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INTERFERENCE PREVENTION SYSTEM ANALYSIS RADIO TRANSMITTER PRO 2 RADIO FM REPUBLIC OF INDONESIA

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Abstract
Today, technology is very important in everyday life. Along with the development of technology, there are lots of electronic media that serve to make it easier for humans to get information as part of life, support their activities and fulfill their needs. Information dissemination is carried out through communication media such as mass media. Among the mass media are newspapers and magazines. The technical data analysis used is direct and in-depth observation and interviews and documentation during the time this report is made. With this uplink unit, the broadcast signal that is sent is then changed its beam frequency to be retransmitted (downlink) to one area on earth. Where the radio broadcasting process was first carried out in the studio room, then the results of the audio were received by the audio room which was processed as perfectly as possible so that the radio listener community could hear it

Keywords : Interference Prevention, System Analysis, RRI

INTRODUCTION

Today, technology is very important in everyday life. Along with the development of technology, there are lots of electronic media that serve to make it easier for humans to get information as part of life, support their activities and fulfill their needs (Dezuanni, 2015). Information dissemination is carried out through communication media such as mass media. Among the mass media are newspapers and magazines. Meanwhile, electronic media includes broadcast radio, television, film and online media (internet) (Saragih, 2020). The tight competition in the industrial world increasingly requires companies to continue to make continuous improvements to the service and presentation of information in order to compete with other companies and also as a form of effort to provide satisfaction to listeners (Abdullah Ali, Umam, Leijnse, & Sa'adah, 2022).

Implementation of Industrial Practice (PI) for students is very important to add insight, as well as knowledge in the industrial world, as a reference in preparation for entering the world of work industry or the industrial world. In addition, the implementation of Industrial Practice is also to understand, and know more about the implementation of the knowledge learned in accordance with the study program (Ghadah Essa Ali & Magalhaes, 2008; Permata & Lestari, 2020). More than that, the implementation of Industrial Practice provides input for students in finding, engineering and developing objects found in the industry, so that later it is expected to be useful for development in industry and the surrounding community.

METHOD RESEARCH

The technical data analysis used is direct and in-depth observation and interviews and documentation during the time this report is made (Owen, 2014). In choosing the place for this Industrial Practice, the author also considers several things, including: the location of the company is far enough so that it provides new experience and insight, the company is also a radio company that is still related to the developing field of science, so it is suitable to be used as an industrial practice. The objectives of carrying out this practical work include:

Knowing the process of radio broadcasting on Radio Republik Indonesia, Knowing the maintenance system of the Pro 2 radio transmitter, Analyzing the data of the Pro 2 radio transmitter. This industrial practice is carried out at the location of Radio Republik Indonesia at Jalan Merdeka Barat 4-5, RT.2/RW.3, Gambir, Gambir District, Central Jakarta City, Special Region of Jakarta, Postal Code 10110. Work execution time starts on 04 July – 04 August 2022. With 5 (five) working days, starting from Monday to Friday from 08.00-15.00 WIB and break time is 12.00-13.00 WIB.

RESULT AND DISCUSSION

The industrial practice that the author does at Radio Republik Indonesia is field research conducted in the Transmission Engineering section which is carried out directly in the field regarding maintenance and maintenance on the main components of transmitters at Radio Republik Indonesia, guided by industry supervisors and staff for 1 month (Kitley, 2014). The work program while carrying out Industrial Practices starting from 04 July 2022 to 04 August 2022 are as follows:

Table 1. Industrial Practice Activities

No.	Activity	Week-				
		1	2	3	4	5
1.	Industry Profile Introduction	■				
2.	AM and FM Transmitter system	■				
3.	Observing the Audio Room		■			
4.	Observing RRI Jakarta's Electrical and Diesel Room Maintenance		■			
5.	Observing the Broadcasting Studio Room			■		
6.	Observing the Traditional Music Room				■	
7.	Preparation of Industrial Practice Reports and Data Collection				■	■

