

The Readiness of Indonesia to Implement Blended Biodiesel B30

*Hermawan Febriansyah**, *Fajar Budi Utomo*, and *Suminto Suminto*

Center of Research and Human Resources Development, National Standardization Agency of Indonesia, Puspiptek Complex Building number 430, Tangerang Selatan 15314, Indonesia

Abstract. Since 2016, based on the regulation of the Minister of Energy and Mineral Resources number 12/2015, the government has enacted a policy of mixing biodiesel into diesel oil by 20 %, also known as B20. It is applied to all sectors that use diesel oil. In 2020, based on that regulation, Indonesia will continue to implement B30. Indonesia will be the first nation in the world to implement B30, especially biodiesel based on palm oil. This study is to present the readiness of Indonesia to implement B30 by the installed capacity, the regulation, the reference of standard, and the availability of biodiesel laboratory. This study is based on literature studies, discussion, and biodiesel testing. The result of this study showed that the biodiesel installed capacity has enough to supply B30. The regulation has available as mandatory starting per 2020. The biodiesel testing showed compliance in the parameter of the revised standard. The biodiesel laboratory as a conformity assessment also has available to test the revision of biodiesel standard. It gives confidence for Indonesia to implement B30.

Key words: Biodiesel standard, B30 regulation, biodiesel laboratory, biodiesel production capacity, palm oil blended biodiesel.

1 Introduction

Diesel oil is one of the most significant fuel needs in Indonesia. As of 2018, Indonesia consumes diesel oil by 30 962 670 kL [1]. Diesel oil can be supplied domestically is only 79 % or 24 460 000 L of consumption, so diesel oil is needed to import. Now, domestic diesel oil users are the micro sector, fisheries, agriculture, transportation, services, general, power plants, industry, and commercial. From 2015 until 2018, there was an increase in diesel oil consumption by an average of 5 % per year. Since 2016, based on the regulation of the Minister of Energy and Mineral Resources number 12/2015, the government has enacted a policy of mixing biodiesel into diesel oil by 20 %, also known as B20 [2]. B20 is applied to all sectors that use diesel oil. In 2020, based on that regulation, Indonesia will continue to implement B30. Indonesia will be the first nation in the world to implement B30, especially biodiesel based on palm oil.

*Corresponding author: hermawan.febriansyah@bsn.go.id

At present, the government is preparing a policy of mixing biodiesel to 30 % or B30. The raw material for B30 is the same as B20, which comes from palm oil. To support this, the ESDM Ministry launched a B30 road test program on 13 June 2019. The program proposed for the approval of the B30 specification proposed as an SNI standard. SNI 7182: 2015 will be revised to become a B30 specification. If it is successfully implemented, Indonesia will become the first country in the world to use B30, and correctly, B30, made from palm oil. While for B20 until 2018, only three countries have implemented B20, namely the United States, Canada, and Indonesia. The United States and Canada have different standards from Indonesia because they do not use palm oil raw materials. The United States and Canada use soybean oil as raw material. This study is to present the readiness of Indonesia to implement B30 by the installed capacity, the regulation, the reference of standard, and the availability of biodiesel laboratory.

2 Method

This study is based on literature studies, discussion, and surveys. The literature studies are to obtain the secondary data of installed capacity, the applied regulation, the reference of standard, and the availability of biodiesel laboratory. The discussion is established by a forum group discussion that consisting of government, industry, and laboratory, and also by surveys to producers to obtain the primary data of installed capacity. The data is collected as per 30 August 2019. The tool of surveys is done by a questionnaire that consisting of 14 questions for producers listed in the regulation of minister of energy and mineral resources number 15k/10/MEM/2019.

3 Result and discussion

3.1. The capacity of biodiesel productions

Until 2019, there are 12 060 000 kL of biodiesel have been installed in Indonesia. The production of biodiesel reached up to 6 160 000 kL in 2018. So the utilization of biodiesel production is about 51 % [3]. If Indonesia applies B30 in 2030, the utilization of biodiesel production will reach about 75 % from existing capacity. As shown in Figure 1, from survey to seven biodiesel producers shows that 43 % of them have a plan to upsize the capacity of production for supply B30.

