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The Effect of Liabilities, on the EDTL Maintenance Management Crisis, In Timor-Leste

[1]Duarte da Costa Sarmento[1,a], [2]Tjokorda Gde Tirta Nindhia[2,b,*], [3]I Gusti Ngurah Nitya Santhiarsa[3,c] , [4]D. Dewa Ngakan Ketut Putra Negara[4,d]

1Sarmento and 1. Mechanical Engineering, Udayana University. 2. Mechanical Engineering, National University of East Timor.

[2]Tirta Nindhia, Mechanical Engineering, Udayana University

[2]Nitya Santhiarsa, Mechanical Engineering, Udayana University

[4]Putra Negara, Mechanical Engineering, Udayana University

E-mail: a* labdeumasak@gmail.com b,*tirta.nindhia@me.unud.ac.id, c.**nitya_santhiarsa@unud.ac.id, d.***devputranegara@unud.ac.id

Abstract-Electrical Diesel Timor Leste (EDTL) is a state-owned company from Timor Leste, which has two central power plants there. The purpose of this study is to observe the electrical energy produced by the maximum and minimum energy required targets or the excess of the required electrical energy targets. This research the researchers conducted by visiting the location, to directly observe the activities implemented in the two EDTL centers, both management and maintenance. The results found in this study, however, are a situation that is still shrouded in uncertainty about the possible benefits of EDTL. This situation was ensured by having an outsider handle maintenance management at both centers. This can have a negative impact on state losses, from one or more problems that will arise in the future. The importance of these findings will be a reference for researchers to recommend to the State, to consider the policy of bringing in experts from abroad to handle the two EDTL centers which are very vital for the economic development of society and the country.

Keywords: The effect, Liabilities. Crisis, Management, Maintenance, Loss

1. Introduction

To support development in Timor-Leste, the government has established two power generation centers in Timor-Leste, in two different locations, center Electrical Diesel Timor-Leste EDTL) in Hera and in Betano. The two centers' EDTL locations can be seen on the map, which is attached below.

Figure (1.1.) East Timor map two centers location showing.

Timor-Leste is a new country, which started building power plants in early 2008. These two power generation centers were eventually called Electrical Diesel Timor-Leste (EDTL). In the central EDTL Hera with a capacity of 119 MW, with a total of 7 units of electric energy generators, where each diesel engine generates electricity with a capacity of 17 MW. The power plant center in Betano with a total capacity of 136 MW, with 8 units of diesel engines to generate electricity. According to [1] the source of electricity generation is very important to produce electricity, and support people's economic growth, both directly and indirectly. Because in the era of globalization with very rapid technological advances, it requires electrical energy, as a source of lighting and driving facilities, for offices, hospitals, ports, aeroports, hotels, and household needs.

Thus, the electrical energy generated from the two EDTL centers can be used for the prosperity of the people and the country. According to [2] effective and efficient maintenance is a required skill so that EDTL's performance can remain optimal to produce electrical energy as needed.

2. The two location

2.1. Hera location

The center of the Hera is situated in the east of the capital Dili Timor-Leste. With a distance of 24 km from the center of the capital.

Figure (2.1.) The center EDTL in Hera

2.2. Betano location

The center EDTL of the Beatano is situated in the south of the capital Dili Timor-Leste. With a distance of 160 km from the center of the capital.

Figure (2.2.) The center EDTL in Betano

3. The objective of the Research

1. To look for new phenomena and information, in the EDTL operational work environment both in terms of management and maintenance, in detail. Because of the importance of the electrical energy produced by the two EDTL centers, for the needs of the people and nation in Timor-Leste.

2. Look for causes and appropriate data, both primary data and secondary data regarding the condition of EDTL.

3. To maintain optimal performance efficiency of EDTL

4. The research findings will be recommended to the government of Timor-Leste, as a scientific study.

5. In general, the research that researchers conducted at the two EDTL centers in Timor-Leste, so that researchers could see firsthand the work situation, was implemented by managers regarding reliable productivity and maintenance management at these two diesel power plant centers. Because the general purpose of management and maintenance is to prevent failure of the machine units being operated. In this way, researchers can find out the management and maintenance application processes that are implemented at the two EDTL centers, whether they can provide benefits for the state of Timor-Leste or vice versa, instead they create a burden for the state and society in Timor-Leste. For this reason, researchers observed directly in the field at the two EDTL centers, to determine the accuracy of the data information. Information about the data will become material for study by researchers to become experience and reference for researchers, other people, and the Government of Timor-Leste. So that research data can also become a reference, to make a change from the old system to the new system at the two EDTL centers, at the two diesel power plant locations, at Hera, and at Betano.

6, The specific aim of the research at the two EDTL centers in Timor-Leste is to process data and information obtained from the field, in a scientific manner, with conceptual theoretical analysis and academic analysis, in order to be able to dig deeper into phenomena that have occurred and will take place at EDTL. If there is no research conducted at the two EDTL centers, then there is no system improvement because there is no scientific data to study to make changes. So, through data information with in-depth study, you can take a hypothesis, which will then be proven through hypothesis testing, so that the results of the hypothesis can be examined sharply and clearly, both theoretically conceptually, and analytically if necessary, so as to produce real results, and academically acceptable.

