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EFFECT OF PRE HEATER AND ECONOMIZER ADDITION ON ACID VALUE IN SPLITTING UNIT AT PT ENERGI OLEO PERSADA

Salman Mubarak[1]*, Cut Aja Rahmawati, Irwan[1]

[1]Department of Chemical Engineering, Lhokseumawe State Polytechnic, Lhokseumawe City

*Email: salmanmubarak007@gmail.com

ABSTRACT

Temperature Problems and Stability of Fatty Acid Quality Become One of the Important Factors in the Occurrence of Hydrolysis in a Splitting Reactor Where Quality Instability Often Occurs in the Fat Splitting Hydrolysis Process, The Addition of Pre Heater and Economizer Provides a Significant Acid Value Stability Impact Judging From the Results of Analysis Conducted Within 12 Hours of Hydrolysis Process Time. With Several Temperature Variations Starting From 110 - 120 OC, Optimum Acid Value Conditions Are Obtained at 120 OC with the Maximum Acid Value Results at Acid Value 208.08. The combination of the addition of Pre Heater and Economizer can increase the efficiency of continuous steam use that can reduce production costs and ensure the stability of the temperature of the material that will enter the splitting reactor, the temperature can be varied to adjust the required heat needs in order to achieve a more perfect hydrolysis by considering economic aspects.

Keywords: *Preheater,Economizer, Acid Value, Hidrolisa, Splitting*

1. INTRODUCTION

Indonesia as a developing country has considerable potential to become an Oleochemical exporting country. This is due to Indonesia as one of the largest palm oil producers in the world which has a high selling value of Oleochemicals in the export market, and the large amount of raw materials in Indonesia produced by palm oil mills such as CPO, CPKO, CNO, RBDPO, and RBDPS which are then processed again in the Oleochemical factory factory to produce products such as fatty alcohol, fatty acid, and glycerine.

Vegetable oil supplies in 1985 reached 10 million tons, of which 85% came from palm oil. Nowadays, the industrial sector has a very important role in national development and the industrial sub-sector is one of the businesses that play a very important role in national economic development. The palm oil industry that will produce export products with high added value is the Oleochemical industry. The Oleochemical industry is growing rapidly in Indonesia. And one of the industrial companies engaged in Oleochemical including PT Energi Oleo Persada. In carrying out its activities PT Energi Oleo Persada operates by using raw materials in the form of: CPO, RBDPO, RBDPS and supporting chemicals. PT Energi Oleo Persada consists of several units of process stages, each of which forms a unity that is interrelated with each other, especially on the characteristics of the amount and quality of the processed. Most of the Oleochemical industry currently uses hydrolysis processes, especially Fat Spliting. Fat Splitting is the process of breaking down oil/fat to obtain fatty acids (fatty acids and glycerin).

Triglycerides are processed in several stages into chemicals in general, the initial processing is carried out in the Splitting column. Processing carried out in the Splitting column occurs with the hydrolysis process where the main purpose of this process is to produce fatty acids and glycerine. In controlling the hydrolysis process depends on several factors that simultaneously enter as feed feed material into the Splitting column, namely the ratio of incoming processed materials, temperature and pressure that must be adjusted

so that good quality fatty acid and glycerine can be obtained. The amount of triglyceride or oil fed is more than water. Water has the main role of directly reacting with oil with the appropriate ratio to get the quality of fatty acid and glicerine products as expected. And the actual condition of water in the Splitting column is more than triglycerides, but as a feed material the amount of water supplied is about 60% of the total feed material. The ratio that occurs must be maintained in the range 0.5-0.7. So far at PT Energi Oleo Persada, has not used a pre heater and economizer so that the quality of the product is often unstable in quality, the purpose of adding the unit is to increase the temperature of the feed material entering the splitter column.

With the optimal temperature before entering the splitter column, it can increase the level of hydrolysis reaction in the column and maintain product quality to be more stable and minimize production costs because the heat used is utilized from the heat of the product released from the column.

2.RESEARCH OBJECTIVES, BENEFITS AND LIMITATIONS

Penelitian ini berfokus pada peningkatan kualitas produk dari proses Splitting serta mempelajari karakteristik proses sebelum dan sesudah dilakukan modifikasi. Dimana nantinya akan ditambahkan Pre Heater dan Economizer terhadap Acid Value pada Unit Splitting di PT Energi Oleo Persada.

Manfaat dari penelitian ini adalah untuk meningkatkan kualitas produk yang dihasilkan, meningkatkan kestabilan kualitas Fatty Acid selama produksi berjalan, meningkatkan nilai jual dari Fatty Acid yang diproduksi yang nantinya akan menghemat biaya produksi jangka panjang.

3. RESEARCH METHODS

3.1 Materials

The materials used in this research are Splitted Palm Stearin Fatty Acid (SPSFA), HCl 0.5 N, NaOH Alcoholic Solution, Phenolftalein Indicator (PP) 0.5%, Na2B4O7.10H2O, Distilled Water, Ethanol 95%, Alcohol 96%, NaOH 0.1 N.

