

CHAPTER III

EXPERIMENTAL TECHNIQUE

3.1 Measurement Method and Data Acquisition

3.1.1 Measuring the NP/NPK Fertilizer Size and Capacity

Fertilizer-Size Measurement

Fertilizer size analysis, particle size distribution, is normally measured by conducting a "screen analysis" (sieve analysis) of a representative sample on 20-cm-diameter sieves. The sample size recommended for testing on these sieves varies according to the size range of the material. The sieve selected for use are stacked, with sieve apertures increasing in size from bottom to top. The sample is placed on the uppermost sieve of the stack, and the stack is placed on a stand which is subjected to controlled shaking. During shaking, each particle in the sample gravitates downward through screen apertures until it reaches a screen with apertures too small to allow its passage. At the end of a specified shaking period, the material on each screen is weighed individually and the particle-size distribution of the sample is thus determined.

Most countries have standard sieve specifications and sieve analysis procedures. These specifications and procedures are usually generic and could be used for a wide variety of products, including fertilizers.

Size Measuring Standard Method : ASTM E11-70

Fertilizer Capacity Measurement

Fertilizer Capacity Measuring, a DCS (Distributing control system), is an online measuring system in ton per unit hour. Total fertilizer products are transferred from the process plant unit to the stock pile by many solid transfer equipments. At the end of process plant unit, the rubber weight belt conveyer equipment is installed to measure the production. It is a real time measurement of the production rate

3.1.2 Measuring of the Sulfuric Acid Content

Sulfuric Acid Content Measuring

By titrametric method, titrated with a barium chloride (BaCl_2), is used to calculate percentage of the sulfate content in liquid-phase raw material to reactor. First, the barium chloride is calculated for a factor number, a concentration of barium chloride, by the rhodizonate indicator. This indicator is prepared by a mixture of disodium rhodizonate and ammonium chloride. Second, the standardization method is operated by use of potassium sulfate. Third, the titration method is achieved by titration of potassium sulfate with barium chloride until the end point.

$$\text{Factor number of BaCl}_2 = \frac{\text{Weight of K}_2\text{SO}_4 \times \text{Molecular Weight of K}_2\text{SO}_4}{\text{Volume of BaCl}_2}$$

After the factor number of barium chloride is calculated, calculation of percentage of the sulfate by a similar method to that of barium chloride follows.

$$\% \text{SO}_4 = \frac{\text{Volume of BaCl}_2 \times \text{Factor number of BaCl}_2}{\text{Weight of Sample}}$$

3.1.3 Data Classification/Stratification

Sizing and Capacity of Fertilizer Data Classification

Both sizing and capacity of fertilizer are classified by the quantities of liquid-phase-content of fertilizers; thus, it can be separated into three cases:

1. The high-liquid-phase-content fertilizer formulation, comprised of only 16-20-0 formulation.
2. The moderate-phase-content fertilizer formulation, comprised of the 16-16-8, 13-13-21 and 15-15-15 formulations.
3. The low-phase-content fertilizer formulation, comprised of the 16-8-8 and 15-7-18 formulations.

3.1.4 Data collection/Acquisition

Percent Sulfate Data Collection

These data is taken from laboratory results. First, the sampling point, located at the liquid raw material feed tank of phosphoric acid to a reactor, is sampled every 2 hours. The analysis results of percent sulfate are reported to the control room for adjustment of process parameters.

Sizing of Fertilizer Data Collection

Local laboratory results, a sieve test analysis, are operated every 1 hour at the outlet of granulated fertilizer rotary drum. These results are reported immediately to control room for adjustment of process parameters.

Capacity of Fertilizer Production Data Collection

Real time data of capacity , from a rubber weight belt conveyer, are sent to DCS (distributing control system) in control room. They are then collected in the check sheet for permanent data collection.