1000000] / System Volume

Here, **System Volume = 1000L** (Assumption)

Excretion Rate = 0.7%

Crab weight = 200gm (Day 1)

Feed = 5g = 0.005 kg



Protein % in feed = 35% = 0.35

Nitrogen content in protein = 16% = 0.16

Excretion rate = 0.7% = 0.007

Unit conversion = 1,000,000 (kg → mg)

**Calculation: Approach:** TAN = 0.00196 mg/L

TAN=0.005×0.35×0.16×0.007×1000 TAN accumulation =0.00196 \* 0.2

=0.005×0.35=0.00175 =0.000392 mg/L

0.00175×0.16=0.00028 1 crab = 0.000392 mg/L

0.00028×0.007=0.00000196 600 crab = 0.2352 \* 0.000392 mg/L

0.00000196×1000 = 0.00196 mg/L TAN Total TAN accumulation for day 1 =0.2352mg/L

Biofilter clearance capacity = 80%

| **Term** | **Description** |
| --- | --- |
| **Feed (kg)** | Total feed given per day (in kilograms) |
| **Protein %** | Fraction of protein in feed (e.g., 35% = 0.35) |
| **0.16** | 16% of protein is nitrogen (N is 16% of average protein) |
| **Excretion Rate** | % of nitrogen excreted as ammonia (typical = 0.6 to 0.8; assume 0.7) |
| **1000** | Converts grams to milligrams (1 gram = 1000 mg) |
| **System Volume (L)** | Total system water volume in litres. |