Program Designing the Improvement of Excavator's Maintenance Team Competencies (Case Study in a Sandstone Mine Company PT XYZ)

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Abstract*—The heavy equipment maintenance system cannot be separated from the problems of Human Resources (HR). Some literature has defined HR as a success factor for the successful implementation of maintenance systems. The Asset Maintenance Division as an organization which responsible to maintain the Company's assets routinely, including the Doosan S500's 50-tonne class excavator. But in fact, excavators that are currently still operated often breakdown and its physical condition are in a bad condition. From the observation of 9 (nine) units excavators, the Key Performance Indicator (KPI) target was still not achieved, especially on the items Mean Time To Repair (MTTR) and Mean Time Between Failure (MTBF). Mechanic's technical competencies needed in achieving KPI are divided into four sub competencies: Maintenance, Repair & trouble shooting, Remove & install and Overhaul. This study aims: analyzing mechanic's competencies against company's standards, analyzing the influence of mechanic's competencies on achieving KPI targets, providing recommendations on the influence of mechanic's competencies for achieving KPI targets. The primary data used in the study were obtained through interviews and the questionnaires as well as secondary data obtained from various literatures, research results and supporting books. The method of processing and analyzing data uses the method of gap analysis and the Non-Parametric Statistics (Multiple Regression). The results of the gap analysis are known that there are still gaps in the actual competence of employees with competency standards set by the company. Factors that cause the competency gap are generally known because of a lack of understanding of the basic skills required, mastery of work techniques and consistency in applying work quality standards. Recommendations from this study as an effort to improve the skills and knowledge of mechanics to improve work effectiveness that affects MTTR and the quality of work that affects MTBF so that the KPI are consistently achieved.

Keywords*—Preventive Maintenance, Downtime, Physical Availability, MTTR, MTBF, Gap Analysis.

I. INTRODUCTION

Almost all mining activities use heavy equipment. Starting from digging and removing land / dirt that covers mine material, digging and moving mining materials, mixing mining materials and bringing them to processing sites for further processing before being sold. With such an important function, the machine must always be ready to use.

In the mining industry, maintenance is a very important issue. This is due to the majority of activities carried out in the mining industry using mechanical equipment, so that production activities are very dependent on the availability of these equipment. Almost all mining activities use heavy equipment. Starting from digging and moving the soil / dirt that covers mining material, digging and moving mining material, mixing mining material and bringing it to the processing site for further processing before finally being sold. With such an important function, the machine must always be in a condition ready for use.

PT XYZ Assets Division continues to monitor their Key Performance Indicators (KPI) consisting of: Service Accuracy, Physical Availability (PA), Mean Time to Repair (MTTR), Mean Time Between Failure (MTBF). From the results of observations on 9 (nine) units of 50-ton grade excavator, the fact that KPI target was not achieved and its performance was volatile relatively. Characteristics of maintenance and issues of concern to PT XYZ so far include: 1. PA is the key to maintenance system performance, Assets Division as the owner and caretaker of the excavator unit and Operation Division as a user or operator jointly use PA as an indicator of performance but with different uses; 2. Class of 50-ton excavators are very critical of their existence in supporting company operations given the largest work capacity in the work environment; 3. The efforts made by the Assets Division are to reduce downtime, work effectiveness during repair and maintenance and optimize the uptime of excavator operations; 4. Mechanical technical competencies needed in achieving KPI are divided into 4 (four) sub skills, namely: Maintenance, Repair & trouble shooting, Remove & install and Overhaul; 5. The assessment of technical competence is obtained according to the results of the Knowledge Assessment in the form of written tests and practices carried out by heavy equipment vendors to the mechanical team in handling 4 (four) major components of the excavator unit, namely: Engine, Powertrain, Hydraulics, Electrical and Preventive Maintenance (PM); 6. Identification of efforts to improve

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mechanical skills and knowledge is needed to improve work effectiveness that affects MTTR and the quality of work that affects MTBF.

The main purpose of the heavy equipment maintenance division is to reduce maintenance costs and minimize production losses due to inappropriate maintenance programs. Zuze (2010) mentions that a good maintenance system can help organizations increase machine availability, reduce production down time, losses and overtime costs.