Based on Table 7 above, the Industrial Practices carried out by the author at Radio Republik Indonesia are field research carried out in the Transmission Engineering section which is carried out directly on the maintenance of the main components of the transmitter such as Antenna, Power Amplifier, Power Supply and others. Directly supervised by industry supervisors and staff of employees of the Transmission Engineering section for 1 full month, which aims to see and analyze the tools directly that will be used as Industrial Practice Reports. The activity of implementing Industrial Practice begins with an observation or introduction to the industry and begins to study the AM and FM transmitter system which aims to find out what is in the company as well as the briefing of basic material on transmitters which is carried out in the first week, then the second week The author observes the audio management process in the room. audio, observing electricity maintenance carried out by the State Electricity Company (PLN) by cleaning one of the components, namely the transformer at Radio Republik Indonesia and operating the diesel room of Radio Republik Indonesia Jakarta, then in the third week the author observed the filming process and analyzed the existing equipment. in the broadcast studio. In the fourth and fifth week analyzing the process of recording music, studying the tools including weak currents and collecting the data needed to make Industrial Practice reports and report improvements. Based on the Industrial Practice programs listed in Table 7, the author got a lot of new and useful knowledge from Radio Republik Indonesia.

The implementation of Industrial Practices is carried out on Monday to Friday starting at 08.00 – 15.00 WIB, at the Radio Transmission Engineering section of the Republic of Indonesia, which is located at Jalan Merdeka Barat 4-5, RT.2/RW.3, Gambir, Gambir District, Central Jakarta City, Special Region of Jakarta Postal Code 10110. Activities carried out during Industrial Practice at Radio Republik Indonesia can be seen in Table 2 below.

Table 2. Activities carried out in Industry

No.	Week-	Date/time	Description of activities
1.	1	Monday, 04 July 2022	➢ Industry Profile Introduction Observation
2.		Tuesday, 05 July 2022	➢ Determination of Fields by the Head of Technology and New Media
3.		Wednesday, 06 July 2022	➢ Provision of basic material about the transmitter system
4.		Thursday, 07 July 2022	➢ Conduct direct observations as well as introduction of Pro 1, Pro 2 and Pro 4 pemancar transmitters
5.		Friday, July 8, 2022	➢ Learn how to turn on the Pro 1 and Pro 2 transmitters
6.	2	Monday, July 11, 2022	➢ Transmitter check
7.		Tuesday, 12 July 2022	➢ Data retrieval
8.		Wednesday, July 13, 2022	➢ Documentation as material for report generation
9.		Thursday, July 14, 2022	➢ Practice at TVRI Joglo
No.	Week-	Date and time	➢ Learn about the Pro 1 and Pro 2 transmitter systems
10.	2	Friday, July 15, 2022	➢ Learn how the Combiner machine works
11.	3	Monday, 18 July 2022	➢ Learn Pro 2 transmitter maintenance
12.		Tuesday, 09 July 2022	➢ Learn the process of receiving audio (Donwlink)
13.		Wednesday, July 20, 2022	➢ Learn how to maintain transmitter pro 1
14.		Thursday, July 21, 2022	➢ Learn audio management
15.		Friday, July 22, 2022	➢ Learning audio delivery (Uplimk)
16.	4	Monday, July 25, 2022	➢ Observing PLN electricity maintenance
17.		Tuesday, July 26, 2022	➢ □ Observing the Diesel chamber
18.		Wednesday, 27 July 2022	➢ Description of activities
19.		Thursday, July 28, 2022	➢ □ Studying DAB Transmitters
20.	5	Monday, 01 August 2022	➢ □ Learn the maintenance process of DAB transmitters
21.		Tuesday, 02 August 2022	➢ □ Submission of title of Industrial Practice report

Based on Table 8 the above industrial practice implementation activities were carried out for 1 full month, it was found that the first week on Monday to Friday, July 4-08 2022, for the first day it was carried out at the office for New Technology and Media to be provided with company profiles and determination field by the Head of Technology and New Media in accordance with the majors that the practitioner is taking, namely the Transmission Engineering Field. On the second day, the practitioner was guided directly by the Industrial Supervisor to be given basic material about radio transmitter systems. Then on the third day, the practitioner was brought to the transmitter room to make direct observations as well as the introduction of Pro 1, Pro 2 and Pro 4.

Figure 1 Introduction of Pro 1, Pro 2 and Pro 4 Transmitters
(Source: Personal Documentation)

On the fourth day, practitioners are taught how to turn on or operate the Pro 1 and Pro 2 transmitters. Then on the fifth day, they start to routinely check radio transmitters and do documentation as material for reports.