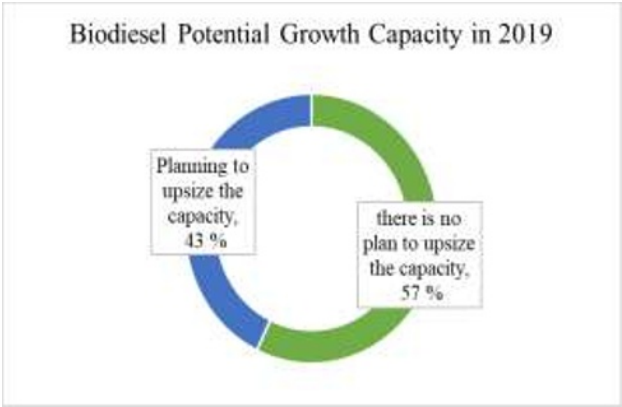


Fig. 1. Biodiesel's potential growth capacity in 2019.

3.2. Regulation of diesel and biodiesel for blended biodiesel B30

In implementing B30 in Indonesia, B30 is a working road test coordinated by the Minister of Energy and Mineral Resources. This road test is to evaluate the parameters of the standard to be implemented for B30. The existing diesel parameter is still available based on the regulation of the Director-General of Oil and Gas number 28.K/10/DJM.T/2016 and Director General of New Energy, Renewable and Energy Conservation Decree number 332K/10/DJE/2018 that only can implement with blended biodiesel B20 [4]. The quality of biodiesel for B20 is referenced to SNI 7182:2015. So, for blended biodiesel B30, the government has not issued the regulation yet.

3.3. The draft of biodiesel standard for blended biodiesel B30

To implement B30, the standard of B30 follows not only the result of road test B30 but also the readiness of the industry to produce the specification of biodiesel. In the discussion of revision SNI 7182:2015, the technical committee of bioenergy still in the debate of five parameters to be changed and six parameters to be added. Table 1 shows that the revision of SNI 7182:2015 will change the parameter of flashpoint, sulfur, acid value, oxidation stability, and monoglyceride. There is also add a parameter of water content, CFPP, metal 1 (Na + K), metal 2 (Ca + Mg), a total of contaminant, and color. Because Indonesia is one of the worlds to implement B30, the result of parameter biodiesel for B30 may be adopted by another country. Indonesia using palm oil as the raw material of biodiesel, so the other countries with different feedstocks may use a different standard. It also may cause difficulty in the harmonization of the biodiesel standard [10].

Table 1. The concern of the draft revision standard of SNI 7182 for B30

The change of parameter	The eliminated parameter	The additional parameter
Flash point	Cloud point	Water content
Sulphur	Water and sediment	CFPP
Acid value		Metal I (Na + K)
Oxidation stability		Metal II (Ca + Mg)
Monoglyceride		Total of contaminant
		Color

Following the regulation of the Minister of Energy and Mineral Resources number 12/2015, users of B30 have now been applied for power plant industries. So, if B30 apply in 2020, it will obligate to all sector at the regulation. However, the problem is any doubt from users to apply B30. Engines issue is the one to be made uncertainty of users. The completion of B30 road test will show the engine performance after the use of B30. It also validates the draft revision of the biodiesel standard to be applied.

Table 2. The draft revision standard of SNI 7182 for B30 roadtest

No	Parameters	Value, min/max	SNI 7182:2015	Test method	Draft revision of standard	Draft revision of test method
1	Density at 40 °C	kg m ⁻³	850 to 890	SNI 7182:2015	850 to 890	SNI 7182:2015
2	Kinematic viscosity at 40 °C	mm ² s ⁻¹ (cSt)	2.3 to 6.0	SNI 7182:2015	2.3 to 6.0	SNI 7182:2015
3	Cethane number	min	51	SNI 7182:2015	51	SNI 7182:2015
4	Flashpoint	°C, min	100	SNI 7182:2015	130	SNI 7182:2015
5	Copper Corrosion (3 h at 50 °C)		No. 1	SNI 7182:2015	No. 1	SNI 7182:2015
6	Carbon residue - into sample; or - into the rest of distillation	%-mass, max	0.05 0.3	SNI 7182:2015	0.05 0.3	SNI 7182:2015
7	Distillation temperature 90 %	°C, max	360	SNI 7182:2015	360	SNI 7182:2015
8	Ash sulphated	%-mass, max	0.02	SNI 7182:2015	0.02	SNI 7182:2015
9	Sulfur content	mg kg ⁻¹ , max	50	SNI 7182:2015	10	SNI 7182:2015
10	Phosphor	mg kg ⁻¹ , max	4	SNI 7182:2015	4	SNI 7182:2015
11	Acid value	mg-KOH g ⁻¹ , max	0.5	SNI 7182:2015	0.4	SNI 7182:2015
12	Free glycerol	%-mass, max	0.02	SNI 7182:2015	0.02	SNI 7182:2015
13	Total glycerol	%-mass, max	0.24	SNI 7182:2015	0.24	SNI 7182:2015
14	Ester methyl	%-mass, min	96.5	SNI 7182:2015	96.5	SNI 7182:2015
15	Iodine value	%-mass (g-I ₂ 100 ⁻¹ g ⁻¹), max	115	SNI 7182:2015	115	SNI 7182:2015
16	Oxidation stability Period of induction with rancimat method or Period of induction with petro-oxy method	Minute	480 36	SNI 7182:2015	600 45	SNI 7182:2015
17	Monoglyceride	%-mass, max	0.8	SNI 7182:2015	0.55	ASTM D 6584
18	Water Content	mg kg ⁻¹ , max	-	-	350	ASTM D 6304
19	Cold Filter Plugging Point (CFPP)	°C, max	-	-	15	ASTM D 6371

