



Research Article

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Quality control: A case study of Henkel Chemicals Lagos

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ABSTRACT

This paper gives an insight into how quality of product are maintained at the HENKEL Chemical Company, Lagos, Nigeria. The paper starts by identifying the type of product produced, how quality control of the product are maintained and how quality control during the production process is effected. It also discusses the analysis done on the raw material before it is used in production and periodic test carried out during production. Finally the paper expatiates on the safety measure taken in quality control room.

INTRODUCTION

With the assistance of the German Company HENKEL Chemicals Limited, they (HENKEL GERMAN) help to establish and give technical assistance to HENKEL Chemical Nigeria. Ltd. The headquarters which is the first to be establish was located at plot 7 Block "k" Isolo Express Way. This is followed by subsidiaries at Aba and Onisha for the eastern zone; Ibadan and Ilorin for the western zone and Kaduna and Kano for the northern zone. That of Kaduna is now expanded to a status of an individual company.

In chemistry, a chemical substance is a form of matter that has constant chemical composition and characteristic properties It cannot be separated into components by physical separation methods, i.e. without breaking chemical bonds. They can be solids, liquids or gases [1]

The chemical industry comprises the companies that produce industrial chemicals. Central to the modern world economy, it converts raw materials (oil, natural gas, air, water, metals, and minerals) into more than 70,000 different products [2]

In all production processes, we need to monitor the extent to which our products meet specifications. In the most general terms, there are two "enemies" of product quality:

- (a) deviations from target specifications
- (b) excessive variability around target specifications [3]

Most of the products in Henkel Chemical Nig. Ltd are for industrial use or application hence about 90% of the products produce are for the industries and 10% for consumer use.

Almost all the staff are Nigerians train in the field of chemistry or industrial operation and management. The company is classify into the following departments:

P3 Department

i. Trimeta Acid ii. Oxonia active iii. Stabillon B iv. Galva clean

Industrial Adhesive Department

i. Pattex ii. Ponal iii. Duffix

Organic Product Department

i. Katipure N 82E ii. Henko size iii. Lubritex N B 8 iv. Defoamer

Detergent Department

i. Silex 200 ii. Silex 640 iii. Crestarch iv. Iron rust remover

In every industry the laboratory is its back bone for it is the home of the chemist, the research center and quality control. Every product produce has a certain required quality, which must be satisfied before it leaves the company premises. This quality as a measure is either specified by the national quality control (S.O.N) international standard organisation or the company.

To make sure that the consumers get the best for their price Henkel ascertain that the standard quality in which they produce is above the national and beat the international standard requirement. These certainly, comply with by the quality control unit headed by the laboratory manager and an assistance with some help which are all chemists. The products are analyzed in the laboratory for many parameters and the instrument used include:-

pH MEASUREMENT

pH is a measure of hydrogen ion concentration; a measure of the acidity or alkalinity of a solution. Aqueous solutions at 25°C with a pH less than seven are acidic, while those with a pH greater than seven are basic or alkaline. A pH level of 7.0 at 25°C is defined as 'neutral' because the concentration of H_3O^+ equals the concentration of OH^- in pure water. [4]

Henkel use two(2) types of pH measurement to determine the strength of there product vis:- pH paper and pH meter.

pH Paper

Using pH paper to check the strength of a product is full of errors, though the pH paper is graded from 1 - 14 with a specific grade. The pH of the product is known by dipping the pH paper in the product which is a solution or some solution of it is made, this change the colour of the pH paper to indicate the grading. Under normal circumstances this is not use as there is a lot of errors and assumption involve.

pH Meter

A **pH meter** is an electronic instrument used for measuring the pH (acidity or alkalinity) of a liquid (though special probes are sometimes used to measure the pH of semi-solid substances). A typical pH meter consists of a special measuring probe (a glass electrode) connected to an electronic meter that measures and displays the pH reading. [5] This one is more sophisticated one or rather a digital type of pH meter and is temperature dependent. It consists of an electrode terminal connected to the meter. The electrolyte which is a bulb lined inside with high sensitive wire, this picks up the strength of the electrolyte in the solution hence give the reading digitally. Before they use the pH meter every day it has to be standardized.

Standardizing the pH Meter

This is done with the aid of a buffer solution.

Buffer Solution

A buffer solution is a solution, which resist a pH change when a small amount of acid or a small amount of base was added to it. The electrode was dipped in a buffer 7, this read down from 20 to 7 and immediately changes to pH4, which means it is waiting for buffer4.

The electrode is then dipped in buffer 4, which read down from 4 to 0.00, this means it is standardize. This can be use as long as light is switch on and for that day only after standardization. The temperature of the solution was first noted which was feed into the pH meter then the electrode was dipped in the solution to read the pH of the solution at that temperature.

