Imas Ratna Ermawati - Conception de Processus Fabrication basée sur le Nano Matériaux Th (3,81 UO + 2,88 SrDU) sur un Cyclotron à Angle étroit à Alimentation Quantique avec une Plage de 617,44 tesla p

by Imas Ratna Ermawati Uploaded By Grecy

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Re-Proposing to Mach Conner Device Design on the Full Automation Device Based of DTL and Combine of Boolean-Map Karnaugh Model in Spinning Line to be Increasing of Effectiveness Production

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Moh. **HARDIYANTO** , Imas Ratna **ERMAWATI**

Abstract—*PT. XYZ is a company had been engaged on the textile industry which has the main products in the form of polyester / cotton blend fabrics and yarns. In the January until December 2018 period, the waste had been produced by the finishing process on the Mach Conner machine with the percentage of waste that occurred were 1,286%. and in the January to March 2019 period, the percentage of waste obtained were 1.303%. Based on literature studies in the volume of 4th December 2017 on a lot of the International Journal of Manufacturing and Production Processes and the International Journal for Automation Processing volume 7 August 2018 that for semi-automated machines have a standardized target of waste that is smaller than 1.1%, then modifications to the Mach Conner machine are based Diode Transistor Logic (DTL) and Boolean-Map Karnaugh. Breakdown or failure operation conditions on the device occur because the system on the device is missing, this is caused by the operator which were performed the first operating setup and prepares generating device has been an error factor or mis-function system on the device in inputting G-Code so that it often the failure of running on Mach Conner.Based on the results of device testing from the Programmable Logic Control (PLC) Laboratory of the Department of Electrical Engineering, Faculty of Engineering, University of Indonesia, the use of electric power could be saved from 17600 watts to 5263,706 watts so that it can save costs of Rp.2,423,423 or US$ 167.65 for one month production of 20.6% and could reduced waste by 17.07%. The cost should been requiring into device modification on the Mach Conner machine is Rp.3,700,000 or US$ 254.2.*

Keywords: *Mach Conner machine, DTL, Boolean-Map Karnaugh, Logical Gates, Electrics Wiring Diagram*

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I. INTRODUCTION

In accordance with clause 4 of the ASEAN Mutual Agreement section 3 on the Process on Good Manufacturing Processes (GMP) which was ratified by the ASEAN Economic Community (AEC) in February 2016, this research focused on redesigning the Mach Conner device to full automation to increase effectiveness and efficiency value towards yarn production process at the spinning line at PT. XYZ. In the period from January to December 2018, 1668710.61 kilograms (kg) were obtained and 21455.5 kg of waste was generated by the machine, so that the percentage of waste that occurred was 1,286%. While in January to March 2019 period the finishing section was able to produce 472348.54 kg of production but there was waste generated by the machine as much as 6153.3 kg, so that the percentage of waste obtained was 1,303%.

As for the running operation programming conditions, data breakdowns that occurred on the Mach Conner machine were obtained, 25 times per month. Based on the concept of device reliability by the American Standard of Mechanical Engineering (ASME), also quoted in the International Journal of Automation Processing special edition Integrated Processing volume July 5th, 2017 stipulates that the standard in running operation programming conditions for target breakdown that occurred was 2 times in per month.

Breakdown or failure operation conditions on the device has been occurred because of the system on the device has been lost, that was caused by the operator who performed the first operating setup and prepared generating device had an error factor or mis-function system on the device in inputting G-Code so that often made the failure of running on Mach Conner. One of the efforts that have to improve the work system of Mach Conner is by upgrading or redesigning the device in Mach Conner from a semi-automation device system to a device system that leads to full automation devices.

The Mach Conner Device that has been matched the reference can achieve an effectiveness target of around 18% and a reduction in electric power consumption by 45% by turning the Mach Conner Device into a Full Automation Device.