4. Benefit of the research

The benefits of research at these two EDTL centers are to provide experience with new input data input information, to change the system that is implemented, if there are deficiencies, or to maintain the system if the system that is implemented is in accordance with what is expected so that it can be maintained and improved again. To become a reference for information for researchers and other people and the government, as a reference for scientific studies on the situation at the two EDTL centers, to be a good control. So that the more research at the two EDTL centers, the more data information is obtained to become a strong and accurate basis, for the development of a better system in accordance with validity, and credibility that can be measured scientifically. For this reason, the data obtained becomes a reference for novelty, whether it will result in consequences, losses or big profits, for the survival of the people and state of Timor-Leste.

The benefits are theoretically, expressing a problem object and defining functions and objectives accompanied by methods and steps to be achieved. This is to facilitate research space, in a systematic, correct and accurate manner. So that the theory can be tested to get a truth value according to the data obtained in the study. Theory also serves as a direction for data collection. The data collected is used to test the hypothesis based on the theory correctly and precisely. So, the benefits of the theory according to [3] are as follows:

1. Explain the relationship of something under study with other things.
2. The nature and meaning of something studied.
3. The basis for developing research hypotheses.
4. Basis for compiling research instruments.

Theory teaches relevant theoretical concepts according to [4], [5] with basic assumptions that can be used, to assist in directing research questions that can be asked and assist in giving meaning to data. According to [6], [7] the concept and role of theory in research provide justification for the selection and use of variables with research models in answering research questions. Then according to [8] giving a more nuanced function of the theory will describe and explain the variables used in the research.

5. Materials and Methods

The two power plants in Timor-Leste, which are located at the Hera and Betano locations, are two units of government companies that were built in 2008 and started operating in December 2011.

For these two companies, the Government faces obstacles, in the field of operations and maintenance. To reduce the occurrence of failures in handling the operation and maintenance on their own, the Government of Timor Leste made a work contract with the Wartsila group from the start of the machine installation in Hera and Betano. At the power generation center in Hera and in Betano. So that the Hera EDTL center has 7 units of electricity generation with a capacity of 17 MW per unit. Meanwhile, the power plant in Betano has 8 units of electricity generation with a capacity of 17 MW per unit too.

Researchers conducted research at both government-owned power plants and saw that there were very significant changes that resulted in the wastage of fixed costs, in this case regarding the capacity of generating units and diesel. Variable costs lead to the purchase of spare parts and the replacement of machine components based on machine working hours. Of the two things that the researchers mentioned, namely fixed costs and variable costs are strongly influenced by manager policies. The totality manager's policy influences which direction will be achieved. However, from the results of research and observations that researchers have made, managers' policies tend to lead to group profits rather than work efficiency with small costs. This phenomenon is reflected in the manager's policy, to reduce the operating capacity of each power generation unit to only 12 MW per unit. According to [9] is an effect of the service transition strategy. On the other hand, according to [10] a decrease in the capacity of generating electricity above 20% is a waste This method was applied by a group of operational managers because they saw that there were limited experts in Timor-Leste, which the Government did not want to display. Even though there are many experts in Timor-Leste, the Government of Timor-Leste does not want to use them to manage the two EDTL centers, arguing that they are not skilled enough to be represented by the Government. Researchers observe from the government's point of view, there are weak points, which can be exploited by operational managers with a policy of using EDTL with new and modern facilities, to gain greater benefits. This is clearly seen from the production of 72 MW of electricity from 6 units of electricity generation, sold by the operations manager to the EDTL owner, the government of Timor-Leste.

Thus, here the researcher has two points of view about the leader and methods. According to [11], [12] a country whose leader does not provide space for technicians and technical experts to be placed in positions that require professional staff, then the country will face degradation in development. Because, the development of a country, requires technical professional experts, to work, innovate, to enrich the culture of expertise they have. Then the country will progress rapidly, both in the field of education and in the field of profession, especially as an engineer, according to [13] involve the next generation in professional development which should be more. Because if the younger generation is not involved in the development, for preventive maintenance of EDTL, according to [14] then the State of Timor-Leste will have a shortage of experts. So EDTL will always be dependent on experts from outside the country. According to [15] so, that it can be relied upon to handle companies such as power plants (EDTL) preventive maintenance which are cheaper and more efficient. Because there is no need to bring in technical experts from other countries. As a method of preventing unemployment for the next generation of Timor-Leste, the Government of Timor-Leste must, with great heart, by instilling confidence in the nation's next generation, in the field of profession and expertise, in the field of engineering, more preventive maintenance of power plants. According to [16] so, that it can increase the enthusiasm and patriotism of the nation, in the field of easy experts, to develop their own country more effectively and efficiently, in the field of preventive maintenance of power plants in Timor-Leste So, this will reduce the unemployment rate in the country of Timor-Leste. According to [17] so, it is necessary to instill trust from day to day to the young generation of experts, so that the nation's youth love their homeland, and do not look for work abroad. But what the researchers observed in Timor-Leste country has not yet adopted what the researchers mentioned above. So, for the leader of Timor-Leste, the applied vision and mission are not directed at the nuances of development, economics, society, culture, food defense, and security.

