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PROCEEDING

International Conference on Green Technology and Design

"A Dissemination platform for supporting green energy, green building, green automation, green transportation and environmental sustainability"

BANDUNG 4 – 5, DECEMBER 2019

BALE DAYANG SUMBI
INSTITUT TEKNOLOGI NASIONAL BANDUNG
WEST JAVA - INDONESIA

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BOOK OF PROCEEDING

INTERNATIONAL CONFERENCE ON GREEN TECHNOLOGY AND DESIGN

Bandung, 4 – 5 December 2019

Bale Dayang Sumbi
Institut Teknologi Nasional Bandung
West Java - Indonesia

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RUNDOWN ICGTD

Day	Time	Description
Wednesday, December 4th 2019	*08.00 – 08.30*	*Registration*
	08.30 – 09.00	*Welcome speech:* ***ICGTD Chair, Rector of Itenas*** *and Opening*
	09.00 – 09.45	*Plenary Session: "Assessment of Solar PV Power Potential over Asia Pacific Region with Remote Sensing and GIS"* ***Jeark A. Principe, Ph.D (Philipine)***
	09.45 – 10.30	*Plenary Session: "Emissions and Mitigation Scenarios for Residential Combustion of Solid Fuels in Developing Countries"* ***Dr. Ekbordin Winijkul (Thailand)***
	10.30 – 10.45	*Coffee Break*
	10.45 – 11.30	*Plenary Session: "Water Resource Management Framework For West Java Province, Indonesia"* ***Iwan Juwana Ph.D (Indonesia)***
	11.30 – 12.30	*Ishoma Break*
	12.30 – 16.45	*Parallel Sessions – as attached*
	16.45 – 19.00	*Closing*

PRESENTATION SCHEDULE

No.	Name	Institution	Paper Topic	Presentation Time	Place
1	Niken Syafitri	Institut Teknologi Nasional Bandung	Green Automation	13.00	GSG Bale Dayang Sumbi Lt 1 (A)
2	Febrian Hadiatna	Institut Teknologi Nasional Bandung	Green Automation	13.15	
3	Florentinus budi setiawan	Soegijapranata catholic university	Green Automation	13.30	
4	Waluyo	Institut Teknologi Nasional Bandung	Green Automation	13.45	
5	Priyo Agus Setiawan	Politeknik Perkapalan Negeri Surabaya	Green Energy	14.00	
6	Lita Lidyawati	Institut Teknologi Nasional Bandung	Green Energy	14.15	
7	Bagus Rizky Pratama Budiajih	Institute Technologi Sepuluh Nopember	Green Energy	14.30	
8	Vibianti Dwi Pratiwi	Institut Teknologi Nasional Bandung	Green Energy	14.45	
9	Rachmad Ramadhan Yogaswara	Universitas Pembangunan Nasional (UPN) "Veteran"	Green Energy	15.00	
10	Lisa Kristiana	Institut Teknologi Nasional Bandung	Green IT	15.15	
11	Achmad Hizazi	Universitas Jambi	Green IT	15.30	
12	Dewi Rosmala	Institut Teknologi Nasional Bandung	Green IT	15.45	
13	Diki Ismail Permana	Institut Teknologi Nasional Bandung	Green Energy	16.00	
14	Yusup Miftahuddin	Institut Teknologi Nasional Bandung	Green IT	16.15	
15	Yudi Widiawan	Institut Teknologi Nasional Bandung	Green IT	16.30	
16	Rifqi Finaldy	Institut Teknologi Nasional Bandung	Green IT	16.45	
17	Hafidz Dayu Aditya	Institut Teknologi Nasional Bandung	Green IT	17.15	
18	Agus Hermanto	Institut Teknologi Nasional Bandung	Green Energy	17.30	
19	Meilinda Nurbanasari	Institut Teknologi Nasional Bandung	Green Energy	17.45	
20	Alfan Ekajati Latief	Institut Teknologi Nasional Bandung	Green Energy	18.00	
21	Lakshmanan Gurusamy	Universiti Malaysia Sarawak (UNIMAS)	Green IT	18.15	