1.1 Research Objectives

The objectives to be achieved in this study are as follows:

1. Describe the production of yarn in the Spinning Line on the type of Mach Conner machine.
2. Increasing the effectiveness of the production and machining characteristics of Mach Conner.

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3. Describe and prototype scale A sensor devices based on DTL based on the Mach Conner machine.
4. Proposing a redesign of the semi-automated Mach Conner Device to a full automation level.
5. Describe the level of effectiveness in production.

1.2 Data Collection

The data needed in this thesis research consists of two types of data as follows:

1. Primary Data
   Primary data in this study were obtained from observations, making prototype scale A sensor devices on the Mach Conner machine, experimental test results and holographic graphics display DTL and electronic spectrographic analysis.
2. Secondary Data
   Secondary data is data that has been available or has been presented by the company, a descriptive study of literature studies based on terminology and programming based on the IEEE Standard and presented in tabular or diagram form. Secondary data in this study were obtained from PT. XYZ.

II. LITERATURE

A. Machine Automation

According to the International Journal for Automation Processing volume 7 (2018), automation is a technology related to the application of mechanical, electronic, and computer-based systems to operate and control production. This technology includes:

- Automatic material handling and storage system
- Automatic inspection system for quality control
- Computer systems for planning, data collection, and decision making to support manufacturing activities

B. Diode Transistor Logic

Diode Transistor Logic is an early form of logic used in the 1950s. The DTL is made of discrete transistors and resistors which were manufactured on printed circuit boards with several gates per board. Then this board is plugged into the board socket with the cable on the socket pin determining the system function. One that is an early form of this DTL that is used by IBM Corp in 360 family computers is a hybrid technology.

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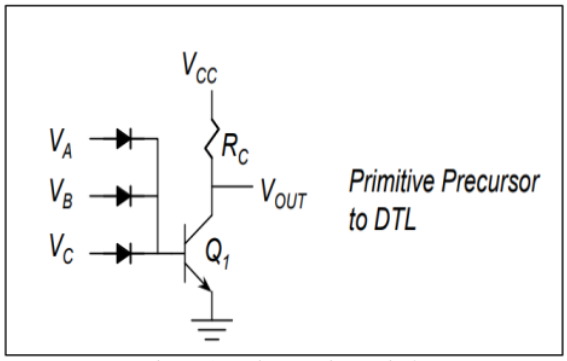

Figure 1 Logic Transistor Diode
(Source: Electronic Tutorial Website, 2019)

Two logic diode configurations, the truth table shows that the first OR logic gate circuit capability and the second circuit perform AND logic. The AND gate has two or more than two input signals but
only one output signal. In an AND gate, to produce a high output signal all input signals must be of high value.

III. METHODS

To facilitate the research phase, the research methodology will be described using a flowchart. The following is a research flowchart from start to finish:

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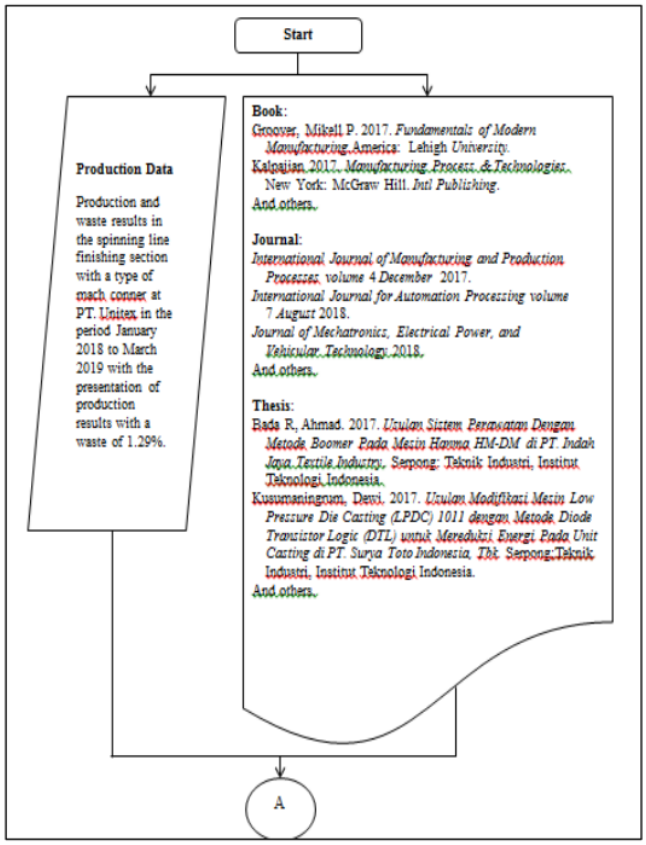