1. Theory and Calculation

1.1. Theory

The challenge faced by the State of Timor-Leste is political policymaking, which sidelines young technical experts who are currently being educated and developed One of the causes of the policy is that every leader in power will control all institutions by placing unprofessional staff who occupy professional positions, which should not be a field. The leadership prefers technical personnel from abroad to hold professional positions, rather than indigenous technicians. Such leadership policies have an impact effect on the management and maintenance of the two EDTL centers in Hera and Betano. One of the concrete examples that researchers observed at the two EDTL centers was the presence of management and maintenance experts from the Wartsila group. From this perspective, the researchers observed that the presence of the Wartsila group did not make a significant contribution to running the management and maintenance system at the two EDTL centers. According to the researcher's analysis, the presence of the Wartsila group only adds to the burden on the Government of Timor-Leste. This phenomenon can be seen from several policies, from the Wartsila group managers, which are applied to handle management and maintenance at both EDTL centers, at Hera, and at Betano.

1.2. Calculation Point leading to waste as a fixed cost.

There is as an example calculation will be presented below. The country of Timor-Leste, for current conditions, requires electricity every day. During the day it is 65 MW and at night it is 60 MW. If we optimize the operation of a generator with a capacity of 17 MW, then we only need 4 units of power plants, which is enough to produce 68 MW of the electrical energy needed by the entire territory of Timor-Leste. As compared with 6 units of power plants, which only produce 72 MW.

Optimizing the capacity of the generation original is more efficient and effective.
The managers adopt policies to reduce the capacity of power plants according to [18] reducing capacity from a capacity of 17 MW to a capacity of 12 MW at each power plant is too much and waste too. This policy has a reducing effect on machine life, in daily operation, the amount of expenditure that is greater than the normal daily operation is required.

There is no need to reduce the generating capacity from 17 MW to 12 MW. Thus, adding 2 units of power plants to become 6 units of power plants to produce a capacity just only of 72 MW of electrical energy, to serve the needs of consumers and the country. The impact of reducing the 17 MW become capacity to 12 MW. capacity influences the fixed cost, of fuel and the variable cost of maintenance. Power capacities waste.

$$\left(\frac{(17-12)MW}{17MW}\right)x100\% = 29.41\%$$

Mostly, operating an electrical energy generation unit, which is not right.

$$\left(\frac{(6-4)engines}{6units}\right)x100\% = 33.33\%$$

Almost energy is wasted, if 6 units of electrical generation in normal operation will produce 102 MW. So, there is an example following data:

- From 17 MW/unit engine x 6 units engine = 102 MW.
- From 17 MW/unit engine x 4 units engine = 68 MW.

Then we prove that $\left(\frac{(102-68)MW}{102\ MW}\right)x100\% =$ 33.33%

The result of the percentage above shows that the difference of capacities engine power plants was reducing and great waste. There is an incredible waste. According to [19] the difference number between the original power generation capacity operation is very large, which means it is a waste that will affect other parts as well.

5.1.1. The effect of the policy

The effect of the policy is on the physical engine of the generator adding used numbers from the reducing capacity to the running of operations and the maintenance. It is should avoid an overhaul, which is something many people shouldn't do. But to maintain the condition of the machine by doing preventive maintenance, which should be more.

5.1.2. Fuel price survey.

According to the on-field survey by researchers that: it electricity generation consumes 200 liters of diesel fuel per hour per unit engine. The price of diesel fuel is $ 1.25/liter. This diesel fuel price survey is fixed at the time the researcher surveys the field. So, in proving it still uses the data obtained at the time the research was carried out in the field. With this data, to prove the excess use of diesel fuel, in the operation of electric energy generating units every day the amount of diesel fuel can be converted into dollars. The evidence can be seen from the following aspects:

Normal operation in using the engine unit for generating electricity, from the data mentioned above, can be seen:

a. If,

$$4\ enge\ units\ x\ \frac{200\ liter\ of\ diesel\ fuel}{hour.engine\ unit}\ x24\frac{hours}{day} = 19200\ liter\ of\ d.fuel/day$$

b. If,

$$6\ engine\ units\ x\ 200\frac{liter\ of\ diesel\ fuel}{hour.engine\ unit}x24\frac{hour}{day} = 28800\ liter\ of\ d.fuel/day$$

c. $\left(\frac{(28800-19200)\ liter\ of\ diesel\ fuel)}{28800\ liter\ diesel\ fuel}\right)x100\% =$ 33.33%

This is a big waste of a liter of diesel fuel.

d. The difference in diesel fuel is converted into dollars then:

$$(28800-19200)\frac{liter\ of\ diesel\ fuel}{day}x\ \frac{\$\ 1.25}{liter\ of\ diesel\ fuel} = \$\frac{12,000}{day}$$

It means that a number of dollars are thrown away for free. It should save EDTL $12,000 per day. This is the impact of the phenomenon of ineffective and inefficient policies from managers.