Figure 2. Pro 2 radio transmitter check
(Source: Personal Documentation)

The second week on Monday to Friday July 11-15, on Monday the practitioner did a practice at TVRI Joglo. Learn about the Pro 1 and Pro 2 transmitter systems, as well as Pro 2 data capture.

Figure 3. Pro 1 and Pro 2 Transmitter Observation Activities
(Source: Personal Documentation)

Next, the practitioner learns how the combiner works. This tool is used to combine the incoming power through the input and output. In addition, the combiner can be used to divide the power. Because basically the lower the temperature of the transmitter, the better the output produced by the transmitter system.

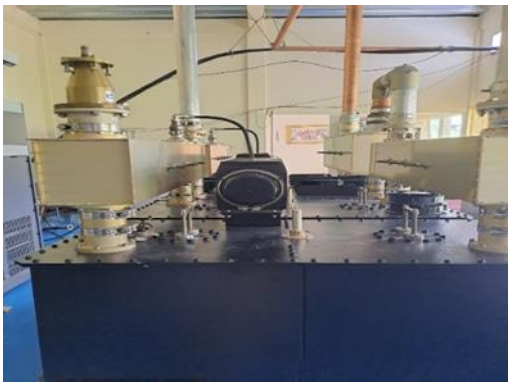

Figure 4 Combiner Machine
(Source: Personal Documentation)

Then the practitioner learns the maintenance of Pro 2, namely by replacing the liquid because the Pro 2 transmitter on TVRI Joglo is the latest version with the Rohde & Schwarz brand. Then learn about the process of receiving audio sent from RRI Jakarta and then Downlinked by TVRI Joglo.

Gambar 5 Audio Processor
(Source:Personal Documentation)

The last activity carried out at TVRI Joglo was learning how to care for and maintain Pro 1, where Pro 1 was damaged in the Power Amplifier section. How to find out the damage in the transmitter is enough to press the Alarm menu in the menus on the transmitter.

Figure 6. Power Amplifier
(Source: Personal Documentation)

On Tuesday, the practitioner conducts an activity, namely learning about the process of managing audio sent from the broadcasting studio and then processing it to produce clear audio, so that radio listeners can hear it. Then after that study the process of sending audio from RRI Jakarta to TVRI Joglo or also called the Uplink process.

Figure 7 Activities in the Audio Room
(Source: Personal Documentation)

On the third day, activities were carried out to observe the PLN electricity maintenance process at RRI Jakarta, namely by cleaning the transformer and others. Then on the fourth day observing the diesel room by running diesel when there was a power outage at RRI Jakarta and on the fifth day studying the DAB transmitter room which of course this DAB transmitter is different from other transmitters because this transmitter is dedicated to digital radio, other people rarely listen because the radio Digital is relatively expensive.

The third week, Monday to Friday, July 18-22, 2022, on Monday, maintenance of the DAB transmitter is carried out with a liquid liquid replacement process. The next day, submission of the title of the Industrial Practice report to the Advisory Lecturer. Then, the next day, they learned how to calculate the antenna distance and take Pro 2 data. On the fourth day, they made direct observations in the broadcasting studio by observing the shooting process. Then on the fifth day the writer was brought to the broadcasting studio

room and entered the Pro 1, Pro 2 and Pro 4 control rooms, then studied the tools in the control room as well as saw how the control room itself worked, one of the tools was power. amplifier being reviewed on a computer screen.

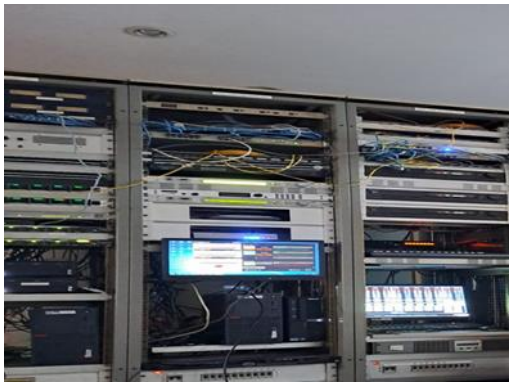

Figure 8 Tools in Broadcast Studio
(Source: Personal Documentation)

The fourth week, Monday to Thursday, July 25-28 2022, on Monday, the preparation of the Chapter I report was carried out. The next day, the practitioner observed the traditional music room by studying traditional musical instruments and explaining the schedule of musical events. Then, the next day studying tools that include weak currents. On the fourth day, we saw the process of recording music in which traditional Javanese music performances were being held by RRI Jakarta staff.

