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Effect of management commitment on the maintenance performance through continuous improvement and total productive maintenance

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Abstract: The research objective to analyze the effect of management's commitment to maintenance performance through total productive maintenance and continuous improvement. Data was gathered from a sample of 234 respondents derived from PT IA, Indonesia, one of the national company engaged in the food, flavor and fragrance ingredients. Analysis using structural equation modeling (SEM), using the software AMOS 22. The results showed that: (1) positive influence management commitment to continuous improvement, (2) positive influence management commitment to total productive maintenance (TPM), (3) continuous improvement positive effect on TPM, (4) TPM positive effect on the performance of maintenance, (5) continuous improvement has a positive effect on the performance of maintenance. There is an indirect effect of management commitment to total productive maintenance through continuous improvement, as well as continuous improvement to the maintenance performance through total productive maintenance.

Keywords: Management commitment, continuous improvement, total productive maintenance, maintenance performance, SEM

I. INTRODUCTION

Maintenance aims to maintain machinery and equipment against damage and engine failure in the production line. Maintenance defined as guarding property, especially the means of production to be durable and remain in good condition. Maintenance activities are fixed, disassemble, or check the machine carefully and thoroughly (Maintenance, Repair, and Overhaul/MRO). Maintenance also means taking action regularly to maintain a device known as scheduled maintenance or prevent disorders (preventive maintenance) (Kambali& Sulistyowati, 2018). MRO can be defined as all measures aimed at maintaining or restoring the component or machine to the ideal state to be able to perform its functions according to the needs of the company. Its actions include a combination of all administrative and managerial oversight. The maintenance process is done to serve the production facilities to guarantee high productivity and to maintain physical assets. The goal is to increase the value of reliability, security, availability, and quality of production, equipment or buildings and to reduce the cost incurred. In general, maintenance means maintaining (keep), preserve, and protect. Routine work to maintain the facilities of the building, structure, ground facility, utility system, or other real property (Ngadiyono, 2012).

Implementation of effective maintenance aims to improve the profitability and competitiveness of the organization through improved efficiency of production processes continuously, increasing effectiveness and productivity that can be achieved by maintaining and improving the quality of all the elements that contribute to the continuous production process and save on costs(Al-Najjar, 2007). Several studies have identified the importance of continuous improvement as part of quality management practices, which contribute to organizational performance. Likewise, continuous improvement also contributes to the efficiency and effectiveness of the organization through Total Productive Maintenance (Cooke, 2000),

Globalization requires cost efficiency has become a necessity so that the product can remain competitive. The global market requires companies applying proactive and innovative strategies to improve capabilities through Total Productive Maintenance / TPM (Ahuja &Khamba, 2008). TPM is a maintenance process developed methods to increase productivity in the work area, by making the process more reliable. Total Productive Maintenance is a mindset about how to control management in the production area even companies, as Total Productive Maintenance also involves the relevant departments such as the PPIC, purchasing, quality, RND, and others. TPM is combining preventive and predictive maintenance with machine operator involvement through autonomous maintenance.

Management commitment by (Cooper, 2006) defined as involved in the process and maintain behaviors that help others achieve goals. The increased frequency of interaction management has positive effect on employee performance. Management commitment, according to (Nadirsyah 2008) is confidence and strong support from management to perform, execute, and implement a policy set together so that the goal on the

implementation of these policies can be achieved. Management commitment needed to achieve continuous improvement. In his research (Maletič et al., 2012) concluded that continuous improvement is significantly and directly to maintenance performance. With a high commitment to management expected to contribute positively to the company. Previous studies have used a number of descriptive research types such as those conducted by (Purba et al., 2018), but none have been related to negotiations relating to planning involving management, continuous improvement, total productive maintenance and performance maintenance based on structural modeling equations (SEM). Based on this background, the researchers interested in conducting quantitative research entitled Effect causal Management Commitment to the Maintenance Performance through Continuous Improvement and Total Productive Maintenance, by taking the case in PT IA, a national company in Indonesia that is engaged in food.