5.1.3. The effect of the Policy

The effect of the manager's policy is to increase the number of generating units, electrical energy can affect the physical condition of the generator engine so that it wears out quickly.

According to [20], [21] electrical energy-generating machines must be maintained in good condition in order to continue to produce electrical energy for a long time. Well, to maintain the condition of the machine, according to [22], [23] by doing more monitoring of preventive maintenance, to prevent failures. The policy of reducing the power generation capacity, by a large amount, implemented by the managers of the two EDTL centers in Timor-Leste, by the Wartsila group, was very ineffective and inefficient. According to [24] the policy of manager will affect the physical condition of machines that produce electrical energy, and preventive maintenance costs.

This can be reviewed on:

a. Reducing the capacity of the power generation energy unit from 17 MW to 12 MW, according to [25] is an application of a new theory, which is implemented in the two EDTL centers in Timor-Leste.

b. With the decrease in the unit capable of generating electricity, this affects the addition of the number of generating units, to compensate for the decrease in capacity. The use of compensation, from reducing the capacity of electric energy generating machines, by operating additional machines, according to [26] if the compensation is above 15% reducing the capacity of electric energy generating machines, and by adding engine operating units, above 15%, then that is, management unproductive. This will damage the condition of the power plant engine to wear out quickly. Management that is not productive is management that only explores the condition of the engine for generating electricity solely, to seek group profits, rather than maintaining the condition of the engine for generating electricity which is expected to be optimal and sustainable.

c. With the addition of the number of power-generating engine units in operation every day also has a direct effect on diesel fuel consumption. Because what should have been the allocation of diesel fuel, was only for 4 engine units to generate electricity. Due to the addition of 2 units of engines to generate electricity to 6 units of engines to generate electricity, the need for diesel fuel consumption for 6 units of engines to generate electricity also increases. From the researcher's point of view, managers should, in carrying out their operational duties, towards the two EDTL centers, not adopt policies that are detrimental to the government of Timor-Leste, with policies that are not appropriate. This is causing inefficiency and ineffectiveness in the use of state facilities in two EDTL centers in Hera and Betano.

1.1. Maintenance viewpoint to waste as a variable cost

After the researchers analyzed management and manager policies, the data had been discussed and proven, which greatly influenced the existence of fixed costs. So next the researchers observed the variable cost, by reviewing the expenditure of spare parts for engines for generating electricity with tools and other supporting materials such as engine lubricating oil, engine cooling water, as well as environmental pollution by the used oil and exhaust gases from the two EDTL centers. By direct observation at the two EDTL centers, researchers observed a preventive maintenance system that was implemented to handle maintenance management. One thing that stands out the most about maintenance at the two EDTL centers is the type of preventive maintenance, which involves changing

Machine components based on machine working hours.

According to [27] correct preventive maintenance is to minimize operational maintenance costs. Not for wasting maintenance costs. If the method based on the working hour is known as a very expensive method. Because many replacement parts are based on machine working hours.

1.2. Preventive Maintenance schedule Pattern.

According to [28] the preventive maintenance schedule pattern, applied by the Wartsila group in both EDTL centers, in Hera and Betano, is based on machine working hours.

According to [29] there is new algorithms preventive maintenance based on machine working hours, which is implemented in the two EDTLs in Timor-Leste, uses the letter K as 1000 hours, to determine the component's working life schedule. Value 1K = 1000 working hours of machine components, which are installed on the machine, during operation to generate, electrical energy. If an engine component, which has been determined in the schedule, is only to be used in 1K operations, then that engine component must be replaced, when the machine's working hours have reached 1000 hours. The number of K, with an odd number, regardless of the number, the value of K remains the same as the value of 1K.

Like the following example:

1K=3K=5K=7K=9K=11K0=13K=15K, until the limit of K, is odd. Usually, an odd number K, is always below an even number K. Every even number K has a different value of K. For example 2K=2000 engine hours, 4K=4000 engine hours, and 6K=6000 engine hours, up to a maximum even number, determined, in the schedule, that the engine is due for an overhaul. In scheduling preventive maintenance of power generators, at the two EDTL centers in Hera and in Betano, the maximum even number is 36K=36000 machine hours. If an electric energy generating unit has reached 36K working hours, then the engine unit must be overhauled or completely dismantled. Every even number K has elements K odd numbers and K even numbers.

Like the example of an even number of 2K, it only has an odd number of 1K. This is meant, if there is a machine component with a working life of 2K, then in the replacement of the 2K component, there is a component with a working life of 1K which is also replaced, because the component for an odd number of 1K is a member of an even number of 2K. This can be seen in the image below.