THERMOMETER

An instrument for measuring temperature, especially one having a graduated glass tube with a bulb containing a liquid, typically mercury or colored alcohol, that expands and rises in the tube as the temperature increases[6] .. It

measure both the boiling temperature and the freezing temperature of substance as it also gives the normal temperature value, i.e. the temperature of the substance at the room temperature (25°C).

The thermometer is used to measure the temperature of the cooled product which must attain the temperature of 20°C before using the viscometer to check the viscosity. This is continuously deep in the cup until that temperature 20°C is attained. It is also use to measure the temperature of the product. When the heat of fusion of a product is to be measure the thermometer is employed. Thus its importance in quality control is undisputed.

Precaution in the Use of Thermometer

1. The thermometer should be deep horizontally.
2. it should not touch the bottom of the cup or container as it will give a wrong reading.
3. It should not be use to stair the sample as it may break during the process.
4. Always clean and deep it in a clean water or spirit (alcohol) after use.

Viscometer

Is any device for measuring viscosity[7] This is use to measure the parameter of viscosity. Most of the product produced here are first of all cool to 20°C before the viscosity is been taken. This is been done by the aid of a refrigerator where some ice is colleted from in cup and the sample which is either in a cup or the viscometer cup is deep in the ice cold water till the temperature of 20°C is attained. The temperature is read out. The viscometer is of two(2)type, the digital and the non-digital one.

The non-digital one use 1 – 7 spindles and the reading is taken from the head where there is a grading with a needle which read off the viscosity at 20°C. When the light is switch on the spindle rotate in one direction and the drag force produce due to the thickness of the sample moves the needle, which is read on the grading from the top of the viscometer. The reading on the viscometer is not the actual viscosity at 20°C. This reading is extrapolated on the chart.

The spindles are used depending on the thickness of the product hence spindle 1 (one) is use for very light product while spindle 7(seven) is use for very thick product. while for solutions other spindles (2 - 6) are use as thickness increase. Every spindle has its own extrapolate on the chart which is read off and recorded.

Precautions in the use of viscometer

1. The cup should be cupped on the viscometer in such a way that the spindle did not scratch the cup when rotating. This may give a wrong reading.
2. The product must be cooled to 20°C to have and accurate reading of the chart.
3. When cooling, care should be taken so that water did not enter into the product, which may alter the result.
4. Every cup should be thoroughly wash and kept clean always.

The digital one also function like the non-digital one but the reading is more accurate and instant. Other apparatus use include pipette, Burette, water bath, condensers, gas chambers, chromatographic columns desiccators spectroscopy's etc.

Mixer

Considering the size and the the location of the company on one hand and the size of the production and product produce on the other, the quality control of this company (HENKEL) is heavily equipped with laboratory size mixers of various size and dimensions.

This mixers are classify into two viz:-

- (a) Powder product mixers.
- (b) Solution product mixers.

Powder Product Mixer

This is the biggest of the two(2) classes of mixers and is powered electrically where the mixing take place within this vacuum is a rotating blade situated in such a way that it curve inward this hinder splitting of the product/raw material when mixing and ensure thorough mixture.

This one is a generating machine, electricity is passed through it and this is converted to rotational which rotate the mixer blades. The intensity of this rotation is increase by turning its nob clockwise and decrease the intensity by turning the same nob anti clockwise.

Solution Product Mixer

This is more simpler than the powder mixer. It consist of a stirrer, a stand where the motor which convert the electrical energy for rotating the stirrer is attached to. The motor is switch on or off through the same switch, and the motor is adjust forward or backward to position it well in the container the stirrer are of different length and size, this are use depending on the size and quantity of the material to be mixed in the lab for experiment. There is also a speed control switch.

Precaution

1. The stirrer must not touch the bottom of the container used in mixing.
2. The stirrer must not scratch the side of the container.
3. It should be dipped as far as possible to ensure thorough mixing.

Hot plate/Magnetic Stirrer

The regulator B hot plate is a modernized one which also contain the magnetic stirrer. The hot plate consist of a top plate and a coil of cupper wire inside it, this heat up the plate by converting the electrical energy to heat energy the hot plate has its grading from one (1) to ten(10).

The regulator B hot plate also contain a rotor used in stirring, this rotate, with the aid of a bar magnet and the solution is stirred. The bar magnet is dipped in the mixture this is rotated with the aid of the rotor hence the mixing takes place. This enhances heating and mixing in one direction giving a homogenous product.

Refractometer

This is an instrument used to measure parameter of refractive index (RI) and solid content percentage (% SC). This only applies to liquid substance and semi liquid substance only.

The refractometer in this company are of 2 types.

- a. The digital one
- b. The non digital one

The non Digital refractometer

This refractometer is electric one and can only be use when the light is switch on. This consist of light bulb within it which light up the product to be analyze and give it a clearer vision on the eye piece. There are two (2) types of eye piece on the refractometer. One of them is use to read the accuracy of the reading. These consist of target point and the shade formed by the product must fill half of the circle of the eye piece. By so doing only then the parameter can be read off.