Figure 9 Music Recording Process
(Source: Personal Documentation)

The fifth week from Monday to Tuesday, August 01-02 2022, on Monday, missing data is taken and the value of Industrial Practice is determined by the Industrial Supervisor. The last day was closed with the process of farewell and saying goodbye to the staff of Radio Republik Indonesia.

Figure 10 Group photo with Transmission Engineering staff
(Source: Personal Documentation)

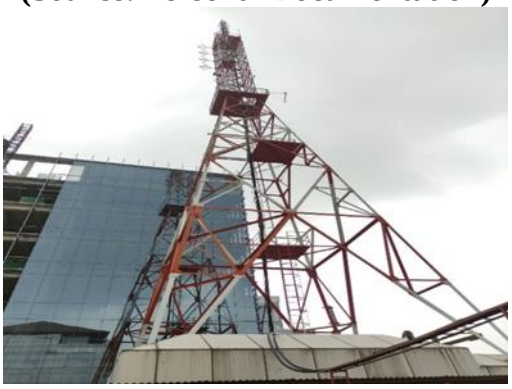

Figure 11. RRI Jakarta Tower
(Source: Personal Documentation)

The broadcasting process can take place using an electromagnetic wave transmitter. The electromagnetic waves are generated by the antenna system, which is an arrangement of metal rods which are usually made of copper or aluminum. The metal rods are arranged in such a way that they can emit electromagnetic waves directed in one direction or in all directions equally. For the purposes of broadcasting and broadcasting, the type of beam used is an antenna with a beam that radiates in all directions equally in accordance with the term "broad". The frequency of a wave has a wavelength which is limited by a period of time starting from the first zero of the wave to the third zero of the wave. The wave frequency also includes the frequency allocated to the radio frequency group (RF=Radio Frequency), starting from MF (Medium Frequency) to SHF (Super High Frequency). This frequency wave radiates with a frequency depending on the type of operation of the station in question. If this station is a MW (Medium Wave) radio station, then the frequency of the broadcast is in the MF (Medium Frequeny) band, the frequency of which is 300-3000 KHz. As for FM broadcasts, the broadcast frequency is in the VHF (Very High Frequency) band, which is between 30-300 MHz. If it is a television station, then the frequency is in the VHF or UHF (Ultra High Frequency) band.

For a television transmitter system, it is broadly the same as a radio broadcasting system, but the source of the information signal is in the form of audio and video signals.

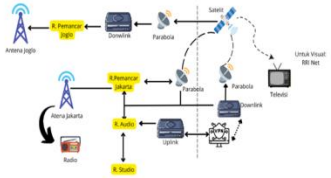

Figure 12 RRI Radio Broadcasting Process
(Source: Personal Document)

The TVRI Joglo broadcasting line was first started from RRI Jakarta because the TVRI Joglo control room was in RRI Jakarta, which was then shot directly from the satellite dish from RRI Jakarta. The satellite dish on TVRI Joglo receives the signal sent by RRI Jakarta which is then received by the receiver (downlink) to the transmitter room. Once in the transmitter room, it is transmitted to the antenna, from this antenna it is transmitted via radio. However, for RRI Net itself, it is first started via VFN and then received by the receiver (downlink) and then transmitted to the satellite dish. From the satellite dish, it is transmitted directly to the satellite, from the satellite, it is re-emitted to each home television by programming the broadcast so that it can capture all the signals on the television.

Based on experience, Radios often have problems with their equipment. This problem will have an impact on the quality of the broadcast produced or transmitted by the radio. The quality of the broadcast from the transmitter will have an impact on the quality of the broadcast on the radio receiver owned by members of the radio listener community (Mohsen, 2020).

Based on experience, Radios often have problems with their equipment. This problem will have an impact on the quality of the broadcast produced or transmitted by the radio. The quality of the broadcast from the transmitter will have an impact on the quality of the broadcast on the radio receiver owned by members of the radio listener community. This has a further impact, namely the level of listener interest. If the problem and the next impact, namely the interest of the listeners. If these problems and impacts occur continuously, then the community radio may be abandoned by listeners. The causes of radio damage can vary, among others:

a. Factors of production: Production defects due to excessive heat, wrong circuit and so on
b. Factors of use (human error): Incorrect use, excessive use, misplacement and so on.
c. Natural or weather factors: Heat, rain, lightning and so on.