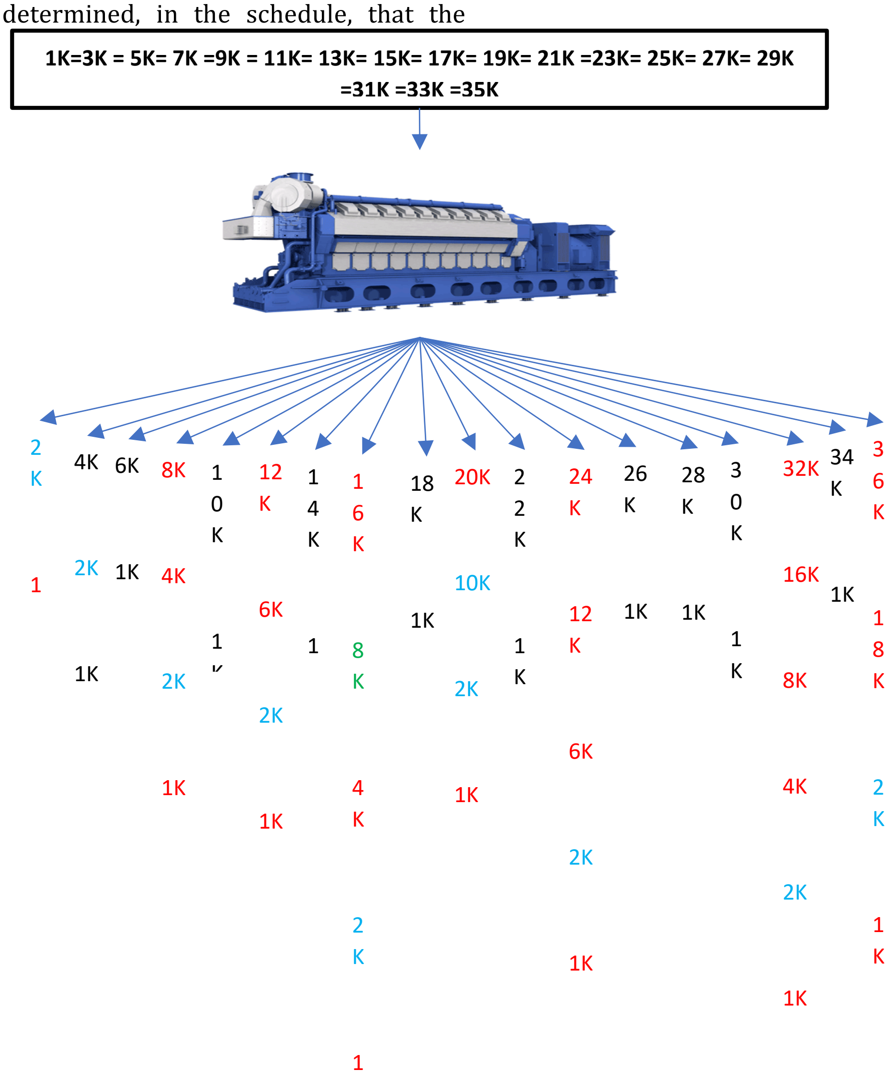


Figure (5.4.1.) The center EDTL in Hera

4.4.1. Information about the even number of members K.

a. 2K members are 1K.

b. 4K members are 2K and 1K

c. 6K members are 1K. Because the number 6 is the product of the even number 2 and the odd number 3. So, 2K and 3K are ignored. Since the number 6k/6K=1, then what is needed is 6K and 1K.

d. 8K members are 4K, 2K, and 1K.

e. Likewise for an even number of 10K it only has an 1K members. Since 2 x 5 = 10 is an even number. The odd number 1K is the number obtained by self-dividing, namely, 10/10=1.

f. The even number of members of 12K are 6K, 2K and 1K.

g. Only 1K is an even number of 14K.

h. The even number of members of 16K are 8K, 4K, 2K, and 1K. Truth check. If $\frac{16}{2} = 8$, $\frac{8}{2} = 4$, $\frac{4}{2} = 2$,

$\frac{16}{16} = 1$

i. The even number of members of 18K are only 1K

j. The even number of members of 22K is also only 1K.

k. The even number of members of 24K is 12K, 6K, and 1K. Truth check if $\frac{24}{2} = 12$, $\frac{12}{2} = 6$, 2K $\frac{24}{24} = 1$

l. The even number of members of 26K is only 1K

m. The even number of members of 28K is only 1K. Truth Check if $\frac{28}{2} = 14$, $\frac{14}{2} = 7$ The number 7 is odd

n. The even number of members of 30K is only 1K

o. The even number of members of 32K is 16K, 8K, 4K, 2K, and 1K. Truth the equal $\frac{32}{2} = 16$, $\frac{16}{2} = 8$, $\frac{8}{2} = 4$,, $\frac{4}{2} = 2$ and $\frac{32}{32} = 1$

p. The even number of members of 34K is only 1K.

q. The even number of members of 36K is 16K, 8K, 4K 2K, and 1K.