Recognizing the importance of human resources for an organization in the present, amidst the ongoing competition, there is an indication that occurs in the organization, among others, the number of mechanics who still need development both in terms of knowledge and expertise and skills. This is done to improve the performance of organizational management in terms of HR management. The stages of HR management consist of: planning, procurement, direction, development, maintenance, and dismissal. One of the activities in managing HR in an effort to achieve employee performance is by increasing employee competency.

One of the ways companies can do in developing human resources is to find out the abilities and skills of each employee by mapping the skills to the competencies needed. One of the goals of the company is to understand employee competencies, namely human resource development programs such as training programs, employee placement systems and career development programs

II. Literature Review

A. Maintenance

According to [1] the problem of care or maintenance has a close bond with preventive and corrective, where the action can be: Inspection, Replacement, Repair, Overhaul. Some maintenance techniques that have been widely used in various industries are as follows [2]: breakdown or reactive maintenance, corrective maintenance, preventive maintenance, predictive maintenance and Realibility Centered Maintenance.

Maintenance is defined as the activities carried out to keep the facility in the same condition at the time of initial installation so that it can continue to work in accordance with its production capacity. Maintenance Management in general is an activity related to planning, organization and staffing, program implementation and control methods of maintenance activities. These activities are aimed at optimizing maintenance performance by increasing reliability and availability (Mann, 1976).

B. Preventive Maintenance Performance Measurement

Like other management methods, the maintenance management system also has a measurement system to assess the performance of the existing system. Maintenance performance measurements carried out will focus on PM performance according to data availability including any downtime that occurs is recorded in PM activities.

Engine downtime is the length of time a unit cannot function as expected. Engine downtime can occur when the unit experiences problems such as damage that can interfere with overall performance, including the quality of the product produced or the speed of its production so it requires a certain amount of time to restore the unit's function to its original condition.

In daily operations downtime factors greatly affect reliability and availability where the level of accuracy must take into account several time components including: Service Accuracy, Physical Availability, MTTR and MTBF.

The accuracy factor to perform routine service as close as possible to this specified interval is called Service Accuracy (SA). The formula used to calculate SA matches the following:

$$SA\ \% = \frac{Number\ of\ Schedule\ Service\ with \pm 10\%}{Total\ Number\ of\ Service} \text{ x } 100\% \quad (1)$$

Physical Availability is a measure of the amount of time the tool is used in units of percentages. Factors affecting the PA include the implementation of unscheduled maintenance activities, preventive maintenance activities, reliability of tools and how to use them. The higher the PA value, the smaller the unit downtime value will be. PA becomes a priority item considering that it directly impacts company profits or in other words high PA values are equivalent to high productivity. PA can be calculated using equations:

$$\text{PA} = \frac{Scheduled\ Running\ Time - Downtime}{Scheduled\ Running\ Time} \text{ x } 100\% \quad (2)$$

MTTR is the average time a tool is repaired when a failure occurs until the tool can operate normally again. MTTR can be calculated using equations:

$$\text{MTTR} = \frac{Total\ Repair\ Time}{Number\ Of\ Repair} \quad (3)$$

MTBF is the time the average tool works before damage occurs again. MTBF can be calculated using equations:

$$\text{MTBF} = \frac{Time\ Between\ Failure}{Number\ Of\ Failure} \quad (4)$$

C. Human Resources Management

Employee performance is the level of how employees achieve job requirements. Management often uses appraisal techniques to improve performance [3]. Performance appraisal is the process of measuring employee performance. Performance appraisal usually includes qualitative and quantitative aspects of the work implementation. Performance assessment as a basic function of personnel is sometimes referred to as performance reviews, employee ratings, performance evaluations, employee evaluations, or personnel ratings.

Competence is defined [4], [5] as the underlying characteristics of a person and related to the effectiveness of individual performance in his work. According to [5] competencies can be divided into 2 (two) categories, namely: "threshold competencies" and "differentiating competencies". Threshold competencies are the main characteristics that a person must have in order to carry out his work. But not to distinguish someone who is high and average. Whereas "differentiating competencies" are factors that distinguish high and low performing individuals. Competency standards are formulations about the ability of a person to do a job or task based on knowledge, skills, supported by work attitude and its application according to the required performance (Neolaka, 2006). The type of competence according to [5], classifies dimensions and components of individual competencies into three, namely: intellectual competence, emotional competence and social competence.