Table 2 continue to the next page

Table 2. Continued

No	Parameters	Value, min/max	SNI 7182:2015	Test method	Draft revision of standard	Draft revision of test method
20	Metal I (Na + K)	mg kg ⁻¹ , max	-	-	5.0	EN 14108/14109, EN 14538
21	Metal II (Ca + Mg)	mg kg ⁻¹ , max	-	-	5.0	EN 14538
22	Total of Contaminant	mg L ⁻¹ , max	-	-	20	ASTM D 2276, ASTM D 5452, ASTM D 6217
23	Color		-	-	3	ASTM D 1500
24	Ash content	%-volume	-	-	0.01	ASTM D 482
25	Cloud Point	°C, max	18	SNI 7182:2015	-	-
26	Water and sediment	%-volume, max	0.05	SNI 7182:2015	-	-

The revision of the biodiesel standard is proposed to add more requirements to support B30. As shown in Table 2, the revision of the biodiesel standard has more requirements than SNI 7182:2015. The revision of biodiesel needs passing 23 tests to conform to the quality of biodiesel for B30. To know the competitiveness of biodiesel, the draft revision of biodiesel standard compared to European Standard of EN 14214:2012+A1:2014 (Table 3), Indonesia has a higher parameter than the European standard. From 24 parameters in the draft revision of the biodiesel standard, the European standard only matched 16 parameters to Indonesia Standard. Moreover, from 16 parameters of matched biodiesel standard, Indonesia has a higher standard for six parameters, there are acid value, total glycerol, iodine value, monoglyceride, water content, and total contaminant.

Table 3. Comparison the biodiesel standard between Europe and Indonesia

No	Parameters	Value, min/max	EN 14214:2012+A1:2014	Draft revision of SNI 7182
1	Density at 40 °C	kg m ⁻³	860 to 890	850 to 890
2	Kinematic viscosity at 40 °C	mm ² s ⁻¹ (cSt)	3.5 to 5.0	2.3 to 6.0
3	Cethane number	min	51	51
4	Flash point	°C, min	101	130
5	Copper Strip Corrosion (3 h at 50 °C)		No. 1	No. 1
6	Carbon residue - into sample; or - into the rest of distillation	%-mass, max	-	0.05 0.3
7	Distillation temperature 90 % vol	°C, max	-	360
8	Sulfated ash	%-mass, max	0.02	0.02

Table 3 continue to the next page

Table 3. Continued

No	Parameters	Value, min/max	EN 14214:2012+A1:2014	Draft revision of SNI 7182
9	Sulfur content	mg kg ⁻¹ , max	10	10
10	Phosphor	mg kg ⁻¹ , max	4	4
11	Acid value	mg-KOH g ⁻¹ , max	0.5	0.4
12	Free gliserol	%-mass, max	0.02	0.02
13	Total gliserol	%-mass, max	0.25	0.24
14	Ester methyl	%-mass, min	96.5	96.5
15	Iodine value	%-mass (g-I ₂ 100 ⁻¹ g ⁻¹), max	120	115

3.4. The effect of handling to keep biodiesel quality

Biodiesel producers have procedures to distribute biodiesel. Some of the biodiesel producers have rules for each shipment; the transporter of biodiesel must have nitrogen blanket facility. They have a reason; the nitrogen blanket would affect the quality of biodiesel. Nitrogen blanket will keep the biodiesel quality to be changed, especially water content quality. It also makes a safe shipment. So some of them recommend standardizing the handling of biodiesel. For shipment with vessel, they found there were any changes for the water content of biodiesel up to 150 mg kg⁻¹. Not only that, but biodiesel producers also found there was the different value of biodiesel quality tested in the discharge point. Some of them doubt about how the third parties or customers handle the biodiesel sample. As shown in Figure 2, biodiesel producers give recommendations the standardize the test of samples in the discharge point.