Figure 2. Flow Chart

"Re-Proposing to Mach Conner Device Design on the Full Automation Device Based of DTL and Combine of Boolean-Map Karnaugh Model in Spinning Line at PT. XYZ to be Increasing of Effectiveness Production."

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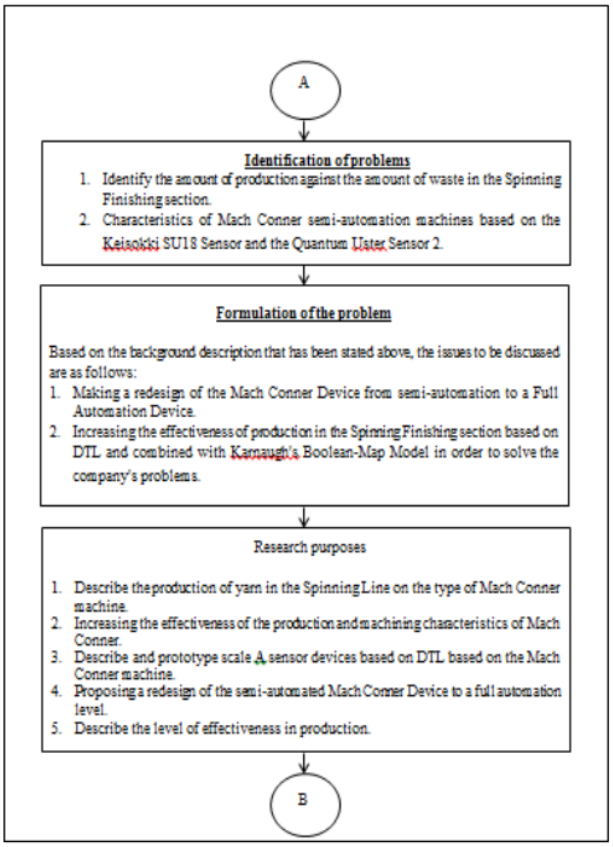

Figure 2. Flow Chart (Continued)

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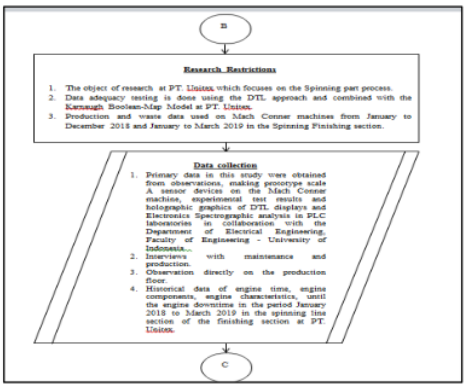

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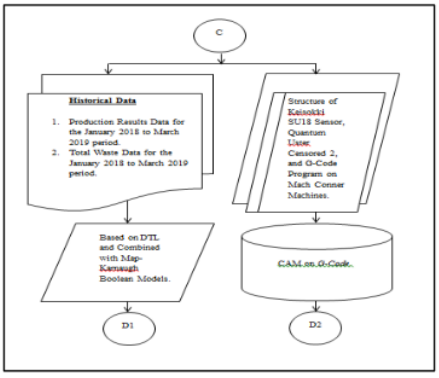