According to [6] the basic framework for determining competency refers to steps called Function, Activities and Competency (FAC). Determine the competencies needed in a particular job position. First, it is necessary to determine specific functions in a position (function of job). The second step, study the specific activities in the process of doing work (activities or process). The third step, determine the competencies needed for the position.

Types of competencies according [5], classify the dimensions and components of individual competencies into three, namely: intellectual competence, emotional competence and social competence. Intellectual competence is the character of attitudes and behaviors or individual intellectual abilities and abilities (can be in the form of knowledge, skills, professional understanding, contextual understanding, etc.) that are relatively stable when facing problems in the workplace, formed from the synergy between character, concept self, internal motivation, and contextual knowledge capacity. Emotional competence is the character of attitude and behavior or the ability to master oneself and understand the environment objectively and morally so that the emotional pattern is relatively stable. Social competence is the character of attitude and behavior or the willingness to build cooperation nodes with others when facing problems at work.

D. Validity

Validity test is used to determine whether the attributes of importance and evaluation of importance can be trusted, valid and can be used repeatedly, if asked to other respondents [3]. There are two types of validity based on the method of testing, namely external validity and internal validity. The validity used in this study is to find the correlation between the attributes of questions with one another (external) and look for correlations between respondents' answers one with other respondents in one question attribute (internal).

E. Gap Analysis

According to [7] gap analysis is a business tool and valuation method that focuses on the gap between current company performance and desired performance. Gap analysis evaluates actual current performance and the improvement efforts needed to close the desired future performance gap. The benefit of this gap analysis is that it helps companies with poor performance due to inefficient use of resources or failure to invest properly and increase production and performance.

III. METHODOLOGY

This research was carried out through several steps. The first step is to identify and analyze existing conditions on aspects: mechanics competence, KPI, and mechanics performance. The second step is to identify competency standards needed so that KPIs are achieved and analyze the gap between existing conditions and competency standards. The third step is to design programs to improve mechanics competencies.

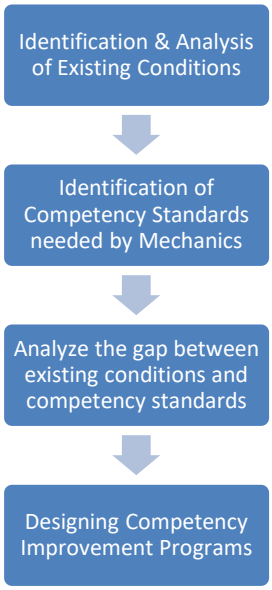

Figure 1. Steps of research

A. Data Collection and Processing

1) Gap Analysis

Data regarding the competence of human resources and the performance of the mechanical team of PT XYZ were obtained through primary data and secondary data. Primary data is data obtained directly by observation, interviews, questionnaires, and expert opinions or company management. Data collection methods used in research are: observation, interview, questionnaire, expert opinion and Forum Group Discussion (FGD) – as primary data. Also secondary data obtained in this study, namely: Data on various types of technical expertise competencies in each mechanical qualification and Data regarding of mechanic

performance appraisals that have been conducted by the company.

Based on a preliminary assessment conducted by one excavator dealer vendor, a mechanical Knowledge test result was obtained for the work: Maintenance, Repair & troubleshooting, Remove and install and Overhaul.

Each of the above attributes is used in the regression model which is determined as an independent variable to the dependent variable, namely the mechanic performance appraisal in handling excavator maintenance work.

In accordance with Table 1. below, the competency assessment scale information obtained is used as a reference when filling in mechanic skills assessment.

TABLE 1.
MECHANIC SKILL RATING SCALE

POINT	CRITERIA	REMARKS
0	Not mastered	Mechanics do not have the knowledge & ability in work expertise
1	Fair/Fit	Mechanics have knowledge of work standards but have not been able to practice expertise according to work standards.
2	Mastered	Mechanics have knowledge of work standards and can practice expertise in accordance with work standards.
3	Expert	The mechanic is capable & adept at practicing expertise according to work standards and has accuracy and precision in work skills.