5.2. Timetable

a. Timetable 1K

- Checking instrument mechanism
- Check the circulation of the lubricating oil engine
- or cooling water if needed
- Remove condensate water and impurities from the tank
- Check the temperature of the engine lubrification
- Check the water cooling for the lubrification engine
- Check the temperature of the engine cooling water
-

b. Timetable 2K

- Change the lubricating oil of certain equipment concerning the manufacturer's manual
- Oiling bearings
- Check the oil filter
- Check the water filter
- Adding chemicals to cooling water
- Add more job 1K like above

c. Timetable 4K

- Oiling bearings
- Change the oil filter
- Changer the water filter
- Adding chemicals to cooling water
- Add jobs 2K+1K

d. Timetable 6K

- Check the function and operation of security devices and alarm systems
- Check valve and valve rotator
- Changing governor lubrication
- Check and clean the grease filter
- Check the quality of cooling water and water treatment units
- Check oil and battery viscosity
- Add jobs 1K

e. Timetable 8K

- Check and clean injectors

- Check the camshaft, crankshaft, and flexible coupling
- Check the looseness of bolts, nuts, gears, and bearings
- Check and replace cooling water
- Checking the oil filter
- Add jobs 4K+2K+1K

f. Timetable 10K
- Check and clean injectors
- Check the camshaft, crankshaft, and flexible coupling
- Check for looseness of bolts, nuts, gears, and bearings
- Check and replace cooling water
- Checking the oil filter
- Add job 1K

g. Timetable 12K
Maintenance of 12000 hours is the maintenance of the Connecting Rod parts, including measuring, replacing, or reconstructing worn components to get optimal operation. Work carried out on Semi Overhaul as Top Overhaul Check, Inspection of all cylinder heads and their components, Inspection and measurement of Piston, Piston Ring, Cylinder Liner, and Cylinder Head, Connecting Rod inspection, material replacement if needed, Turbocharger inspection and cleaning, Check for cracks, corrosion or wear, Check bearing lubrication, Machine capability testing, Add jobs 6K+2K+1K.

h. Timetable 14K
- Check and clean injectors
- Check the camshaft, crankshaft, and flexible coupling
- Check for looseness of bolts, nuts, gears, and bearings
- Check and replace cooling water
- Checking the oil filter
- Add jobs 1K

i. Timetable 16K
Maintenance of 16000 hours on the EDTL Machine includes measuring, replacing, or reconditioning worn components to get optimal operating conditions. The work carried out is as follows: 16K Semi Overhaul work, will be replaced if there is a material defect.
Crankshaft inspection and bearing inspection, and inspection of the tooth surface, Check the engine vibration damper, auxiliary equipment, and machine testing, Adds more job 8K+ 4K+2k+1k

j. Timetable 18K
- Check the function and operation of security devices and alarm systems
- Check valve and valve rotator
- Changing governor lubrication
- Check and clean the grease filter
- Check the quality of cooling water and water treatment units
- Check oil and battery viscosity
- Add jobs 1K

k. Timetable 20K
- Check and clean injectors
- Check the camshaft, crankshaft, and flexible coupling
- Check the looseness of bolts, nuts, gears, and bearings
- Check and replace cooling water
- Checking the oil filter
- Add jobs 10K+2K+1K

l. Timetable 22K
- Check and clean injectors
- Check the camshaft, crankshaft, and flexible coupling
- Check for looseness of bolts, nuts, gears, and bearings

Check and replace cooling water

- Checking the oil filter
- Add jobs 1K

m. Timetable 24K
Maintenance of 24000 hours on the EDTL Machine includes measuring, replacing, or reconditioning worn components to get optimal operating conditions. The work carried out is as follows: 24K is Semi Overhaul work, if there is a material defect, it will be replaced, Crankshaft inspection, bearing inspection, and inspection of the tooth surface, Check the engine vibration damper, auxiliary

equipment, and machine testing.
Adds more jobs 12K+6k+2k+1K

n. Timetable 26K
- Check the oil filter
- Remove the oil filter
- Clean the oil filter
- Change the oil filter
- Add jobs 1K

o. Timetable 28K
- Check and clean injectors
- Check the camshaft, crankshaft, and flexible coupling
- Check for looseness of bolts, nuts, gears, and bearings
- Check and replace cooling water
- Checking the oil filter
- Add jobs 14K+2K+1K

p. Timetable 30K
- Check the oil filter
- Remove the oil filter
- Clean the oil filter
- Change the oil filter
- Add jobs 1K

q. Timetable 32K
- Check and clean injectors
- Check the camshaft, crankshaft, and flexible coupling
- Check the looseness of bolts, nuts, gears, and bearings
- Check and replace cooling water
- Checking the oil filter
- Add jobs 16K+8K+4K+2K+1K

r. Timetable 34K
- Check and clean injectors
- Check the camshaft, crankshaft, and flexible coupling
- Check for looseness of bolts, nuts, gears, and bearings
- Check and replace cooling water
- Checking the oil filter
- Add jobs 2K+1K

s. Timetable 36K

Maintenance of 36,000 hours on the Machine: overhaul total for Diesel Overhaul Services:

- General overhaul of a diesel engine as per Maker manual instructions
- Recondition of all Turbochargers
- Overhaul and calibration of governors
- Calibration and overhaul of engine components i.e. cylinder heads, pistons, connecting rods, etc.
- Recondition and calibration of fuel injection pumps and injectors at the workshop renewable
- Renewal of cylinder liners
- Renewal of crankpin bearings and main bearing shells
- Dismount and remount the alternator
- Chemical cleaning of the radiator
- Calibration and functional test of safety devices
- Engine commissioning, no-load, and load test
- 72 hours engine reliability test.

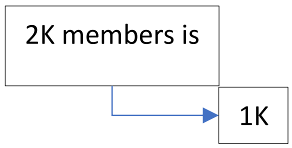
o. Timetable
1K=3K=5K=7k=9K=11K=13K=15K=17K=19K=
21K=23K=25K=27K=29K0=31K=33K=35K
The definition is the number of working hours of power plant engine components that are not divisible by two, the function of working hours is equal to 1K

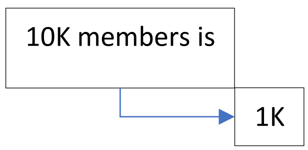
p. Timetable 36K conversion
36K = 36000 hours = 1500 days = 4.1 years is one period of working power plant engine to be overhaul.

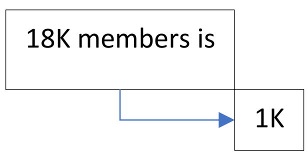
q. Engine Overhaul Results
A result of seamless coordination between the on-site diesel service team and the workshop service team, experts completed the job within the agreed time frame of eight (8) days per engine finishing within the total project window of 60 days for the 7 units.
r. Timetable Overhaul
The dismantling of the electric energy generating machines at the Hera EDTL center was carried out from October 2020 to November 2020, for 7 units

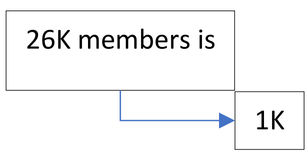
of diesel engines generating electricity.

6. Benefits of Research at the two EDTL Centers in Timor-Leste.



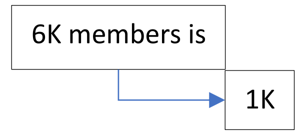


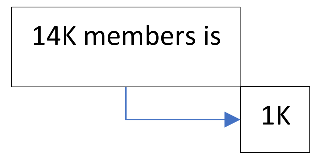


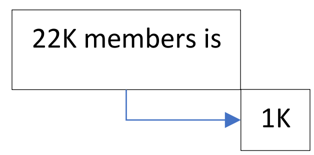


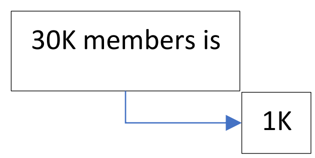
7. K Element Member

K Element Members, which has only one member there are 8 elements

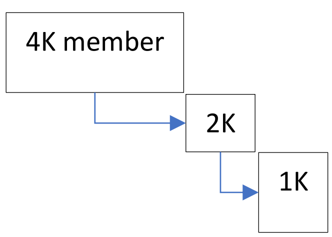




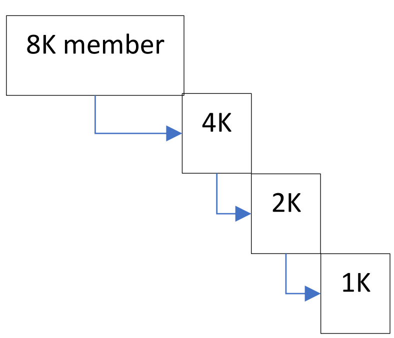


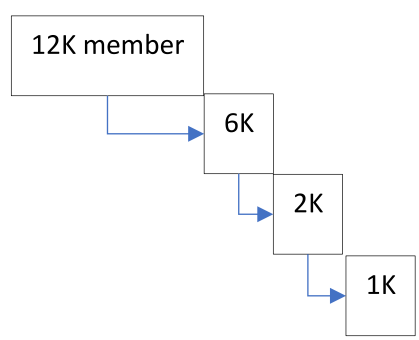


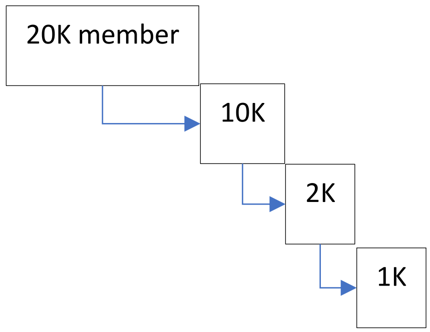
K elements that have members of two, only one.