No.	Name	Institution	Paper Topic	Presentation Time	Place
22	Abu Arif Jalaluddin	Universiti Malaysia Sarawak (UNIMAS)	Green IT	18.30	
23	Yanuar Z. Arief	Universiti Malaysia Sarawak (UNIMAS)	Green IT	18.45	
24	Nur Laela Latifah	Institut Teknologi Nasional Bandung	Green Building	13.00	GSG Bale Dayang Sumbi Lt 2 B
25	Riny Yolandha Parapat	Technische Universität Berlin (TU-Berlin), Berlin, Germany	Green Transportation	13.15	
26	Erwin Yuniar Rahadian	Institut Teknologi Nasional Bandung	Green Building	13.30	
27	Ardhiana Muhsin Machdi	Institut Teknologi Nasional Bandung	Green Building	13.45	
28	Tiara Anantika	Institut Teknologi Nasional Bandung	Green Building	14.00	
29	Wahyudi	Institut Teknologi Nasional Bandung	Green Building	14.15	
30	Dwi Prasetyanto	Institut Teknologi Nasional Bandung	Green Transportation	14.30	
31	Fred Soritua Rudiyanto Manurung	Institut Teknologi Bandung	Green Transportation	14.45	
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36	Ratna Agustina	Institut Teknologi Nasional Bandung	Green Transportation	16.00	
37	Jatmiko Wahyudi	Regional Development Planning Agency	Suistanability Environment	13.00	GSG Bale Dayang Sumbi Lt 1 (B)
38	Desti Santi Pratiwi	Institut Teknologi Nasional Bandung	Suistanability Environment	13.15	
39	Nguyen Thi Kim Oanh	Asian Institute of Technology (AIT)	Suistanability Environment	13.30	
40	Agung Pramudya Wijaya	Institut Teknologi Nasional Bandung	Suistanability Environment	13.45	
41	Edi Wahyu Wibowo	Politeknik LP3I Jakarta	Suistanability Environment	14.00	