This study also uses secondary data on the length of experience of mechanics work during handling preventive maintenance activities with a rating scale according to Table 2 below.

TABLE 2.
LENGTH OF EXPERIENCE RATING SCALE

POINT	LENGHTH OF EXPERIENCE
0	Less than 1 year
1	1 - 2 years
2	2 - 3 years
3	More than 3 years

2) Multiple Linear Regression Analysis

Multiple regression analysis is an analysis model that aims to find the magnitude of the influence of the independent variable on the effect of the response variable or with regard to the study of the dependence of one variable (response variable) on one or several other variables (independent variable). Based on the framework that has been explained, in this study multiple linear regression analysis will be used, because the independent variable is more than one.

Mechanic skills that are the independent variables in this study include maintenance skills of the Engine and Hydraulics components for maintenance, repair & troubleshooting, remove & install and overhaul activities, while the dependent variable is mechanic performance according to the results of the Performance Appraisal conducted by the Assets and HRD Division Team.

The variables contained in the regression equation model include:

Mechanical Performance Assessment (Y), Skill handles Engine (X1) and Skills handles Hydraulics (X2) and Knowledge (X3). The formula used in this regression analysis is as stated by Umar (2005):

$$Yi = \beta 0 + \beta iX1i + \beta iX2i + \ldots\ldots\ldots \beta pXpi + \beta i + \varepsilon \quad (5)$$

where,

Yi : Variable response (Performance)
β0 : Constant/Intercept
βi... βp : The direction constant of the regression line
Xk : Free variables (Mechanic skills)
ε : Error/ stochastic component

3) T test (partial)

The t test was used to partially test the regression coefficient parameters of each independent variable. This means that the t test can find out whether the independent variable individually has a significant effect on the response variable.

Variables used in the t test assumption (partial) include:

Mechanical Performance Assessment (Y), Skill handles Engine (X1) and Skills handles Hydraulics (X2) and Knowledge (X3). The hypothesis for decision making is as follows:

- H0: bi = 0 (Xi factor does not affect Y) means that the influence of the independent variable on the dependent variable is not real
- H1: bi 0 (Xi factor influences Y) means that the influence of the independent variable significantly influences the dependent variable

A factor X has an effect on Y, if the t-value is greater or the calculated probability value is smaller than α (α = 5%). The influence here means that there is a rejection of H0, whereas the reverse occurs if the t value is smaller than ttable or the calculated probability value is greater than α (α = 5%) which indicates that the X factor has no effect on Y.

- t calculated > t table or P value <α; Reject H0
- t calculated <t table or P value> α; Accept H0

$$t_{hitung} = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \quad (6)$$

4) F test (simultaneous testing)

The F test is used to test the suitability of the model simultaneously whether mechanic competency factors affect performance. The variable used in the F test assumption is the same as testing the other assumptions used in the regression model, namely:

Mechanics Performance (Y), Skill handle Engine (X1), Skill handle Hydraulics (X2) and Knowledge (X3).

The hypothesis for decision making is as follows:

- H0: b1 = b2 = b3 = b4 = b5 = 0 (all Xi variable factors do not affect Y)
- H1: bi ≠ 0 (there is at least one Xi variable that affects Y)

A factor X will affect Y together can be seen from the calculated F value, if F-calculated is greater than F table then there is at least one X that affects Y. Whereas, if F calculated is smaller than F table, then certainly none X which affects Y.

- Fcalculated <Ftable then H0 is accepted, meaning that the X factor together has no significant effect on Y
- Fcalculated t> Ftable, then H0 is rejected, meaning that there is at least one X factor that significantly affects Y.

B. Data of Maintenance

From the observations obtained information that maintenance is carried out 108 times, maintenance that is not on schedule 5 times, the percentage of maintenance that is not on schedule is 4.6%, while tolerance is 10%, Service Accuracy are still in tolerance (detail of service accuracy monitoring as per unit shown by Table 3 below).