Therefore, the biggest cause of damage to the transmitter is the lack of Preventive Maintenance actions, which should be checked periodically on the condition of the transmitter so that damage to radio equipment can be avoided, can work optimally and last long (Hitijahubessy, 2022). Preventive Maintenance is every activity carried out to maintain every component that can run in accordance with the conditions it should, through maintenance and prevention of total damage that suddenly experiences frequency interference. Usually in the company there are two types of Preventive Maintenance, namely Routine maintenance and Periodic maintenance. Routine maintenance includes maintenance

activities that are carried out routinely, for example every day. Meanwhile, Periodic maintenance includes maintenance activities that are carried out within a certain period of time, for example 1 month or every 3 months. This type of maintenance that I do is Periodic maintenance. Because sometimes there is no damage at all but only need to replace the liquid liquid, annual cooling checks and dry coolant pump inspections every four years (Woon et al., 2021).

In Preventive Maintenance has several advantages and disadvantages. The advantages are minimizing the time that interferes with the broadcasting process, improving transmitter component controls and reducing emergency work. And some of the disadvantages of Preventive Maintenance such as eliminating the remaining life of the components in the transmitter, when these components must be replaced before they are completely damaged and also higher maintenance costs than the predictive maintenance method. In cases that often occur in companies are usually too worried about failures, for example broadcasts are delayed because of problems in the transmitter section. This creates past problems and leads to high maintenance costs. The cases show frequent damage to the equipment due to lack of understanding (Pandi, Santosa, & Mulyono, 2017). For example, when turning on a radio transmitter, the transmitter is turned on first in an interval of 5-10 minutes after that, then the audio, so that the transmitter is more durable (the transmitter is filled with audio after it is ready to transmit). It would be nice to provide AC (for wind in and out) to reduce heat and then provide a separate place or far from reach and make sure the antenna is connected to the transmitter properly.

CONCLUSION

With this uplink unit, the broadcast signal that is sent is then changed its beam frequency to be retransmitted (downlink) to one area on earth. Where the radio broadcasting process was first carried out in the studio room, then the results of the audio were received by the audio room which was processed as perfectly as possible so that the radio listener community could hear it. After the audio processing is complete, this audio room will then send an uplink signal to the satellite dish from the satellite dish which is transmitted directly to the satellite, where the audio room and satellite dish will work together towards the transmitter room. Once in the transmitter room, it will be transmitted to the antenna, from the antenna which is transmitted to every house which can finally be carried out by the radio audience through voice on the radio. However, for RRI Net itself, it is first started via VFN and then received by the receiver (downlink) and then transmitted to the satellite dish. From the satellite dish, which is transmitted directly to the satellite, it is re-emitted to each television by programming the broadcast in order to capture all the signals on the television.

The type of maintenance that the author does is periodic maintenance. In carrying out Preventive Maintenance for the Pro 2 Transmitter System, there are several procedures that must be passed so that the maintenance process can run smoothly. For the early stages of Preventive Maintenance, the Pro 2 transmitter system detects it by deactivating the transmitter first.

So Power Out, Forward Power (FWD) and Reflected Power (RFL) on August 08, 2022 from the above data produce the same data, namely 4 KW for power out, 4 KW for Forward

Power, 21W for Reflected Power and 1.47 for VSMR . However, on August 11, different data were obtained on Power Out, Forward Power (FWD) and Reflected Power (RFL), namely 5.14 KW for power out, 5.14 KW for Forward Power, 20 W for Reflected Power and 1.69 for VSMR. Then it can be said that the Pro 2 transmitter works stably. Then how the transmitter system works well. Although there are differences in the results of Power Out, Forward Power and Reflected Power, it is because the output power, forward wave and reflected wave can change at any time due to weather or shifting conditions. However, this does not affect the broadcast process while the Power Out, Forward Power and Reflected Power are stable every 2 hours.

The calculation results obtained from the wavelength obtained is 1.88 meters including the type of VHF (Very High Frequency) with a range of 30-300 MHz with a wavelength between 1-10 meters. While the antenna distance is 9.4 meters per antenna. Then the radio broadcast coverage of RRI Central Jakarta is as far as 315 Km. The results of the comparison of receiving and transmitting power from the antenna are 1.

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