Indonesia has already released a reference in handling biodiesel. It is contained in the General Guidelines for Handling and Storage of Biodiesel Fuel (B100) and Biodiesel Mixtures (BXX) issued in 2018. In this guideline, it has been recommended to store in an oxygen-free steam chamber, for example, is using nitrogen blankets. However, because the guideline is not mandatory, it needs to be standardized or regulated so that it can be applied consistently [6]. This is also supported by guidelines for handling biodiesel from other countries. One of them is released by United States (U.S). Biodiesel Handling and Use Guide (Fifth Edition), which made by U.S. Department of Energy, also recommends the use of nitrogen blankets in biodiesel storage [11].

Earl Christensen in [9] has studied the stability of biodiesel and biodiesel blends. They did the experiment to test the biodiesel sample with a nitrogen blanket and stored it in a dark room at room temperatures. The study based on the long-term storage stability of biodiesel and biodiesel blends, [9] did fuel aging experiment. The study showed that a nitrogen blanket could reduce the oxidation of biodiesel [9].

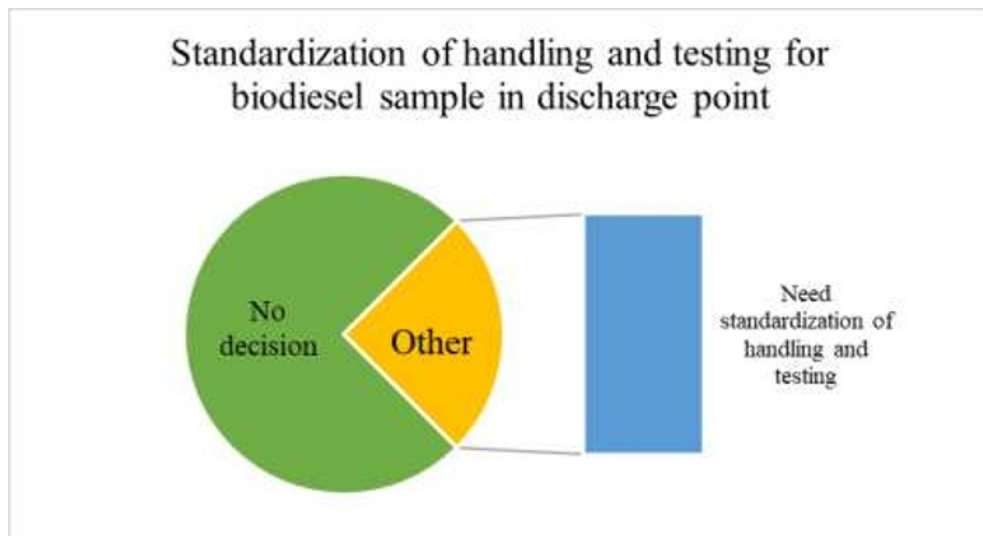


Fig 2. Biodiesel producers recommend standardizing the handling and testing of biodiesel.

3.5. The availability of biodiesel laboratory

For the biodiesel testing laboratory, Indonesia has six laboratories listed in the National Accreditation Committee of Indonesia; there are PPPTMGB “Lemigas,” PT Sucofindo (Persero), PT Tekenomiks Indonesia, PT Pertamina (Persero) terminal BBM Manggis, LPPM IPB, and PT Wilmar Nabati Indonesia. However, only PPPTMGB “Lemigas” can test the biodiesel for full parameter [5]. All of the biodiesel producers have biodiesel laboratory, but some of them only can test biodiesel partially. In many cases, the biodiesel producers test biodiesel in another country for export.

4 Conclusion

The result presented that biodiesel producers ready to implement B30 based on their production capacity. In 2018, Indonesia consumes 3 750 066 kL, still 31 % of 12 059 369 kL of installed capacity. The Standard of biodiesel has not been finished revision yet, and also the standard or regulation of diesel oil needed to be revise because it only applies to B20. The testing laboratories as one of quality infrastructure are available and ready to provide testing for biodiesel.

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