TABLE 3.
SERVICE ACCURACY MONITORING

Month	PM Type (interval hours)	Target PM (hours)	SMU Actual (hours)	Variance (hours)
17-Jan	250	4243	4234	-9
17-Feb	500	4484	4479	-5
17-Mar	250	4729	4717	-12
17-Apr	250	5217	5211	-6
17-May	500	5711	5711	0
17-Jun	250	5711	5709	-2
17-Jul	250	5959	5965	6
17-Aug	250	6215	6206	-9
17-Sep	500	6456	6468	12
17-Oct	500	6968	6970	2
17-Nov	250	7259	7258	-1
17-Dec	250	7508	7510	2

According to the information shown in the Table 4. the performance of the population of nine excavators units cumulatively, there are several excavator units that have failed to achieve the KPI target as follows:

- PA (S500-8).
- MTTR (S500-8, S500-17, S500-25)
- MTBF (S500-8, S500-17, S500-14).

TABLE 4.
EXCAVATOR PERFORMANCE BY UNIT

No.	Unit ID	PA	MTTR	MTBF
1	S500-8	71.4%	20.25	22.02
2	S500-17	88.5%	16.68	36.48
3	S500-25	98.7%	13.91	83.97
4	S500-14	99.1%	1.04	11.99
5	S500-19	92.5%	1.08	91.26
6	S500-20	93.6%	7.21	97.73
7	S500-21	94.3%	3.76	76.54
8	S500-23	97.8%	0.95	114.67
9	S500-24	98.2%	1.69	222.23

TABLE 5.
EXCAVATOR PERFORMANCE BY MONTHLY

Period	PA	MTTR	MTBF
Jan-17	97%	1.6	27
Feb-17	96%	1.2	24
Mar-17	94%	1.5	34
Apr-17	96%	1.4	70
May-17	93%	11.7	87
Jun-17	98%	1.2	128
Jul-17	91%	24.3	63
Aug-17	85%	22.5	98
Sep-17	86%	17.5	96
Oct-17	92%	2.2	81
Nov-17	85%	2.7	108
Dec-17	98%	1.3	82

As shown by Table 5. also obtained information on the failure to achieve the Assets Division in reaching the KPI by monthly target items as follows:

- MTTR (from July to September)
- MTBF (from January to March).

Downtime is the time that is calculated when the engine starts to stop instantly until the engine can be operated again normally caused by a problem with the engine. Note that downtime indicates the reliability of the machine for a certain period of time.

Based on the downtime history of each excavator unit during the 2017 period (Table 6), component information can be obtained from the excavator unit which takes the greatest amount of time to repair, namely: Engine & Hydraulic.

TABLE 6.
COMPONENTS WITH THE LARGEST DOWNTIME

GROUP	DOWNTIME (Hrs)	DOWNTIME (%)
ENGINE ASSY	2.897	33%
HYDRAULIC SYSTEM	2.727	31%
IMPLEMENT	1.414	16%
TRANSMISSION	522	6%
HYDRAULIC ACTUATOR	450	5%
ELECTRICAL SYSTEM	360	4%
COOLING SYSTEM	169	2%
GAUGES & INDICATORS	168	2%
UNDER CARRIAGE	127	1%
	8.833	**100%**

And the following below in Table 7 shows 2 (two) components that have the highest frequency of downtime that are: Engine & Hydraulic.

TABLE 7.
COMPONENT WITH THE HIGHEST FREQUENCY DOWNTIME

GROUP	EVENT (Times)	FREQ (%)
HYDRAULIC SYSTEM	295	59%
ENGINE ASSY	88	18%
IMPLEMENT	39	8%
GET	33	7%
PM SERVICE	20	4%
GAUGES & INDICATORS	14	3%
ELECTRICAL SYSTEM	10	2%
	499	**100%**

C. Existing Mechanics Competencies Measurement

Mechanics level refers to the standard competency skills of the vendor assessor team / excavator dealer consisting of: Senior Mechanic, Junior Mechanic, Pre-Mechanic Mechanical technical skills are divided into 4 (four), namely: Maintenance, Repair & trouble shooting, Remove & install and Overhaul. Mechanics technical competencies assessment was obtained according to the assessment results in the form of written tests and practices conducted by the assessor in handling 4 (four) major components of excavator units, namely: Engine, Powertrain, Hydraulics, Electrical and Preventive Maintenance.