II. LITERATURE REVIEW

a) Management Commitment

Management commitment is a strong belief in and support of management to perform, execute, and implement policy have set together so that the goal of the implementation of the policy can be achieved (Nadirsyah 2008). Management commitment regarded as an important factor in the effort and continuous improvement programs. However, at other levels, management commitment is also very important (Alhaqbani et al., 2016),

Leadership and commitment to continuous improvement must be demonstrated by managers at all levels of the organization (Prajogo&Sohal, 2004). In general, the measurement can be done in two ways: direct questions posed to the manager or the behavior of their commitments be monitored. With very little effort has been able to empirically assess the actual impact of the behavior of management commitment to employee behavior. The increased frequency of interaction management to positively affect employee performance. In this study the hypothesis given were:

H1= Management commitment to continuous improvement has a positive effect

H2= Management commitment positive effect on the total productive maintenance

b) Continuous Improvement

Continuous improvement is as a weapon to maintain and enhance the competitiveness of the more practical and see it as a tool to implement the production system. The continuous improvement consists of the establishment of the internal or external customer requirements, eligibility, measuring success, and continue to check the requirements of customers to find the areas where improvements can make. Continuous improvement is seen as a set of specific routines that can help an organization to improve the performance. Many researchers view as a dynamic process of continuous improvement, focus on improving the program and its relationship to other organizational elements in the organization and its environment.

The learning experience can encourage employees to give feedback to evaluate the performance, allowing the results of continuous improvement activities incorporated into the knowledge base of the organization (Oliver, 2009). System principal value of the continuous improvement is improvement / continuous improvement involving everyone in the organization. The elements of continuous improvement comprising: focus on the customer, quality control integrated (Total Quality Control), robotics, group quality control, system advice, automation, discipline in the workplace, kanban, improvement of quality, Just-in-time, zero defect, small group activities, cooperative employee relations and management (Akter et al., 2015). TPM is used to facilitate continuous improvement (Crespo, 2007).

H3= continuous improvement positive effect on the performance of total productive maintenance

c) Total Productive Maintenance

Total Productive Maintenance is a maintenance process developed methods to increase productivity in the work area, by making the process more reliable (Borris, 2006). TPM can help to configure the organizational structure necessary to facilitate the treatment of continuous improvement in the practices.

Currently, many organizations have higher customer pressure. The company uses the support functions, one of which is the maintenance as an important part of the impact on organizational performance. To respond to this major problem in the manufacturing system, the Japanese company has implemented and developed the concept of Total Productive Maintenance. With the Continuous Improvement is expected to increase the Total Productive Maintenance (TPM) and ultimately to improve the performance of maintenance (maintenance performance) (Brah& Chong, 2004). In this study the hypothesis given were:

H4= total productive maintenance positive effect on maintenance performance

d) Maintenance Performance

The overall performance management system is necessary to define the inadequate use of performance information in decision-making and dissatisfaction in the performance measurement system by the maintenance manager. The effectiveness of the feedback process in performance management and how performance information should be used to trigger a change (Muchiri et al., 2010). Defining the size and actual measurement for monitoring and control is a very complex task for large organizations. The complexity of maintenance performance measurement (MPM) is increasing.

Oliveira et al.(2016) said that in general, concerning management performance indicators, the company has a lot of opportunities to improve, especially in the use, understanding, and application of maintenance performance indicators, regardless of the sector companies, origin, size, number of employees or size of the maintenance staff. Performance indicators should be integrated and interdependent to give an overall perspective on the company's objectives, business strategy, and specific goals. Most companies have a basic level of maintenance management, which means they have the opportunity to make improvements and what matters is profit.

According to (Maletič et al., 2012) the effectiveness of the maintenance system plays an important role in the success and development of the organization. Therefore, system performance needs to be measured by performance measurement techniques. Therefore, maintenance performance measurement has become an important element of strategic thinking asset owners and managers. Performance measurement is a basic principle of management.(Muchiri et al., 2011) states that as more manufacturing functionality, performance measurement is important in managing the maintenance function. In addition, performance measures provide an important relationship between strategies and management actions and thus support the implementation of improvement initiatives. Furthermore, they have the potential to help the maintenance manager to centralize the maintenance staff and resources to specific areas of the production system will affect the performance of the manufacturing. Maintenance performance management system should be designed to track and improve various aspects to increase the maintenance performance. Maintenance performance measurement is essential in managing the maintenance function. It would also improve the performance of the company (Simões et al., 2011).