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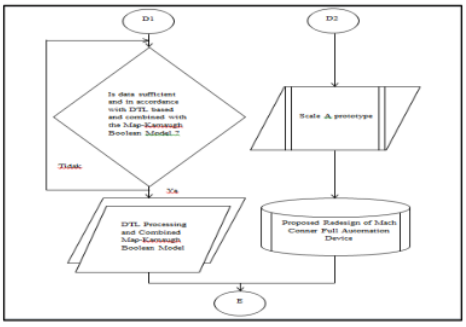

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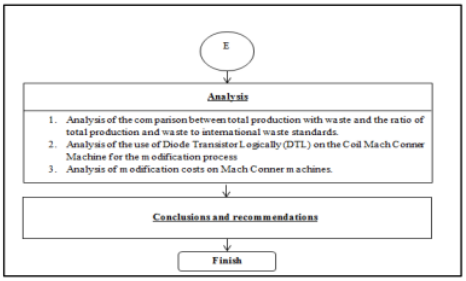

Figure 2. Flow Chart (Continued)
"Re-Proposing to Mach Conner Device Design on the Full Automation Device Based of DTL and Combine of Boolean-Map Karnaugh Model in Spinning Line at PT. XYZ to be Increasing of Effectiveness Production."

IV. RESULTS AND DISCUSSION

Total production is the amount of yarn produced by Mach Conner spinning line finishing section in the period January 2018 to March 2019, where the yarn is produced in good condition and meets specifications. Here is a table of total production and waste results:

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Table 1 Data on Average Production Results and Waste Spinning Line Finishing Section of PT. XYZ, January 2018 - March 2019

year	Production	Month	The Amount of Prod (Kg)	*Waste* (Kg)
2018	I	January	92035.05	1535.8
		February	149885.15	1912.5
		March	165151.17	2260.1
	II	April	163358.71	1954.7
		May	166153.94	2094.0
		June	102135.58	1098.0
	III	July	125723.3	1927.7
		August	132387.72	1566.4
		September	126996.01	1325.8
	IV	October	137092.49	1966.7
		November	149273.84	1759.1
		December	158517.65	2054.7
2019	V	January	169894.88	2211.8
		February	153167.14	1931
		March	149286.52	2010.5
TOTAL			**2141059.15**	**27608.8**

(Source: Research Data Processing Results, 2019)

Based on the data waste in the period January - December 2018 the results obtained percentage of 1,286%, and in the period January - March 2019 obtained results of the percentage of waste that was equal to 1,303%.

So that the total percentage of waste generated was equal to 2,589%. In the current condition the device drive in Mach Conner had had a vibration time when the condition was stable at 48000 seconds with a percentage ratio of 20%.

Based on waste data and time of the device drive condition in Mach Conner, it could be showed the breakdown that occurred on the machine. Calculation of the breakdown that occurred as followed:

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Breakdown = 48000 seconds x 2.589%
Breakdown = 124,272 seconds (%)

So that the breakdown that occurred on the Mach Conner machine every month was equal to:

Total Breakdown = 20% x 124,272
Total Breakdown = 24,854 times / month
Total Breakdown = 25 times / month

Technical Specifications for Electrics Wiring Diagram Mach Conner

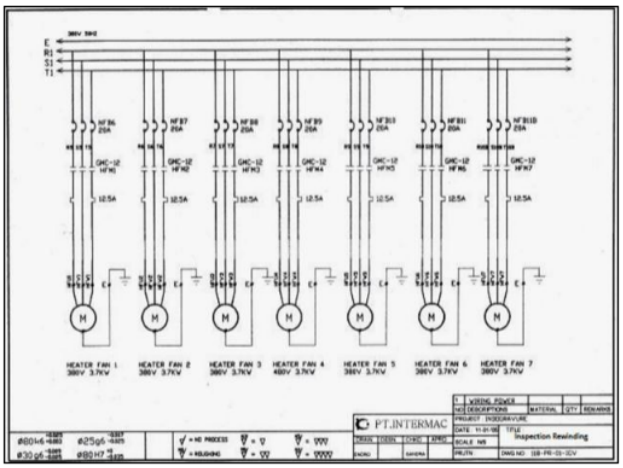

Figure 3. Electrics Wiring Diagram Mach Conner Machine (Continued)
(Research Trial Results, 2019)