D. Mechanics Performance Appraisal

There are 3 (three) main aspects that are assessed in the performance appraisal: intellectual competence, emotional competence and intellectual social – as shown by Table 8.

TABLE 8.
MECHANIC PERFORMANCE APPRAISAL

No.	MECHANIC LEVEL	MECHANIC POSITION AT WORKSHOP	PERFORMANCE APPRAISAL			
			intellectual competence	Emotional competence	Social competence	Total
1	Senior Mechanic-1	Foreman	42	28	26	96
2	Senior Mechanic-2	Foreman	40	25	29	94
3	Senior Mechanic-3	**Supervisor**	42	28	31	101
4	Junior Mechanic-1	Foreman	54	38	5	97
5	Junior Mechanic-2	Foreman	39	46	6	91
6	Junior Mechanic-3	M1	36	52	4	92
7	Junior Mechanic-4	M1	45	46	4	95
8	Pre Mechanic-1	Foreman	36	28	28	92
9	Pre Mechanic-2	M2	34	28	25	87
10	Pre Mechanic-3	M2	32	25	25	82
11	Pre Mechanic-4	Foreman	34	28	33	95
12	Pre Mechanic-5	M2	38	22	25	85
13	Pre Mechanic-6	M2	34	27	25	86
14	Pre Mechanic-7	M2	34	23	25	82

IV. RESULTS AND DISCUSSION

A. Mechanics Standards Competencies

According to the hierarchy from top to bottom at PT XYZ uses the terms Supervisor, Foreman, Mechanic-1 to Mechanic-2 3. The assessor uses the terms Supervisor, Head Mechanic, Senior Mechanics, Junior Mechanic and Pre-Mechanic.

TABLE 9.
MECHANICS LEVEL EQUIVALENCE

MECHANIC LEVEL (VENDOR/ASSESSOR)	MECHANIC LEVEL (PT XYZ)
Supervisor	Supervisor
Chief Mechanic	Foreman
Senior Mechanic	Mechanic-1 (M1)
Junior Mechanic	Mechanic-2 (M2)
Pre Mechanic	Mechanic-3 (M3)

Assessor gives a range of ratings for each mechanical level according to Table 9. Each level of mechanics (senior mechanics, junior mechanics and pre-mechanics) is divided into 3 (three) qualifications. From the results of the assessment, it can be seen the gaps for each level according to mechanics. Each level of mechanics (senior mechanics, junior mechanics and pre-mechanics) is divided into 3 (three) qualifications.

TABLE 10.
STANDARD OF KNOWLEDGE SCORE

MECHANIC LEVEL	SCORE RANGE	SCALE
1. Senior Mechanic (SM)	719-1018	a. 719-819 = SM Level 1 b. 820-919 = SM Level 2 c. 920-1018 = SM Level 3
2. Junior Mechanic (JM)	419-718	a. 419-519 = JM Level 1 b. 520-619 = JM Level 2 c. 620-718 = JM Level 3
3. Pre-Mechanic (PM)	110-418	a. 110-219 = PM Level 1 b. 220-319 = PM Level 2 c. 320-418 = PM Level 3

From the results of the assessment, it shows a gap (Table 11).

TABLE 11.
KNOWLEDGE GAP IN MECHANICS POSITION

No.	MECHANIC SCORE KNOWLEDGE	MECHANIC LEVEL	MECHANIC POSITION AT WORKSHOP
1	915.2	Senior Mechanic-1	Foreman
2	858.2	Senior Mechanic-2	Foreman
3	731.8	Senior Mechanic-3	**Supervisor**
4	692.2	Junior Mechanic-1	Foreman
5	593.4	Junior Mechanic-2	Foreman
6	511.8	Junior Mechanic-3	M1
7	498.8	Junior Mechanic-4	M1
8	402.8	Pre Mechanic-1	Foreman
9	383.8	Pre Mechanic-2	M2
10	379.4	Pre Mechanic-3	M2
11	319.4	Pre Mechanic-4	Foreman
12	250.8	Pre Mechanic-5	M2
13	176.6	Pre Mechanic-6	M2
14	158.2	Pre Mechanic-7	M2