Maintenance of assets has contributed positively to productivity, product quality and company profits (Simões et al., 2011). Maintenance is also contributing to the achievement of corporate objectives. Maintenance is carried out to improve production facilities and ensure increased production, through increased efficiency of the production process. Increased productivity can be achieved by improving the quality of all the elements that contribute to the continuous production process (continuous improvement) and finally be able to improve the performance of maintenance (Brah& Chong, 2004). In this study given hypothesis is:
H5= continuous improvement positive effect on maintenance performance.

Maintenance performance is influenced by various factors, such as management commitment, TPM, and continuous improvement. Frameworks models illustrate that management commitment, implementation, and continuous improvement TPM exactly is expected to have a positive effect on the maintenance performance, as shown in Figure 1.

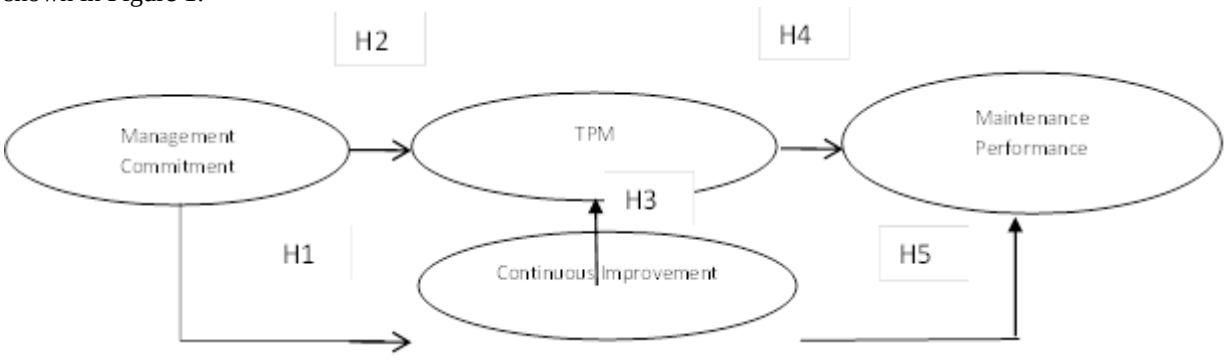

Figure 1. Research Framework

III. METHODS

a) Data Collection

The data used are primary data collection techniques using questionnaires. Respondents are employees involved and working in the operation and maintenance of machinery/equipment in PT. IA Indonesia. The sample size was between five and 10 times the number of indicators. The study had 22 indicators, so that the number of survey respondents ranges from 110 to 220 respondents. The number of respondents was obtained

was 234 respondents, so it is considered already to meet the requirements(Hairet al., 2009). Measurement data using the differential semantic scale. The samples were conducted with purposive sampling, respondents selected intentionally by the ability of respondents to answer the questions. The data is spread with the help of google form in April - May 2018 distributed to 254 respondents, and that returns as much as 234. Data analysis using Structural Equation Model (SEM), operated by AMOS program version 22.

Testing the validity of the data using the Test Confirmatory Factor Analysis (CFA) with the Convergent Validity test. Reliability testing using the construct reliability (CR) and extracted variance (VE). Testing normality of the data performed by removing data outliers, using the critical value of ± 2.58 at the 0.01 level. The Goodness of Fit done using ten measurements are Probability Chi-Square, CMIN/DF, Goodness of Fit Indices (GFI), AGFI, CFITucker-Lewis Index (TLI), NFI, IFI andRoot Mean Square Error of Approximation (RMSEA) and RMR.

b) Conceptual Framework

Definitions of the variables in this study are:

1) Management commitment is confidence and strong support from management to perform, execute, and implement a policy set together so that the goal on the implementation of the policy can be achieved (Nadirsyah, 2008),
2) Total Productive Maintenance is one of the maintenance process developed methods to increase productivity in the work area, by making the process more reliable (Borris, 2006),
3) Continuous Improvement is a tool to maintain and improve the competitiveness of which refers to the more practical things and see it as a tool to implement a production system (Marin-Garcia et al., 2008),
4) Maintenance Performance is a maintenance function capability to control maintenance costs, extend equipment life, and improve security (Peach et al., 2016). Latent variables derived from the following indicators (Table 1).