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43	Elvira Rizqita Utami	Institut Teknologi Nasional Bandung	Suistanability Environment	14.30	
44	Farah Fauzia Raihana	Institut Teknologi Nasional Bandung	Suistanability Environment	14.45	
45	Byna Kameswara	Institut Teknologi Nasional Bandung	Suistanability Environment	15.00	
46	Ajeng Alya Hidrijanti	Institut Teknologi Nasional Bandung	Suistanability Environment	15.15	
47	Fenty Wastika Sari	Institut Teknologi Nasional Bandung	Suistanability Environment	15.30	
48	Yudi Adi Pratama	Institut Teknologi Nasional Bandung	Suistanability Environment	15.45	
49	Jono Suhartono	Institut Teknologi Nasional Bandung	Suistanability Environment	16.00	
50	Iredo Bettie Puspita	Institut Teknologi Nasional Bandung	Suistanability Environment	16.15	
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53	Maya Ramadianti Musadi	Institut Teknologi Nasional Bandung	Suistanability Environment	17.00	
54	Maya Ramadianti Musadi	Institut Teknologi Nasional Bandung	Suistanability Environment	17.00	
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67	Edi Setiadi Putra	Institut Teknologi Nasional Bandung	Green Design	14.15	
68	Sulistyo Setiawan	Institut Teknologi Nasional Bandung	Green Design	14.30	
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70	Agung Pramudya Wijaya	Institut Teknologi Nasional Bandung	Green Design	15.00	
71	Gita Permata Liansari	Institut Teknologi Nasional Bandung	Green Design	15.15	
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73	Detty Fitriany	Institut Teknologi Nasional Bandung	Green Design	15.45	
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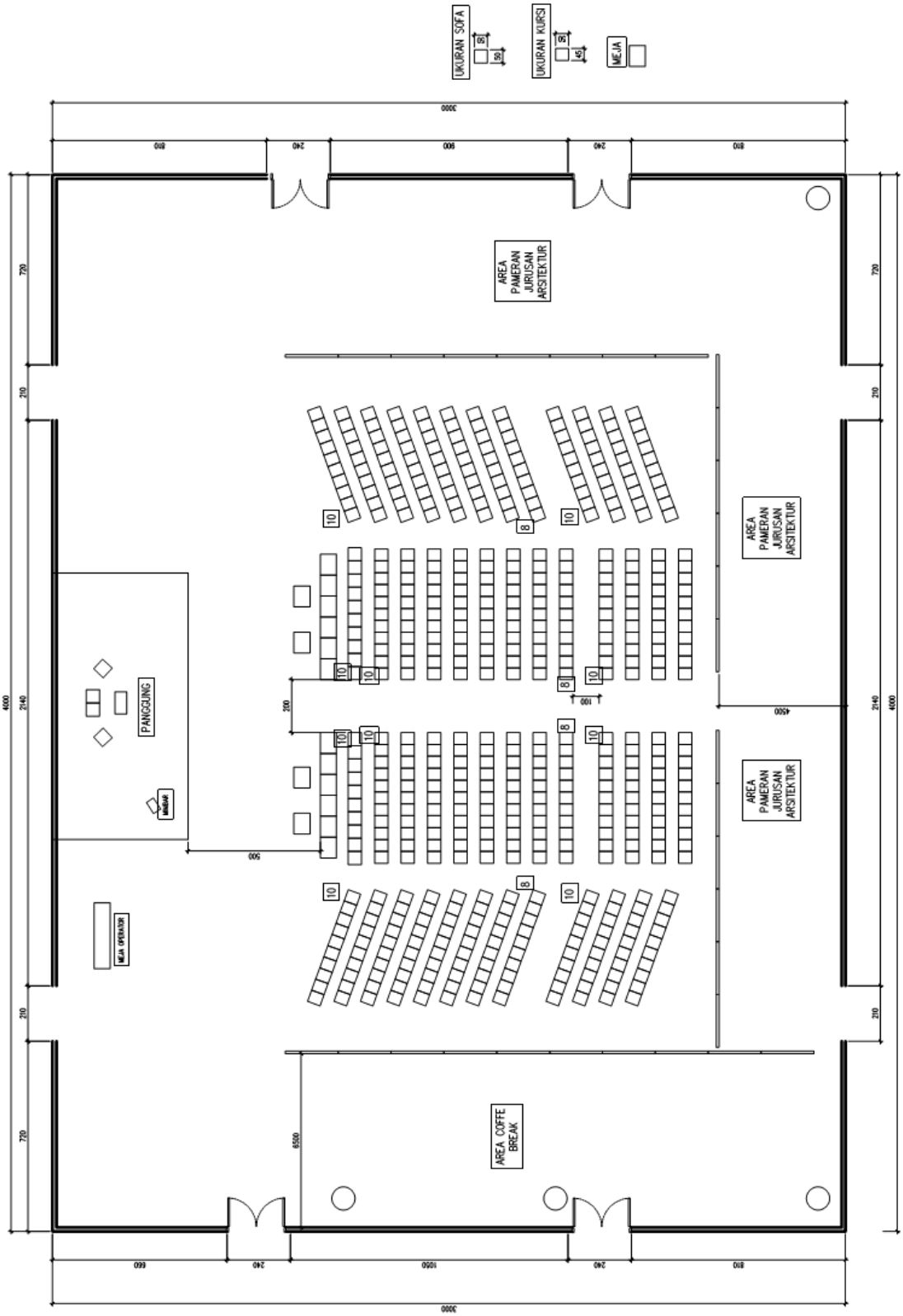
75	Aditya Januarsa	Institut Teknologi Nasional Bandung	Green Design	16.15	
76	Bambang Arief Ruby,	Institut Teknologi Nasional Bandung	Green Design	16.30	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PANGGUNG
MEJA OPERATOR
AREA COFFE BREAK

FOREWARD

Welcome to the 1st International Conference on Green Technology and Design. This conference takes place in Bandung, 4th December 2019 and become our first international conference in green technology and design.

It is our responsibility to contribute in the national development and sustainability, the Institut Teknologi Nasional (Itenas) Bandung through its Lembaga Penelitian dan Pengabdian kepada Masyarakat (LP2M) conducts this conference and draws upon the expertise of wide range of knowledge.

The ICGTD 2019 conference aims to promote research in the field of Green Energy, Green Building Green Automation, Green Transportation, Sustainability Environment, Green IT and Green Design, and to facilitate the exchange of new ideas in these fields among academicians, engineers, junior and senior researchers, scientists and practitioners. It also includes the plenary, keynote and invited speakers.

