

The Implementation of Pyrolysis of Waste Material to Bio-Oil in The KKN Course

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ABSTRACT: Kuliah Kerja Nyata (KKN) is one kind of university contribution to community. Through KKN, student also learn how to apply their knowledge and contribute it to community need. In Universitas Islam Indonesia (UII) there are two kind of KKN which are Regular and Pembelajaran Pemberdayaan Masyarakat (PPM), which differentiate from the topic used. KKN PPM already has major topic that obtained from village destination need. The problem from KKN PPM is limitation time for student to learn about major topic before socialize to community like in KKN UII 57 unit 310-315 which has pyrolysis method as their major topic. Not all the student that include in unit 310-315, which come from different study, understand about pyrolysis. To settle this problem, experimental method was choose as learning method used, which help student understand about pyrolysis in limitation time. The effectiveness of this method was observed by observation, interview and questioner. The result show that experimental method give good result. The student understand basic concept of pyrolysis process that needed in limitation time, even though they did not understand anything about pyrolysis method before.

Keywords: KKN PPM, Pyrolysis method, experimental method

INTRODUCTION

Education is important for country growth. There are many ways can be used to educate student, but there are also many factors that will affect the result. One of so many factor is learning method. Roy Killen [1] introduce two type of learning method which are Teacher Centered Learning (TCL) and Student Centered Learning (SCL). Nowadays, especially in university, SCL become more popular than TCL, because focusing student as the centered of learning will improve their ability more.

KKN is program that held by university as their contribution to community. It has so many advantage, especially for student, they can learn to socialize with community and also implement their knowledge. There are two type of KKN which are Regular and PPM. KKN PPM is type of KKN that hopefully can bridge community problem [2], and that was the reason why topic of KKN PPM should be related to village destination needed.

UII as one private college in Yogyakarta also has Regular and PPM types. The difference of both type coming from the topic used. In regular, there is no major topic, student will do program that community needed without specific purpose. In PPM, there is one major topic, so, all the program held by student should be directed to major topic as the end result (all the program will support major topic). Major topic that held in PPM should be program needed by village. In this 2018, unit 310-315 in KKN UII 57, has pyrolysis method to produce briquette and bio-oil as their major topic. Pyrolysis is thermal degradation that held at high temperature without oxygen condition (no oxidation process). The application of pyrolysis method is burning biomass (e.g. rice husk) to produce energy. In pyrolysis process, biomass will be converted to gas, liquid and char [3]. Gas that produced then converted to liquid (as bio-oil), and char that will be produced is called briquette which is one of alternative energy because it has high calorific value. Not all student in KKN learning about pyrolysis, but soon, they should educate community about pyrolysis process. So, to improve student knowledge about pyrolysis in limitation time, experimental method was used as strategic learning method applied in KKN PPM.

The result of the experimental method to deepen student knowledge about pyrolysis will be observed.

METHOD

Experimental Design

Experimental method as learning method for student with step : (1) preparing ingredients (rice husk) and tool (pyrolysis reactor); (2) reactor introduction (through lyterature studies and coaching with teacher); (3) practice; (4) application in location

Location, time and subject experiment

Training has been hold in Chemical Laboratory. FMIPA, UII. Application will be held in village destination (Butuh Village). This experiment will be held for one month (July to August 2018). Subject experiments are all student in 310-315 unit.

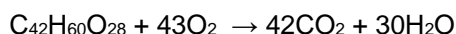
Data collection

Observation, questioner, literature study

RESULT AND DISCUSSION

This experiment focused on experimental method as leaning method used because the effectiveness of the method on helping student to understand the project in limitation time. The effectiveness of the method will be shown from collected data. The data will be collected and processed to get information about effectiveness of experimental method in learning process. The question used in questioner are separated to two type which are theory question (student understanding about pyrolysis method) and instrumental question (student understanding about tools that used in pyrolysis process).

Pyrolysis method is thermal degradation of biomass to get an energy as the product, and for efficiency, usually used agricultural waste as biomass source [4]. Pyrolysis using high temperature on burning process without oxygen condition. The temperature is used from 200-500°C and produce charcoal, tar and gas (CO and also CO₂) [5]. The existence of oxygen on pyrolysis process will conduct complete burning that convert all of biomass become water vapor and gas (CO₂) following reaction [6]:



The result from collecting and processing data are shown that majority of the student understand about basic knowledge of pyrolysis (as mentioned before) as seen at Figure 1. But, especially question about chemical reaction happen in pyrolysis process, mostly student got wrong answer. The explanation of this result is because chemical reaction is not common, people who never learn about chemical reaction, they will be confused by symbol used in reaction. Other question that has wrong answer is about pyrolysis product. Some student answers that 'ash' was pyrolysis product. This happen when doing trial eror simulation, student obtain ash when burning biomass at higher temperature. Actually ash can be produce when the burning process are upper the limit temperature of biomass to degrade thermally but, it is not expected product from pyrolysis.