The micro controller used in the Coil Mach Conner Machine was an AT89C52 microcontroller because it could be used to increase and decrease the voltage on the power supply. The overall circuit of the AT89C52 minimum system could be shown in the following figure:

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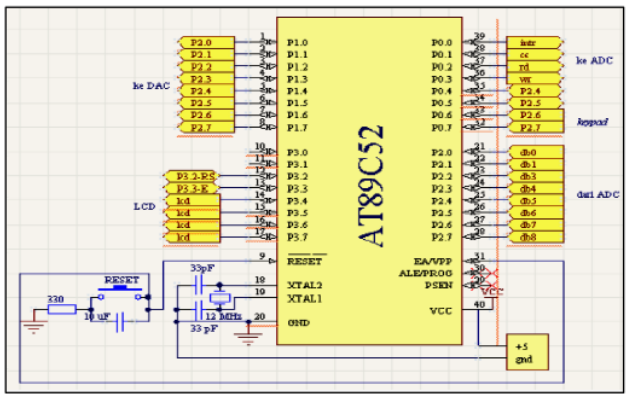

Figure 4. AT89C52 Microcontroller Circuit
(Research Trial Results, 2019)

The microcontroller had been used as a provider of high-voltage AC power that served to supply working voltage. The high output voltage could be adjusted from 0 to 1000 volts.

Table 2: THD% Selection

Curnt. THD (%)	*Input*			*Output*			*Power Losses*
	V_p *(V)*	I_p *(A)*	P_p *(kW)*	V_s *(V)*	I_s *(A)*	P_s *(kW)*	
0	120	15,09	1,81	116	10,99	1,67	12,73%
32,40	120	17,65	1,84	109	16,87	1,67	16,70%
42,10	120	20,31	1,85	92	13,25	1,67	18,20%
68	120	24,56	1,89	86	15,82	1,67	21,50%
81	120	28,39	1,91	79	16,71	1,67	23,60%

(Research Trial Results, 2019)

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Based on the THD values obtained through simulation so that transformer losses could be calculated without the effect of harmonics or due to the effects of harmonics and its relation to transformer efficiency, the best THD% limit is 0% with an input voltage of 120V and the output voltage of 116V. Therefore the expected power losses would be 12.73%. Increasing THD% would cause an increase in energy to be wasted by machines. As a result, the energy consumption needed by the engine would increase.

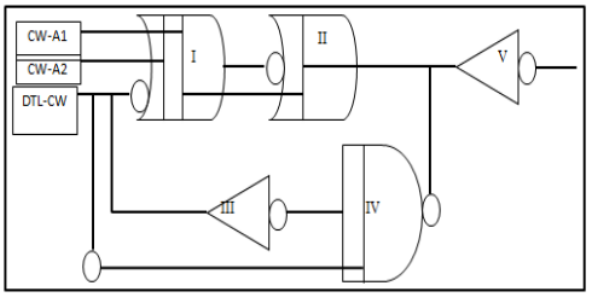

Figure 5. Boolean Structure of the Mach Conner Machine Complex

From the Boolean (complex) calculation with the OR-Exclusive logic gate above on the motor drive device, the numerical values were:
Where :

$$f(\mathrm{VC}) \cong \frac{f(I_{cc})}{f(R_s)}$$

So :

$$= \frac{181{,}948}{0{,}159} + \frac{0{,}159}{181{,}948} + \frac{0{,}159}{181{,}948}$$
$$= 1144{,}327 + 8{,}738 + 8{,}378$$
$$= 1161{,}803 \text{ (basic function)}$$