On behalf of Organizing Committee, it is a great pleasure to welcome you in Itenas Bandung and look forward to meeting you at ICGTD2019.

Warm regards,

Chair
Dr. Ir. Nurtati Soewarno M.T.

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Green Design

ICGTD 2019 International Conference on Green Technology and Design

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Multimode Ultrasound Cleaner Design for Green Extraction Food Processing

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***Abstract*—Many alternative methods which are often referred to as green methods have several advantages when compared to conventional methods. Some of these advantages are the use of fewer solvents, shorter extraction times, and their application can be carried out at lower temperatures. These advantages will produce bioactive compounds in large quantities without destroying biological activities. In addition, alternative methods are also better at isolating the desired compound and reducing the formation of unwanted by products and reactions. Some of the advantages of the green method are the use of fewer solvents, shorter extraction times, and their application can be carried out at lower temperatures. These advantages will produce bioactive compounds in large quantities without destroying biological activities. The advantage of the ultrasonic extraction is the use of low temperatures. Also as to maintain perishable compounds with high temperatures and prevent overall structural damage. The equipment designed consists of several parts, each of which is designed according to needs. The parts are signal-generator, system settings and modes, power booster, ultrasonic transducer and tank. The setting system functions to adjust the frequency, power gain and pre-set modes. Installed modes consist of ON-OFF mode, Alternate Frequency mode, Alternate Power and a combination of frequency and power. Sonic electronic control system that is designed consists of a signal generator with a variable frequency. The signal generator output is fed to an amplifier whose gain is variable, so there is a combination of frequency and amplitude that can be adjusted. After the frequency and amplitude are set, it is then fed to a power amplifier that will drive the transducer with a fixed frequency and amplitude, with enough power. The controller functions to regulate the voltage, frequency and stability of the system. The installed mode that was previously set is saved in the control system. The sonication system is designed to have an ultrasonic frequency range from 20 kHz to 100 kHZ with pre-set and self-regulated modes based on previous experiments.**

Keywords—ultrasonic, seaweed, frequency, multimode, cleaning

I. INTRODUCTION

Products with various contents of bioactive compounds are experiencing an increase in the number of enthusiasts because of its potential in improving health. One such product is seaweed, which in addition to consumption, can also be used as a functional product because of its bioactive compound content [1]. Seaweed has been used as a source of food since 3000 BC. In addition, seaweed can also be used as medicine [2]. Now, seaweed has become part of daily food, especially in countries in East Asia. Seaweed environmental conditions are classified as extreme so that seaweed has a self-protection mechanism in the form of secondary metabolite production that has the ability of bioactivity [3]. Some of these bioactivity abilities are anti-aging, antioxidant, antimicrobial, anti-poliferative, anti-inflammatory, antidiabetic, and neuroprotective activity [4]. Seaweed antioxidant sources come from the polyphenol content, especially phlorotannin. Phlorotannin is the largest polyphenol group in brown seaweed formed from several phloroglucinol units[5].Bioactive compounds in seaweed can be extracted with conventional methods and with new alternative methods. Conventional methods include extraction using Soxhlet, solid-liquid extraction, and liquid-liquid extraction. The disadvantages of conventional methods are the use of too many and often toxic solvents and long extraction times [6].

Meanwhile, alternative methods which are often referred to as green methods have several advantages when compared to conventional methods. Some of these advantages are the use of fewer solvents, shorter extraction times, and their application can be carried out at lower temperatures. These advantages will produce bioactive compounds in large quantities without destroying biological activities. In addition, alternative methods are also better at isolating the desired compound and reducing the formation of unwanted byproducts and reactions [7].

Aim of this research is design a sonication system that suitable for several kind of food, especially for seaweed. The equipment have to set with different frequency, amplitude dan presentable mode.

II. ULTRASOUND EXTRACTION

A. Green Extraction Method

An extraction method can be called a green method if it fulfills some of the principles below [8]. These principles are not rules but innovative examples that can be followed.