3.2 Methodology

3.2.1 Preparation of Reagents - Reagents

3.2.1.1 Preparation of 0.5 N HCl Solution

- Measured HCl (37%, ρ = 1.19) as much as 20.75 ML
- Put into a 500 mL measuring flask
- Added distilled water up to the upper limit – Homogenized

3.2.1.2 Preparation of Alcoholic NaOH

- Weighed 4 grams of NaOH pellets using an analytical balance.
- Put into a 250 mL measuring flask
- Added 6.25 mL distilled water
- Stirred NaOH Pellets until dissolved
- Added 95% ethanol

3.2.1.3 Preparation of neutral ethanol

- Put 50 mL of neutral ethanol into a glass beaker
- Heated using a hotplate
- Dripped PP indicator until ethanol is purple

3.2.2 Determination of Saponification Numbers

3.2.2.1 Standardization of 0.5 N HCl

- Weighed Na2B4O7.10H2O 0.191 grams
- Put into erlenmeyer
- Added 25 mL of distilled water
- Added 1 mL PP indicator
- Titrated using ethanolic NaOH until the red color becomes a clear color
- Recorded the volume of ethanolic NaOH used

3.2.2.2 Determination of Saponification Numbers

- Weighed 2 g sample
- Put into Erlenmeyer
- Added 25 ML Alcoholic Ethanol into Erlenmeyer
- Refluxed until all samples were completely atomized (fat-free solution) for about 1 hour.
- Cool the solution and then rinse the inside of the condenser with distilled water
- Added 1 mL of Phenolftalein Indicator into the solution
- Titrated excess NaOH into the solution using 0.5 N HCl until the pink color disappears
- Calculated the volume of HCl used
- Titrated blank solution (without sample) as in the determination of the sample
- Calculated the volume of HCl used

3.2.3 Determination of Acid Numbers

- Dissolved 0.5 g of sample into 125 mL of neutral ethanol, and made sure the sample dissolved completely (Warm up if needed)
- Added a few drops of Phenolftalein indicator
- Shaken the sample until completely dissolved
- Titrated using 0.5 N NaOH until the solution to the pink end point lasts for 30 seconds
- Recorded the volume of NaOH 0.5 N used
- Titrated blank solution (without sample) as in the determination of the sample
- Recorded the volume of NaOH 0.5 N used

4. RESULTS AND DISCUSSION

4.1 Result Research

Research on the effect of the addition of Pre heater and economizer in the splitting unit of PT Energi Oleo Persada was conducted on October 17, 2023 by adding 2 Plate type Heat Exchangers. The first heat exchanger is used to utilize the heat generated from the product coming out of the splitting hydrolysis process, and the second heat exchanger is used to support the temperature to be more leverage in raising the feed temperature until the optimum point is reached.

The use of 2 heat exchangers also increases the efficiency of the process because it does not require a lot of heat supply because it is supported by the heat from the process that has occurred. After modification, the results obtained are more stable and optimum than before modification.

Table 4.1 Acid Value Observation Data before Modification

Date	Time	ACID VALUE*
16 October 2023	06.00	207,78
	10.00	205,58
	14.00	206,55
	18.00	207,74

(source, PT Energi Oleo Persada Lab)

Table 4.2 Acid Value Observation Data after Modification

Date	Time	ACID VALUE*
18 October 2023	06.00	207,00
	10.00	207,36
	14.00	208,02
	18.00	208,06

(source, PT Energi Oleo Persada Lab)

Table 4.3 Acid Value Analysis Data of SPSFA PT Energi Oleo Persada After Improvement of Pre Heater & Economizer with Temperature Variation (1100C)

Date	Time	ACID VALUE*
19 October 2023 Temp Set (110^0C)	06.00	207,02
	10.00	207,23
	14.00	207,55
	18.00	207,43

(source, PT Energi Oleo Persada Lab)

Table 4.4 Acid Value Analysis Data of SPSFA PT Energi Oleo Persada After Improvement of Pre Heater & Economizer with Temperature Variation (115˚C)

Date	Time	ACID VALUE*
20 October 2023 Temp Set (115^0C)	06.00	207,68
	10.00	207,58
	14.00	207,60
	18.00	207,62

(source, PT Energi Oleo Persada Lab)

4.2 Discussion

Based on the results of the PT Energi Oleo Persada Laboratory Analysis, it was found that the increase in Acid Value occurred significantly and experienced better stability compared to before the use of modifications. The temperature variation used also refers to conditions where there is a vacuum system in

the splitting process so that the author does not take too high a range because it can cause overheating of the SPSFA material used and to keep the material somewhat undamaged. With the comparison carried out, the optimum quality was found at a feed material process temperature of 120 0C. The hydrolysis that occurs is also stable and there is no emulsion that can cause damage to product quality.