SectionV :
$= 1 + (\mathrm{DTL} - \overline{\mathrm{CW}}) + (\overline{\mathrm{CW} - \mathrm{A1}})$
$= 1 + 8{,}738 + 8{,}738$
$= 18{,}476$ (emitter function)

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Based on the results of the simulator that could be seen the circuit started to work optimally when the graph rised at λ = 380 nm with% ratio = 43%. Then gradually decreased due to the charges that were in the circuit were absorbed by the capacitor that served as a control so that the working circuit could work optimally. After that the circuit was in a stable state at λ = 1200 nm with% ratio = 20%. From this figure, we got the value of the actual time function when the circuit was working and when conditions were stable.

Based on the Boolean structure in Figure 5 and the TE-4000 Digital Oscilloscope and TE SPI SUN SIMULATOR 240 A simulators have been obtained, the results are shown in Figure 6.

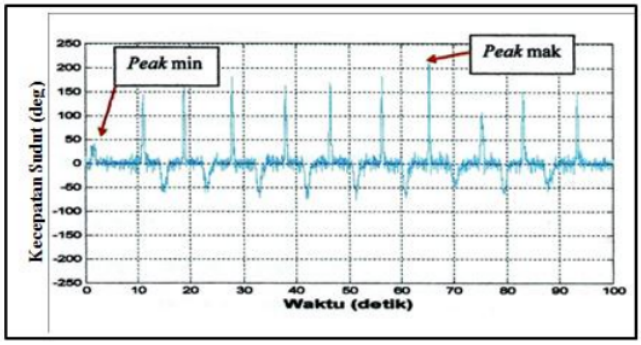

Figure 6.Relating to the speed of the Coil Mach Conner Machine on a particular drive
(Source: Research Data Processing Results, 2019)

From the study of the picture above, the peak value - a maximum of 27.75 degree / second-radial and peak - minimum of 16.67 degree / second-radial. So in the two conditions, so that if this machine becomes full automation, the sensor could have the flexibility to work in 2 conditions as requested by production and could reduce electricity consumption on the machine.

After the Mach Conner machine had been repaired by applying Logically Diode Transistors to the Mach Conner Machine for the modification process, an increase in the number of products could be made where there was an increase in the effectiveness of the production process by 17.07% of the current production process. The following is the graph of the production result before and after improvements to the Mach Conner machine:

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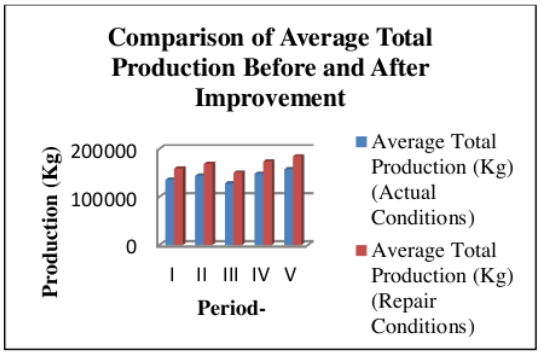

Figure 8. Comparison of Average Total Production After Device is Implemented
(Source: Data Processing Research Results, 2019)

In addition, the amount of waste generated by the machine has decreased. The following is the graph of the results of the amount of waste before and after improvements to the Mach Conner machine:

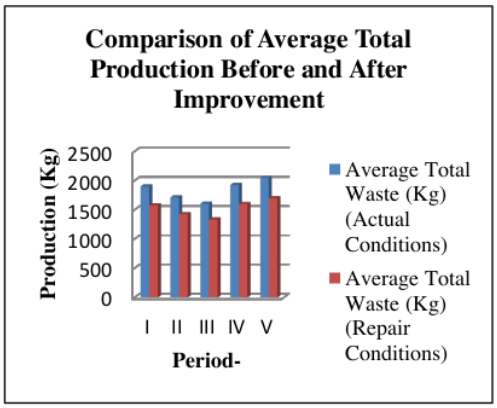

Figure 9. Comparison of Average Waste After a Device Is Implemented
(Source: Data Processing Research Results, 2019)

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In the initial conditions the Mach Conner engine had consumed an electric power of 17600 Watt. After a device modification had been made on the Mach Conner engine, the engine consumed electrical power to 5263,706 Watt.