1. Innovation using alternative resources from plants
2. Use alternative water-based or agro-solvents
3. Reduce energy consumption with innovative technology
4. Reduce waste production
5. Reduce operating units and use safe and controlled processes

6. Leads to extracts that are not denatured and biodegradable and without contaminants

Some of the advantages of the green method are the use of fewer solvents (usually able to achieve a ratio of materials and solvents of 1: 100 for conventional methods) [9], shorter extraction times, and their application can be carried out at lower temperatures . These advantages will produce bioactive compounds in large quantities without destroying biological activities. In addition, alternative methods are also better at isolating the desired compound and reducing the formation of unwanted byproducts and reactions [10].

B. Ultrasound Assisted Extraction

UAE is an extraction method that is assisted by the use of ultrasonic waves. Ultrasonic waves are waves with frequencies above the human hearing capacity that is between 20 kHz to 100 kHz [11]. Unlike electromagnetic waves, ultrasonic waves are mechanical waves that can penetrate solid, gas and liquid media. When passing through the liquid media, the waves will cause negative pressure in the liquid. Then if the pressure exceeds the tensile strength (tensile strength) of the liquid, bubble formation will occur. Cavitation or bursting of bubbles can occur when bubbles are in high ultrasonic fields [12]. As a result of cavitation is the rupture of particles so that it helps the release of bioactives from the biological matrix. This increases the efficiency of extraction due to an increase in mass transfer by an internal diffusion mechanism [13].

Ultrasonic devices that can be used for extraction are divided into 2 types namely ultrasonic water bath (indirect sonification) and ultrasonic probes (direct sonification). The difference between the two is the operating conditions and how ultrasonic waves affect the sample. For ultrasonic water baths, they usually operate at a frequency of 40-50 kHz and at a power of 50-500 W and the sample is submerged in an ultrasonic bath. Whereas ultrasonic probes usually operate at a frequency of 20 kHz only and the sample is not submerged, but the probe is submerged in the sample.

The advantage of the UAE is the use of low temperatures so as to maintain perishable compounds with high temperatures and prevent overall structural damage). In addition, the UAE can use a variety of solvents that are only needed in small amounts so that they are environmentally friendly. When compared with conventional methods, the time required for extraction with ultrasonic is less and the yield produced is more so that the extraction runs efficiently . Then the costs needed for the tools tend to be smaller than other alternative methods.

C. UAE Application

The large ultrasonic cleaner is a wonderful industrial ultrasonic parts cleaner tank. It has very wide applications both in commercial and industrial parts cleaning and degreasing. Especially for massive cleaning work the production lines in factories. In general, there are specific applications as follows. Commercial Large Ultrasonic Parts Cleaner including musical instruments and lab equipment such as laboratory instruments and glassware cleaning. And medical instruments cleaning in hospitals. And it is a wonderful large ultrasonic parts cleaner for golf clubs. In Electronic and Optical Industry, producing the PCB circuit board, PC motherboard and optical parts cleaning. In Auto Parts Cleaner for automotive Maintenance, Ultrasonic is using for parts cleaner of carburetors, engine parts, fuel injectors, filters and diesel injectors. Ultrasonic also applied on Gun Parts Cleaner for weapons production. It is good for cleaning various gun parts, such as pistol parts, rifle parts, and bullets cleaning. Hardware Industrial Cleaning and Parts Degreasing use ultrasonic for precision bearing parts, sealing parts, machine tool accessories cleaning, etc.

Application of UAE use for extraction of bioactive compounds from seaweed showed that it is usually used mainly for the extraction of polyphenolic compounds. The samples used were seaweed consisting of several species including Hormosira banksii, Ascophyllum nodosum, Laminaria hyperborea, Ecklonia cava, Sargassum muticum, Codium tomentosum, Osmundea pinnatiefa, and Laurencia obtuse.

From some of the literature obtained, it can be seen that the ultrasonic frequencies that are often used are in the range of 20-50 KHz. While the variation of the power used ranges from 150 to 750 watts. Extraction of polyphenol compounds from brown seaweed Hormosira banksii was reported by Dang et al., (2017). The parameter conditions observed were frequency of 50 kHz, power of 150-250 W, use of 70% ethanol by 50 mL, temperature of 30-50 ° C and extraction time for 20-60 minutes. From these various parameter conditions, the optimum yield of polyphenols of 23.12 ± 1.01 mg / g db was obtained using a power of 150 W, a temperature of 30 ° C and an extraction time of 60 minutes.