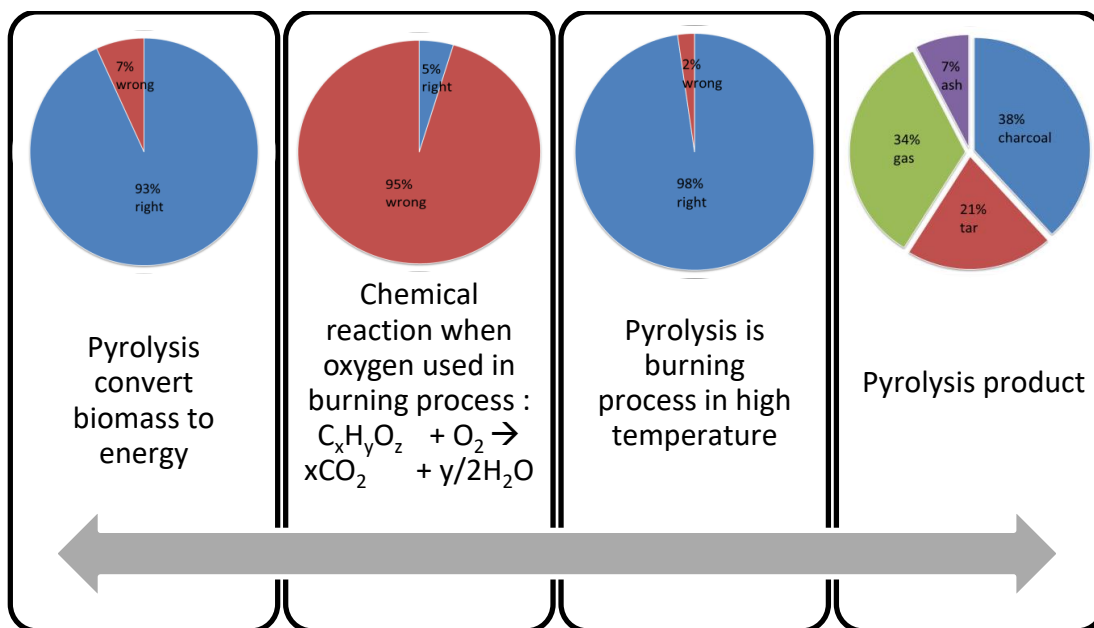


FIGURE 1. Answer percentage about theoretical question

Question prepared in instrumental question type based on reactor that student used to learn (Figure 2). There are two basic part of reactor in pyrolysis which are burning furnace (symbol A) as biomass burning take place and condenser (symbol B) as part in which gas converted to liquid called bio-oil (side product of pyrolysis process).



FIGURE 2. Pyrolysis Reactor

The result about instrumental question are given in Figure 3. The result shows better than theoretical question because understanding tools that student practicing with, is more easy than learning theoretical about process.

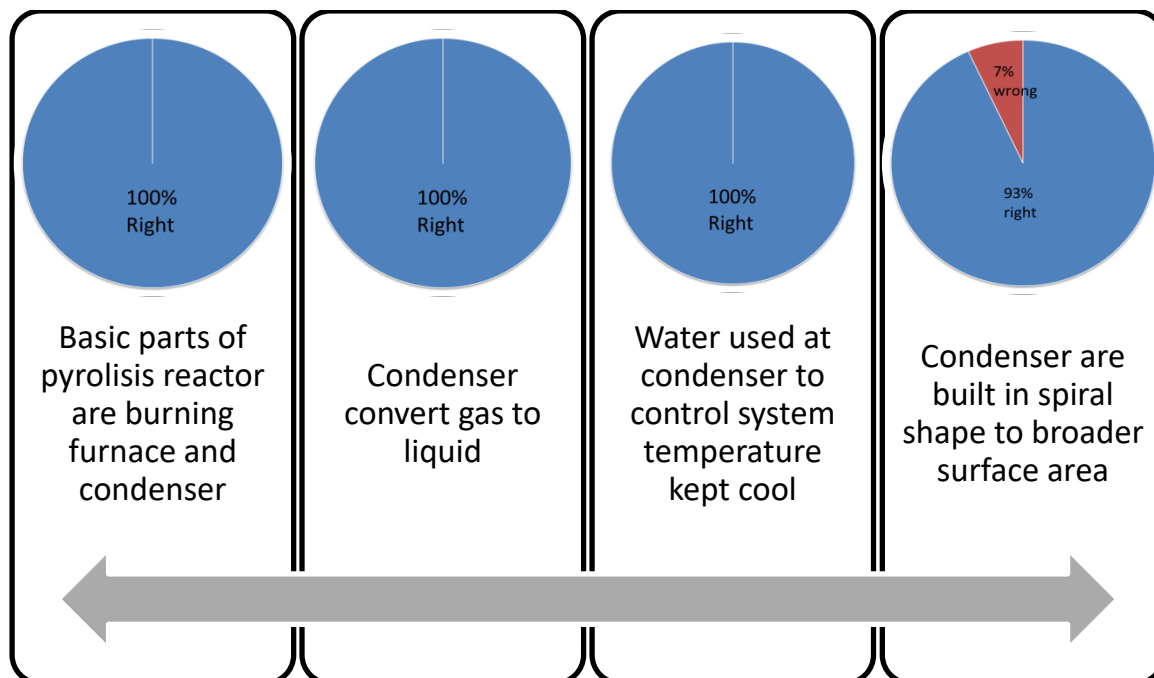


FIGURE 3. Answer Percentage about Instrumental Question

From the result of both type question, it can be concluded that experimental method, help student learning rapidly because there is majority student that do not have basic concept about pyrolysis process (84%), but after doing simulation, they can understand general knowledge about pyrolysis.

CONCLUSION

Learning method using experimental method is effective to help student understand problem in limitation time like in KKN PPM.

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