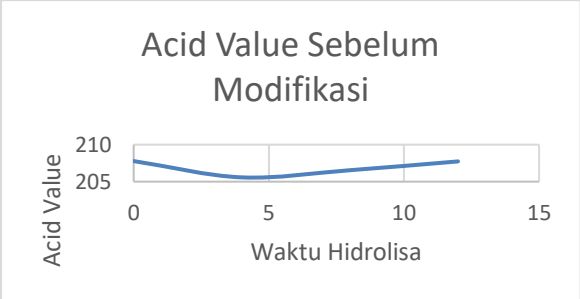

Figure 4.1 Acid Value Chart Before Modification (October 16, 2023)

From graph 4.1 it can be seen that the process that occurs does not run stably and there is a decrease in performance due to the temperature of the incoming material still below the expected temperature, before modification, the temperature of the incoming material starts from 68oC to 70oC.

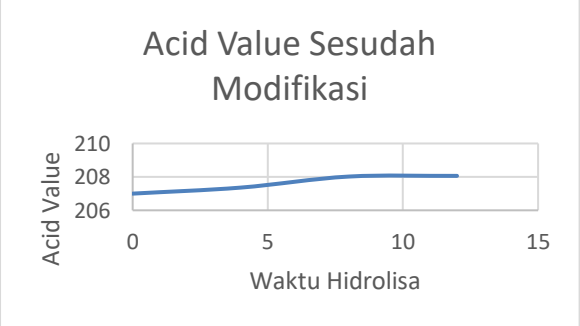

Figure 4.2 Acid Value Graph after Modification (October 18, 2023)

From graph 4.2, it can be seen that the increase in acid value quality is better with an increase assisted by the Economizer which is able to increase the temperature to 100oC and assisted by the Pre Heater to 120oC.

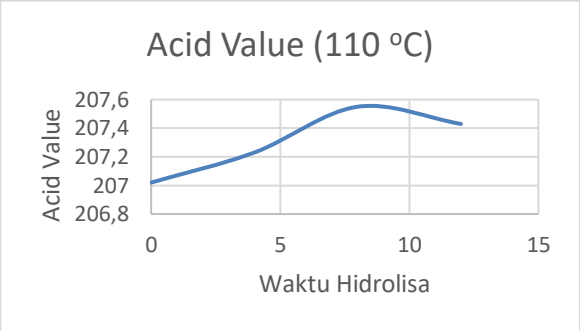

Figure 4.3 Acid Value Graph with 110oC Temperature (October 19, 2023)

From Figure 4.3, it is obtained that the results vary with the condition of 110oC temperature set at the Pre Heater with the steam valve opening set manually.

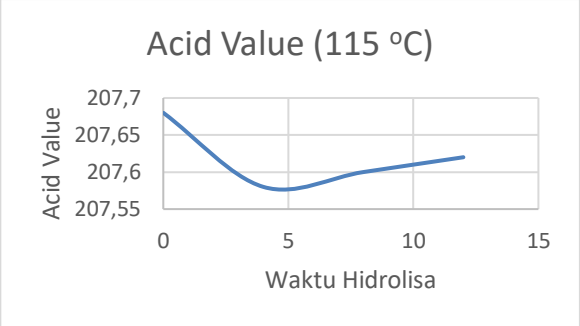

Figure 4.4 Acid Value Graph with 115oC Temperature (October 20, 2023)

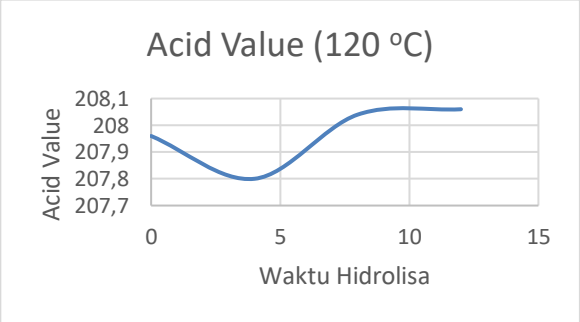

Figure 4.5 Acid Value Graph with 120oC Temperature (October 21, 2023)

From Figure 4.5, the optimum result is obtained at the acid value point at 208.06 which is a good acid value for the Splitted Palm Stearin Fatty Acid hydrolysis process.

CONCLUSION

Based on the results of the research that has been carried out, several conclusions can be drawn:

The addition of Pre heater and Economizer is able to increase the temperature of Fatty Acid material significantly seen from the comparison graph between before and after modification. From the graph of temperature increase after modification starting from 110 - 120 oC, the optimum Acid Value condition is obtained at a temperature of 120 oC with the maximum Acid Value result at a value of 208.08. Economizer helps increase the temperature up to 100oC and assisted by Pre Heater which can be adjusted as needed so that the steam used is more economical.

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