Table 1 Operational Definition of Variables

No.	Variables	Indicator	Code
1	**Management Commitment**	1. Commitment of maintenance manager	MC1
		2. Commitment of production manager / user	MC2
		3. Commitment of maintenance supervisor	MC3
		4. Commitment of production supervisor / user	MC4
2	**Total Productive Maintenance**	1. Autonomous maintenance	TPM1
		2. Health and safety	TPM2
		3. Training	TPM3
		4. Maintenance planned	TPM4
		5. Maintenance of quality	TPM5
		6. Maintenance focused	TPM6
		7. Support Systems	TPM7
		8. Management of early stage	TPM8
3	**Continuous Improvement**	1. Implementation	CI1
		2. Individual continuous improvement	CI2
		3. Focus on the customer	CI3
		4. System advice	CI4
		5.Automation	CI5
		6. Discipline in the workplace	CI6
4	**Maintenance Performance**	1. Availability	MP1
		2. Performance	MP2
		3. Quality	MP3
		4. The overall machine condition	MP4

source: Nadirsyah(2008), Borris(2006), Marin-Garcia et al.(2008), and Peach et al.(2016)

Modeling using Structural Equation Modeling (SEM) with structural equation as follows:

$CI = \beta_1 MC + e_1$ ……(1)

$TPM = \beta_2 MC + \beta_3 CI + e_2$ ……(2)

$MP = \beta_4 CI + \beta_5 TPM + e_3$ ……(3)

Expected signs: β1, β2, β3, β4, β5> 0
Where:
CI = Continuous Improvement
TPM = Total Productive Maintenance
MC = Management Commitment
MP = Maintenance Performance

IV. RESULTS

a) Characteristics of Respondents

Questionnaires were made with a variety of questions based on 22 indicators studied. Questionnaires were distributed to the respondents amounted to 254, following the data of respondents based on long worked in the company (Table 2).

Table 2 Data Respondents, Working Period

Working Period (Years)	Total (Person)	Percentage
<1	62	24%
2	17	7%
3	26	10%
> 4	149	59%
Total	254	100%

Source: HRD PT. IA (2017)

Table 2 declares that the working period of respondents who worked more than four years amounted to 149 (59%). Respondents with 3 years old work amounted to 26 (10%). Respondents with 2 years are 17 people (7%) and less than 1 year amounted to 62 (24%). Most respondents who have worked for more than four years, as many as 59%.

b) Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) aims to determine whether the indicators can explain a construct. CFA test is done to look at the validity of the data, by looking at the significance level of 0.05 indicator and standardized estimate value above 0.5. CFA testing was conducted to see the relationship with the indicators of latent variables. If not in accordance with the provisions, the indicator should be removed and re-test the CFA to obtain the results as per the requirement. The test results indicate that the indicator has a value of less than 0.5 loading factor are MC1, MC3, CI1, CI3, CI5, MP1, and MP3, and should be removed from the model (Haryono, 2017).

Variable management commitment shows that the probability of all significant indicators at 0.001 (***), with the value of the indicator MC4 loading factor (0.819) and MC2 (0.830). Variable continuous improvement shows that the probability of all significant indicators at 0.001 (***), with the value of the indicator CI2 loading factor (0.724), CI4 (0,624) and CI6 (0.685). Variable Total Productive Maintenance showed that the probability of all significant indicators at 0.001 (***), with the value of the indicator TPM1 loading factor (0.725), TPM2 (0.662), TPM3 (0.659), TPM4 (0.658) TPM5 (.689), TPM6 (0.724), TPM7 (0.699) and TPM8 (1.216). Variable Maintenance Performance shows that the probability of all significant indicators at 0.001 (***). Rated loading factor on indicators MP4 (0,878), and MP2 (0.825).

c) Construct Reliability Test

Reliability testing is a test to measure the internal consistency of indicators used. Here are the results of the calculation of the value construct reliability and average variance extracted, Table 3.