Kadam et al., (2014) reported the extraction of various bioactive compounds such as polyphenols, phosocytes, and uronic acid in brown seaweed species Ascophyllum nodosum. The parameter conditions used were a frequency of 20 kHz, a power of 750 W, the use of a distilled water and HCl 0.03 M of 40 ml and an extraction time of 25 minutes. In the literature, there is no mention of the temperature used. Under these parameter conditions, the optimum yield of polyphenols, phosocytes, and uronic acids was 139.73 mg GAE / g db; 86.63 mg / g db; 117.44 mg / g db. The solvent used to produce the optimum yield is 0.03 M HCl.

Two species of brown seaweed, Ascophyllum nodosum and Laminaria hyperborea, were observed by Kadam et al. (2015) to determine which species produced the largest yield of polypnol and laminarin. The parameter conditions used are the same for both species, namely frequency of 20 kHz, power of 750 W, use of solvents in the form of 200 mL aquades and 0.03 M HCl and extraction time for 15 minutes. In that study, there was no mention of the extraction temperature used.

Of the two species observed, the optimum yield of polyphenols and laminarin was found in Laminaria hyperborea of 0.365 ± 0.039 mg / PGE db and 6.240 ± 0.008% db. The results were obtained using 0.03 M HCl as a solvent. Whereas with the same parameter conditions, the optimum yield of polyphenols and laminarin in Ascophyllum nodosum species was 0.156 ± 0.014 mg / PGE db and 5.822 ± 0.343% db.

III. METHOD

The equipment designed consists of several parts, each of which is designed according to needs. The parts are:

- Signal generator

- System settings and modes
- Power booster
- Ultrasonic Transducer
- Tank

The function of each system can be described as follows. The signal generator is designed to generate sinusoidal signals with frequencies that vary from below 20 kHz to 100 kHz. Frequency is generated by sinusoids which are near pure with constant amplitude. The frequency is regulated by the system settings provided to the operator and comes from automatic mode with a predetermined pattern.

The setting system functions to adjust the frequency, power gain and pre-set modes. Installed modes consist of ON-OFF mode, Alternate Frequency mode, Alternate Power and a combination of frequency and power. The power amplifier functions to produce a signal with a larger current for the ultrasonic transducer. Large power is needed to produce ultrasonic vibrations that will produce the expected amount of bubbles. Ultrasonic transducer functions to produce vibrations with frequencies that are in accordance with predetermined settings. The resulting vibration must be able to vibrate like a container, so as to produce enough bubbles. The reservoir is made of stainless steel which is able to vibrate with ultrasonic frequencies. The thickness of the material is designed so that the power transmitted through the transducer can vibrate the body wall.

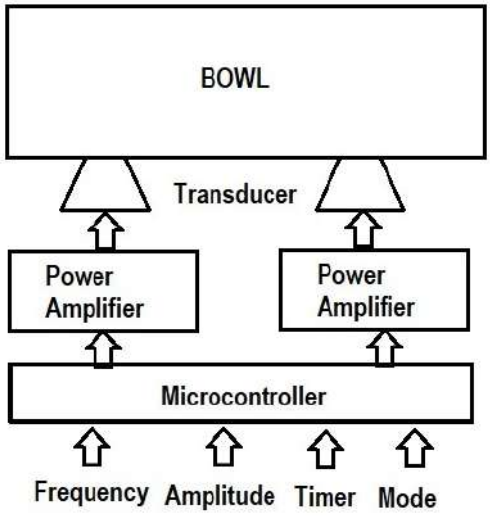

Fig. 1. Sonication System

Yakut et.al se power unit to produces an amplitude-modulated signal across the transducers, where envelope of the modulated signal has 100 Hz, but the carrier frequency is 28 KHz. The maximum voltage observed across the transducers on their experiment is about 600Vpp. Dynamic range of voltage value changes between 500V and 600V during cleaning operation [14].