B. Analysis of Mechanic Competencies Gap

1) Senior Mechanic Respondent

TABLE 12.
GAP AT SENIOR MECHANIC LEVEL

Atributs	Actual	Standard	Gap
Knowledge	2.00	3	(1.00)
Time experience (Engine)	3.00	3	0.00
Time experience (Hydraulics)	3.00	3	0.00
Skill Engine	2.42	3	(0.58)
Skill Hydraulics	2.75	3	(0.25)

Based on Table 12, it is known that the competency assessment results that include Engine and Hydraulics competencies still do not meet the standards set by the company. The results of the assessment indicate there is a gap between the standard value and the employee's actual competency. This happens because Senior Mechanics-2 and Senior Mechanics-3 still have not mastered engine overhaul expertise and the level of knowledge of Senior-Mechanics-3 is still below average.

2) Junior Mechanic Respondent

TABLE 13.
GAP AT SENIOR MECHANIC LEVEL

Atributs	Actual	Standard	Gap
Knowledge	1.50	2.5	(1.00)
Time experience (Engine)	2.50	2.5	0.00
Time experience (Hydraulics)	2.50	2.5	0.00
Skill Engine	2.56	2.5	0.06
Skill Hydraulics	1.75	2.5	(0.75)

Based on Table 13, it is known that the results of the competency assessment that includes Hydraulics skills still do not meet established standards. This happens because the Junior Mechanics-1 and Junior Mechanics-4 still have not mastered the skills of repair & troubleshooting hydraulics and overhauling hydraulics as well as the level of knowledge of the Junior Mechanics-3 and Junior Mechanics-4 which are still below average

3) Pre-Mechanic Respondent

TABLE 14.
GAP AT PRE-MECHANIC LEVEL

Atributs	Actual	Standard	Gap
Knowledge	2.50	2	0.50
Time experience (Engine)	2.57	2	0.57
Time experience (Hydraulics)	1.29	2	(0.71)
Skill Engine	1.14	2	(0.86)
Skill Hydraulics	1.18	2	(0.82)

Based on Table 14, it is known that the competency assessment results that include the Engine and Hydraulics skills still do not meet the specified standards. This happens because almost all pre-mechanical levels do not yet have the skills to overhaul the engine and overhaul hydraulics and length of experience to handle Hydraulics components that are relatively lacking.

TABLE 15.
GAP AT EACH LEVEL OF MECHANICS

Atribut	Gap Results		
	Senior	Junior	Pre
Knowledge	(1.00)	(1.00)	0.50
Time experience (Engine)	0.00	0.00	0.57
Time experience (Hydraulics)	0.00	0.00	(0.71)
Skill Engine	(0.58)	0.06	(0.86)
Skill Hydraulics	(0.25)	(0.75)	(0.82)

As presented in Table 15, the biggest competency gap in the Hydraulics skill is at all mechanic levels. Knowledge gaps and skills also occur at the level of senior mechanics and junior mechanics. Engine competency gaps occur at pre-mechanics and senior mechanics levels. While the gap needs for time work experience in handling Hydraulics components occur at the pre-mechanic level.

C. Relationship of Competence with Performance Appraisal

The influence of the magnitude of mechanic competence which includes independent variables such as skill handling engine and hydraulics as well as knowledge of mechanics performance can be determined by measuring the multiple regression equation using a spreadsheet application. The independent variables used in this study are: Skill-Engine as $x1$, Skill-Hydraulics as $x2$, Knowledge as $x3$, while for the dependent variable (Y) is mechanics performance.