Table 3 Average Variance Extract and Construct Reliability

	AVE	Construct Reliability
Management Commitment	0.68	0.809
Continuous Improvement	0.461	0.719
TPM	0.599	0.919
Maintenance Performance	0.726	0.841

The cut-off value of construct reliability is a minimum of 0.70 whereas the minimum variance extracted 0.50 (Ghozali, 2014). Table 3 shows the value construct reliability is greater than 0.70, meaning that it meets the specified requirements. While the value of AVE on continuous improvement of 0.461 (under the terms of at least 0.50), even so according to (Hair et al., 2009) value above 0.40 is acceptable. So it can be said that overall the data used is reliable.

d) Normality and Outliers

Analysis of multivariate normality is done by using the criteria of the critical ratio (cr) from the multivariate curtosis. If the value cr is in the range of 2.58 ± means are multivariate normally distributed data (Haryono, 2017). More results of the testing of normality after eliminating outliers of data presented in Table 4.

Table 4 Assessment of Normality

Variable	Min	Max	Skew	cr	Kurtosis	cr
MP2	1	5	0.59	3,675	0.952	2.966
MP4	1	5	0,138	0.86	0.83	2,585
CI6	1	5	.614	3.825	0,829	2.582
CI4	1	5	0.267	1.666	.834	2.6
CI2	1	5	.247	1,539	1,095	3.411
KM2	1	5	0,034	0.215	0.334	1.039
KM4	1	5	0.099	.614	0,656	2,043
TPM1	1	5	0.136	0,844	-0.195	-0.608
TPM2	1	5	.248	1,547	0,293	.914
TPM3	1	5	0.186	1,157	-0.206	-0.641
TPM4	1	5	0,244	1,523	0.25	.778
TPM5	1	5	0.301	1,878	.777	2,422
TPM6	1	5	0.436	2,717	.441	1,375
TPM7	1	5	.415	2,587	1,124	3.501
TPM8	1	5	.521	3.244	.971	3,025
Multivariate					**6.698**	**2,264**

Table 4 declares the value of the critical ratio of 2,264, which is in the range -2.58 to 2.58. Chi-square value tables on the significance of 0.001, df. 22, the obtained value of 49.72. Table 4 states that Mahalonobis d-squared value none exceeds 49.72 it is stated that the data are normally distributed.

e) Conformance Model

The results of the final model after testing the validity, reliability, and normality of the data, the final model can be presented in Figure 2.

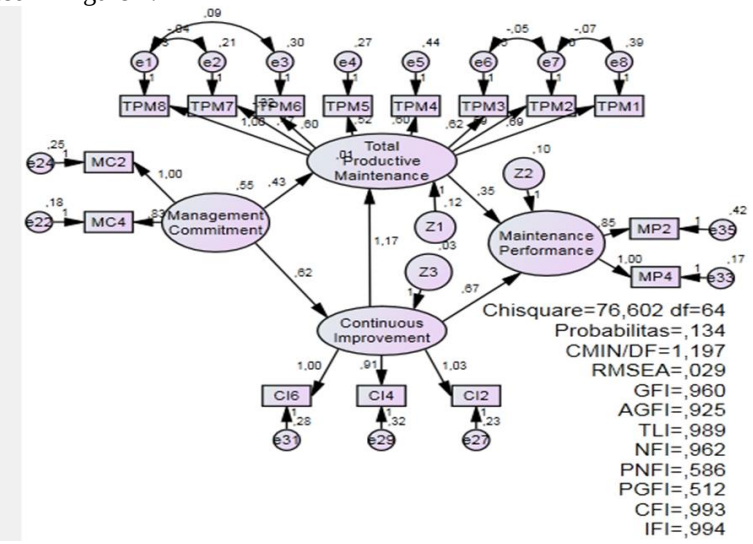

Figure 2 Full Model SEM

f) Goodness of Fit

The assessment criteria considered suitable model is that if more than 5 criteria according to the criteria expected.