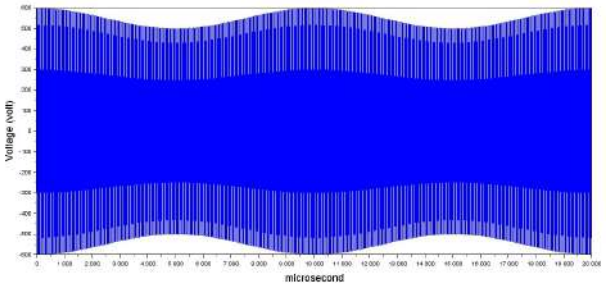

Fig. 2. Amplitude Modulation Sonication System

Sonic electronic control system that is designed consists of a signal generator with a variable frequency. The signal generator output is fed to an amplifier whose gain is variable, so there is a combination of frequency and amplitude that can be adjusted. After the frequency and amplitude are set, it is then fed to a power amplifier that will drive the transducer with a fixed frequency and amplitude, with enough power. The controller functions to regulate the voltage, frequency and stability of the system. The installed mode that was previously set is saved in the control system.

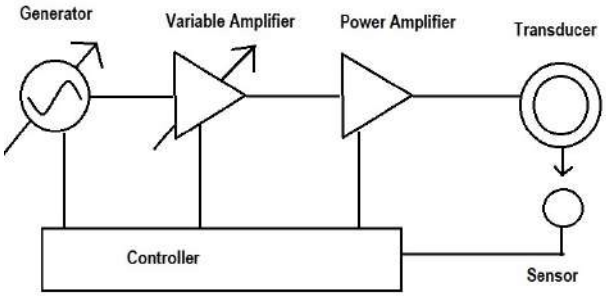

Fig. 3. Electronic Control System

The automatic mode provided can be set or the existing mode. The following are examples of the modes installed in the system. ON-OFF mode will produce a signal with a frequency of 28 kHz which will be active periodically every one millisecond. Alternate frequency mode will produce outputs with frequencies that alternate between 20 kHz and 40 kHz. Power alternate mode will produce power mode which alternates between full and half power mode.

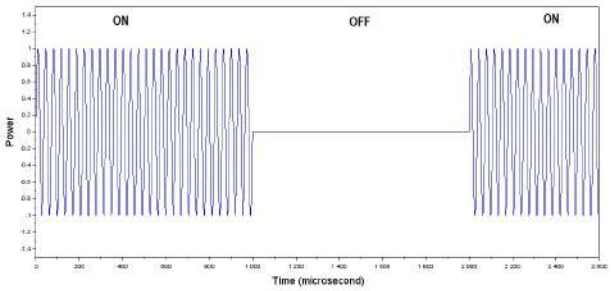

Fig. 4. On Off Mode

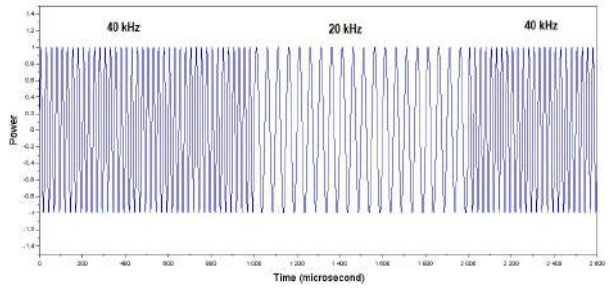

Fig. 5. Alternate Frequency Mode

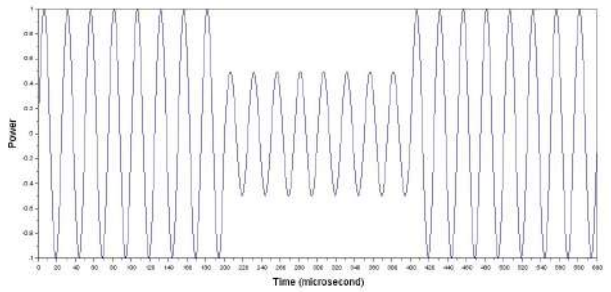

Fig. 6. Alternate Power Mode

IV. CONCLUSION

The sonication system is designed to have an ultrasonic frequency range from 20 kHz to 100 kHz with pre-set and self-regulated modes based on previous experiments. Mode of sonication design can be set based on seaweed characteristics. Signal processing can be applied to controller in order to obtain optimum cleaning for seaweed before further process.

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Ketua Program Studi Fakultas Teknologi Pertanian Universitas Katolik Soegijapranata, Semarang dengan ini memberikan tugas kepada :

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