The second eye piece shows grading, one above and the other below. The one above use to read off refractive index while the one below is use to read off percentage solid content. On the right side of the refractometer is three (3) different nob, one is use to form a near clear image of the parameter to be measure. The upper one among the remaining two is use to form a fine and clearer image of the parameter of the solid content. While the one at the bottom is use to form a fine and clearer image of the parameter of refractive index.

Below the nob is a thermometer which read the temperature at which the refractometer is functioning. When the product to be analyze is put on the glass surface it is clamp down and a side lamp is light on this to give clear vision and image.

Precaution

1. Readings can only be taken when the light is on.
2. Reading can only be taken when the lead is clamp thoroughly.
3. Product to be analyze should be cooled to at least room temperature.
4. The front of the refractometer should not be cover in order to get a clearer image.
5. Always clean the refractometer after use and before using it.

Some Test Carried out on the Products/raw Materials Bulk Density

This is measured to know the bulkness of the raw material or product manufactured.

There are standard cup for it or sometime a beaker of 250mls is used. This cup is weighed first then filled with either the product or the raw material to the brim and it is level with the top of cup this is then weighed again hence the bulk density is the weight of the raw material and cup divide by the weight of the cup.

Let y = weight of cup

Let x = weight of cup + raw material
 $x/y = z$ = Bulk density.

Heat of fusion

This is measured by taking a weighed sample of the product or raw materials in a beaker, this sample is then dissolved in water and stirred the solution for about 10 minutes. After stirring the solution the temperature of the solution is measured with a thermometer. This temperature measured is the heat of fusion of the substance.

% Alkalinity

2% solution of the product or raw materials is prepared taking 2 grams of the product or raw materials and making it up to 100ml with distilled water. Out of this prepared 2% solution, 5ml was measured out in a beaker and 45mls of water added. This 50mls solution is then titrate against 0.5 hydrochloric acid using phenol phthaline as an indicator. The titre value was recorded. % Alkalinity = titre value x a factor while the factor is 0.4. Therefore titre x 0.4. = % Alkalinity = 0.4y%

Salt Content

A sample of the raw materials or product is collected in a beaker, 2 grams of the sample is weighed this is made to 200 grams of water for every one gram, 100 g of water is use. Sometime it is sparingly soluble in water hence the mixture is heated and vigorously stirred continuously with a hot plate regulator. On doing so the sample which is at first sparingly soluble will dissolved completely with slight heat.

Take 2mls of the dissolved solution of the sample and 2 drops of 2% solution of sodium ($\text{Na}^2 \text{Cr}^2 \text{O}^4$) 2% solution was added as an indicator, this was titrated against 0.1N of silver Nitrate. e.g If the titre value (end point) is 5ml. The salt content is caculated by a constant.

Is Titre x 4 x 58.5 x 100/10,000 [E.g. if Titre value =5, Therefore salt content = 5x4 58.5 x 100/10,000= 11.7. therefore salt content = 11.7.]

Solid content

This parameter is only measured of semi solid solutions (i.e those with higher viscosity). In this a sample of the product or raw material to be tested is taken in a petri dish, the dish is first weighed then the sample is put into the dish and weighed. The weight is noted before the dish + sample is put into an oven to dry and heat it for about 1 hour, after this time the sample + dish was allowed to cool for about 1 hour then weighed.

Safety Measures

1. In every room and department there is five extinguishers.
2. Every staff in the laboratory / production has and is taught the use of fire retardant cloth
3. In case of emergency there is an emergency bell and an emergency exit in every department.
4. There is a clinic where the staffs are been treated
5. Those (in the quality control/production) use safety glass
6. They use hand gloves always
7. They use industrial boot's always
8. They use industrial mask to cover our mouth and nose always
9. They use laboratory coat always
10. Do not spill water or chemicals on the floor
11. Always clean chemicals that spill on the ground quickly
12. Always wash their hands after work
13. Keep the door lock after working hours
14. Switch off the light before leaving.

CONCLUSION

The quality control is the heart beat of any company as the quality of the product is maintain to conform with that of the Standard organization of Nigeria (S.O.N.). The international standard organization or the standard already set by the company. In this place production is monitored ensure good manufactory practice and ensure that the goods sent into the market are safe, i.e not harmful or toxic to human being or environment, to ensure this first, analysis of the raw material that are use in the company is done. To ensure easy and prompt compliance to the formulation, the analysis for some parameters during production and after the final product is produced were also taken periodically. Some sample of final product are also stored in the quality control room for months or years to ascertain the duration

(expired time) of it to degenerate, test are done on this sample quarterly. All these are measures to be taking in maintaining quality control in an industry.

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