Table 5 Goodness of Fit

Goodness of Fit	Cut of Value	Result	Decision
Probability Chi-Square	≥ 0.05	0.134	Good fit
CMIN/ DF	≤ 2.00	1,197	Good fit
GFI	≥ 0.90	0,960	Good fit
AGFI	≥ 0.90	0.925	Good fit
CFI	≥ 0.90	0.993	Good fit
TLI	≥ 0.90	0.989	Good fit
NFI	≥ 0.90	0,962	Good fit
IFI	≥ 0.90	.994	Good fit
RMSEA	≤ 0.08	0,029	Good fit
RMR	≤ 0.05	0,019	Good fit

Table 5 shows ten of the goodness of fit criteria decision concluded a good fit and meet a good model. GOF is considered sufficient to assess the feasibility of a model with the terms of each criterion: Absolut Fit Indices, Incremental Fit Indices, and Parsimony Fit Indices are represented. It can be concluded that the overall model of feasible and can proceed hypothesis test to determine how much influence between variables in the model (Ghozali, 2017).

V. DISCUSSION

Steps after the data are declared valid, reliable, distributed as normal and good models fit the hypothesis test. Hypothesis test results on the effect of the relationship between latent variables and latent variables with the dimensions shown in Table 6.

Table 6 Standardized Regression Weights

			Estimated	SE	CR	P
Continuous_Improvement	<---	Management commitment	**,933**	, 068	9.142	***
Total_Productive_Maintenance	<---	Management commitment	,331	, 216	1,980	0.048
Total_Productive_Maintenance	<---	Continuous_Improvement	,602	.357	3,264	0.001
Maintenance Performance	<---	Total_Productive_Maintenance	,459	, 166	2,099	, 036
Maintenance_Performance	<---	Continuous_Improvement	,458	, 329	2,043	, 041
TPM8	<---	Total_Productive_Maintenance	**1,216**			
TPM7	<---	Total_Productive_Maintenance	,696	, 067	6.958	***
TPM6	<---	Total_Productive_Maintenance	,724	, 085	7.118	***
TPM5	<---	Total_Productive_Maintenance	,689	, 075	6.881	***
TPM4	<---	Total_Productive_Maintenance	,658	, 089	6.776	***
TPM3	<---	Total_Productive_Maintenance	,659	, 091	6.749	***
TPM2	<---	Total_Productive_Maintenance	,662	, 087	6.733	***
TPM1	<---	Total_Productive_Maintenance	,725	, 099	6.989	***
MC4	<---	Management commitment	,819	, 060	13.882	***
MC2	<---	Management commitment	**,830**			
CI2	<---	Continuous_Improvement	**,724**	, 110	9.356	***
CI4	<---	Continuous_Improvement	,624	, 110	8.296	***
CI6	<---	Continuous_Improvement	,685			
MP4	<---	Maintenance_Performance	**,878**			
MP2	<---	Maintenance_Performance	,825	, 097	8.804	***

Table 6 explains that management commitment to continuous improvement has a positive effect. Each increase in one unit of the management commitment will be increasing continuous improvement by 0.933. The results of this study were conducted with empirical studies conducted by (Formento et al., 2013) which stated that management commitment has a positive influence on continuous improvement. The strongest relationship management commitment is influenced by the commitment of the production manager/user. This indicates that the commitment of the production manager / user plays the most important role in encouraging continuous improvement, compared to the commitment of the manager and supervisor of maintenance.

Management commitment has a positive effect on the total productive maintenance. Each increase of one unit of management commitment will increase the total productive maintenance of 0.331. The results of this study are in accordance with studies conducted by (Shen, 2015; Brah& Chong, 2004). The strongest relationship of total productive maintenance is explained by indicators of the role of early management in ensuring the proper installation of new machines. The installation of new machines correctly and correctly will have an impact on the performance of the machine in production.

Continuous Improvement has a positive effect on total productive maintenance. Each increase of one unit of continuous improvement will increase the total productive maintenance amounted to 0.602. The strongest relationship Continuous Improvement is explained by individual Continuous Improvement. This shows that the participation of employees in improving Continuous Improvement is very important in order to achieve continuous improvement.