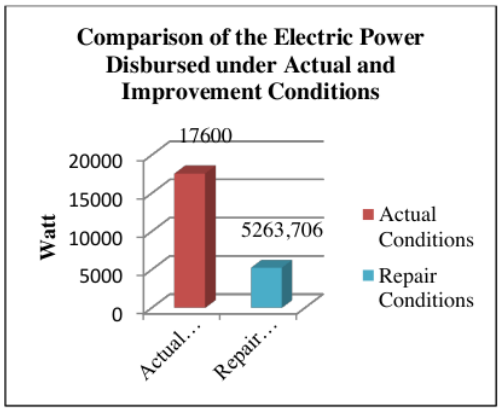

Figure 7 Comparison of Electric Power after a Device is Implemented
(Source: Data Processing Research Results, 2019)

Based on the Harmonic Distortion Current Limit in% load current, the best THD% limit is 0%. Therefore, the expected power losses were 12.73%. So that after modifications to the industrial chain could save electricity usage by 42.668%.

The decreasing of electric power consumed by the modified engine from 17.6 kWh to 5.263 kWh would provide cost savings that would be incurred that could benefit from the industry. This could be seen from the table presented below, namely:

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Table 3 Comparison of Costs for Actual Conditions and Repair Conditions

Cost	Actual Condition (Rupiah)	Improvements Condition (Rupiah)
1 Month electricity cost	8.141.619	2.434.848
Wages Operator Cost	8.144.000	8.144.000
Early Setting Cost	417.000	348
New Components Cost	-	1.500.000
Brainware Cost	-	2.000.000
Installation Cost	-	200.000
Total	**16.702.619**	**14.279.196**

(Source: Data Processing Research Results, 2019)

By giving a proposal in the redesign of the device could reduce electricity costs per month and the cost of the initial setting on the machine every month. So that the party from the industry could make efficient the cost of electricity expenditure in one month that is equal to 16.97% or Rp.2,423,423 or US$ 167.65.

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V. CONCLUSIONS

From the results of this research the conclusions obtained are:

1. Mach Conner devices based on full automation had advantages that had a good impact on the production process, such as the machine could work without the involvement of the operator, can set lay on in production, can set lay off in production, can set lay idle in production, and can do an autonomous evaluation including if the device will fail.
2. Modifications to the machine can increase the effectiveness of the production process on the machine by 17.07%. In the condition of full automation, it gives the operator ease in preparing the first operation setup on the machine so that it can provide an autonomous evaluation by itself without operator involvement.
3. The device design is carried out by modifying the motor and pneumatic device coil series machine Conner machine and by using a NAND-DTL filter based on the OR-exclusive circuit on the ¬ + pneumatic coil machine Conner machine based on DTL. The power supply used in the Mach Conner machine is the AT89C52 microcontroller and Block Current Digital (Drive + Pneumatic Coil Mach Conner Machine). To modify the device requires several circuit components consisting of PCB, IC type MAX232CPE, Kit-control, VC, Rs, and Ls. In addition, it takes technicians to manufacture power supplies with the ESCI (Electrical Standard for Commercial Industry) standard. So that with the modification of this device requires a fee of Rp. 3,700,000 or US$ 254.21.
4. With the effectiveness of the production process that is equal to 17.07% can improve the production process and can reduce the amount of waste generated by the Mach Conner device. With a full automation based device, it can reduce electricity consumption from 17600 watts to 5263,706 watts so that it can save costs by Rp.2,423,423 or US$ 167.65 for one month.
5. Implementing the device gives an increase in the number of production with an average production of 713686.4 kg to 835512.65 kg, and reduces the amount of waste from 1840.59 kg to 7631.99 kg.

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