TABLE 16.
RESULTS OF REGRESSION ANALYSIS CALCULATIONS

Variables	Coef	t-cal	Sig.	Keterangan
Constant	81.686	24.815	0.000	-
Skill Engine	0.560	0.283	0.783	Reject H0
Skill Hydraulics	0.179	0.113	0.912	Reject H0
Knowledge	0.016	2.297	0.044	Accept H0

Referring to the results of Multiple Linear Analysis, the regression equation in this study:

$Y = 81.686 + 0.560\ x1 + 0.179\ x2 + 0.016\ x3$

F calculated = 4.179, Rsquare = 0.556

In accordance with data processing, the calculated F values and sequential F tables are 4.179 and 3.98. Based on the F test, the results of these values illustrate that the regression equation model is appropriate to use because together the independent variables affect the dependent variable. The following is a t test for each independent variable on mechanical competence, including:

a. The value of t-calculated (0.283) < t table (2,200) means that the Skill handling engine does not significantly affect Performance.
b. The value of t-calculated (0.113) < t table (2,200) means that the skill handling hydraulics does not significantly effect on Performance.

c. The value of t-calculated (2,297) > t table (2,200) means that Knowledge has a significant effect on performance.

D. Plan for the Mechanic Competency Improvement Program

PT XYZ to determine the core skills needed to support the achievement of KPI Assets Division especially in Preventive Maintenance activities Referring to the standard competencies set by the Ministry of Energy and Mineral Resources Director General of Electricity & Energy and Oklahoma Department of Career and Technology Education. Based on the results of the research according to the priority scale, the management of the company to provide training with knowledge material for excavator maintenance for Senior Mechanic and Junior Mechanic levels and training to improve hydraulic skills to all mechanical levels.

Given the importance of updating data on the achievement of knowledge and mechanical skills in the observation period, the Company Management needs to educate the mechanics of the Supervisor level to become assessors who have the same minimum qualifications as the external assessor.

The company management needs to follow up by equalizing or equivalent mechanical levels adjusting the mechanical level that is standardized by the assessor. The updated mechanical level will facilitate the Assets Division and HRD team in monitoring and evaluating the mechanical knowledge and skill gaps.

From the research results obtained information on the gap in the length of experience working at the Pre-Mechanic level, especially to handle Hydraulics components, while at the same level the length of experience for handling Engine components actually gives a surplus value or exceeds the standard determined by the Assets Division. This length of experience gap only occurs at the Pre-Mechanical level and does not occur at the level of Senior Mechanic and Junior Mechanic. Job rotation is one alternative solution to the gap variable for length of experience mentioned above. The Assets Division team can carry out the strategy of transferring jobs handled by the Pre-Mechanic level to other jobs, at the same level, which have similar skills requirements. Job rotation is the periodic change of an employee from one task to another.

Assets Division to conduct KPI monitoring after the determination of core competencies and action plans or road maps to fulfill mechanic skills. After determining core competencies, the Assets Division conducts KPI monitoring of measurable parameters. The monitoring and evaluation process must be carried out regularly and communicated to all the teams involved so that it is expected to increase satisfaction, motivation and increase the sense of involvement

V. CONCLUSION

Based on the results of research, discussion, and interpretation of data that has been described with reference to several theories and results of previous studies, the results of this study can be concluded as follows:

1. The main components of excavator units that are the most critical and play an important role in the KPI Assets Division, namely Engine and Hydraulics.
2. Most of the actual competencies possessed by mechanics at all levels of position (Senior Mechanics, Junior Mechanics and Pre-Mechanics) are still below the competency standards set by the company, especially in technical expertise competencies.
3. Some factors that cause disparities are lack of understanding of the type of work, lack of length of experience and lack of mastery of work techniques.
4. Knowledge have a real influence on performance improvement.

Based on the conclusions above, the suggestions that can be submitted by researchers in this regard are efforts to increase mechanical competence:

1. Company management to regularly assess key mechanical competencies at least once a year. The results of the assessment will be the basis for performance assessment, analysis of training needs and performance improvement plans.
2. The process of performance appraisal should be carried out jointly by direct superiors and supervisors or the highest officials in the area. The purpose of the assessment method by the two tiered superiors is expected to get more objective scores and minimize bias. The Assets Division team and the HRD Department to provide a performance appraisal administration system so that the mechanics can provide evidence of the documentation of the mechanical performance of the period prior to the assessment.
3. Further research should be added to the questionnaire in the form of questions related to factors that cause employee competency gaps. This makes it easier to find out the causes of gaps and alternative repair solutions.

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