Total productive maintenance has a positive effect on maintenance performance. Each increase of one unit of Total productive maintenance will improve the maintenance performance by 0.459. The results of this study are consistent with the study (Brah& Chong, 2004). The strongest relationship Total productive maintenance is explained by the early management role. This indicates that the initial management role is very effective in increasing Total productive maintenance.

Continuous improvement has positive effect on the maintenance performance. Each increase of one unit of continuous improvement will enhance the maintenance performance by 0.458. The results of this study support the research conducted by (Maletič et al., 2012). The strongest relationship of maintenance performance is influenced by overall engine condition. This explains that a good overall engine condition can indicate good maintenance performance, and vice versa.

The amount of direct and indirect effect was measured using standardized estimates. Using standardized estimates because it is not affected error. The following are direct effects (Table 7), the indirect effect (Table 8) and the total effect (Table 9) between the variable.

Table 7 Standardized Direct Effects

	Management Commitment	Continuous Improvement	Total Productive Maintenance
Continuous Improvement	, 933	, 000	, 000
Total Productive Maintenance	, 331	, 602	, 000
Maintenance Performance	, 000	, 458	, 459

Table 8 Standardized Indirect Effect

Variable 1	**Mediator Variable**	**Variable 2**	**Coefficient**
Continuous Improvement	TPM	Maintenance Performance	0, 276
Management Commitment	Continuous Improvement	TPM	0, 561

Table 9 Standardized Total Effects

	Management Commitment	Continuous Improvement	Total Productive Maintenance
Continuous Improvement	, 933	, 000	, 000
Total Productive Maintenance	, 892	, 602	, 000
Maintenance Performance	, 837	, 734	, 459

Source: Processed Data

The regression coefficient direct influence management commitment to total productive maintenance by 0,331 (Table 7), the regression coefficient indirect effect of management commitment to total productive maintenance is 0.561 (Table 8), and the total impact of 0.892 (Table 9). This result indicates that the indirect effect of management commitment to total productive maintenance through continuous improvement greater than the direct impact. The meaning that continuous improvement is a mediating variable of management commitment to total productivity maintenance.

The direct effect regression coefficient of continuous improvement on the maintenance performance is 0.458 (Table 7), the indirect effect continuous improvement of the maintenance performance of 0.276 (Table 8), and standardized total effect of 0.734 (Table 9). This result indicates that the indirect effect continuous improvement of the maintenance performance through total productive maintenance is smaller than its direct effect. It means that total productive maintenance is not a mediating variable of continuous improvement on maintenance performance.

VI. CONCLUSION

This study aimed to analyze the effect of management commitment to maintenance performance through total productive maintenance and continuous improvement. The results suggest that the positive effect management commitment to continuous improvement. Management commitment, positive effect on the total productive maintenance. Continuous improvement positive effect on the total productive maintenance. Total productive maintenance to maintenance positively affects performance. Continuous improvement positive effect on maintenance performance.

The indirect effect of management commitment on total productive maintenance through continuous improvement greater than the direct impact. Instead, the indirect effect continuous improvement on the maintenance performance through total productive maintenance is smaller than the effect directly. The meaning that continuous improvement is a mediating variable of management commitment to total productivity maintenance. While total maintenance productivity is not a mediating variable of continuous improvement on maintenance performance.

Policy implications for companies in improving maintenance performance are: 1) the company needs to give a greater role to the commitment of the production manager, compared to the maintenance manager, 2) the need to encourage employee participation in carrying out continuous improvement, 3) the need for management support in the early stages of production machine installation to ensure that the new engine is installed properly and correctly, 4) the overall condition of the engine can describe maintenance performance.

Contributions to the theory, the results of this study are very important and useful in improving knowledge, proposed indicators and propose a conceptual framework of commitments Management, Continuous Improvement, Total Productive Maintenance, and Maintenance Performance. Suggestions for further research by adding variables, dimensions, and indicators on the model, resulting in a deep theoretical concept. The limitation of this study is the average variance extracted under the provisions (Ghozali, 2014), although according to Hair et al.(2009) values above 0.40 are still acceptable.

VII. ACKNOWLEDGEMENTS

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