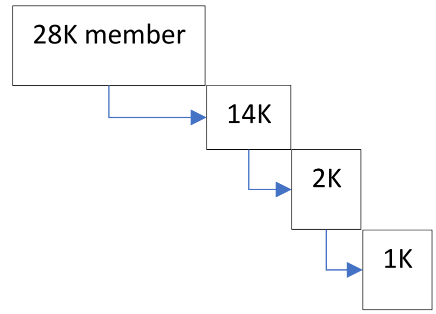


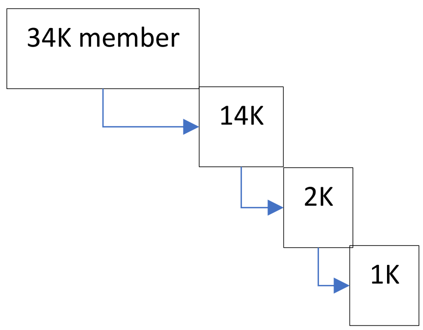
K elements that have elements of three, there are six.

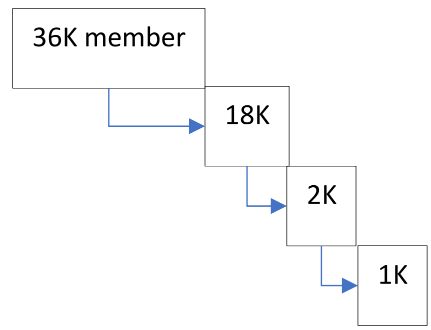




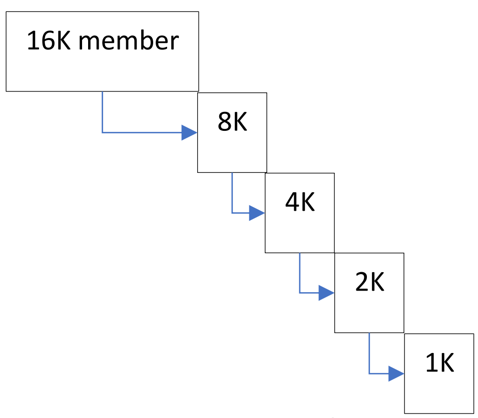


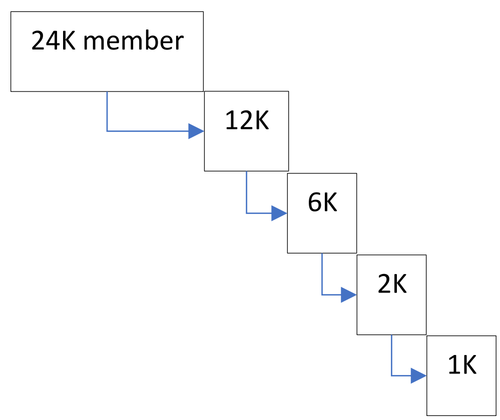




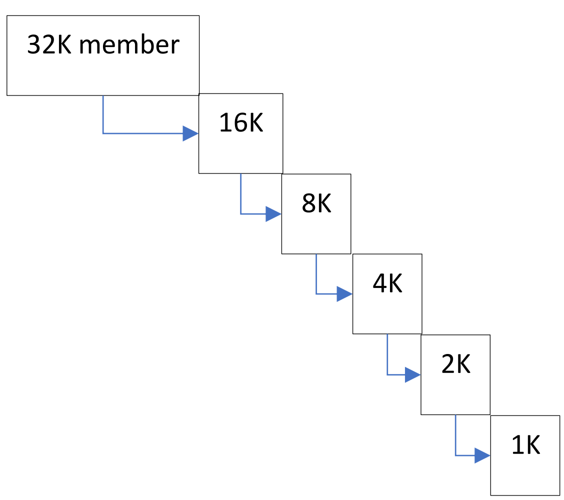


K elements that have four members, there are two





K elements whose members are five, there is only one.



Those are eighteen work routines, which are carried out, through preventive maintenance, which determines the age of the machine, and machine components, based on machine hours.

1. Discussion

In the discussion, the author takes the point of view of two phenomenal analyses. 1. Against the obligations, and management policies, implemented in the two EDTL centers, in Timor-Leste.

From that point of view, as a researcher at the two EDTL Centers in Timor Leste, I found that there was improper management to be implemented at these two EDTL centers in Timor-Leste.

In terms of obligation, management is forced to be implemented. However, the quality of management and management efficiency are very crucial for the two EDTL centers in Timor-Leste. This can be seen from the policies implemented by managers, by reducing power capacity, from 17 MW capacity to 12 MW capacity.

From the researcher's point of view, management is applied:

1. does not generate profit, which is obtained from the electricity generated from the two EDTL centers.
2. Adding a burden to the Government of Timor-Leste, fixed costs, and variable costs, for all of its operations.

The results discussion

No	Item	Result	Category
1	Reduces Capacity	29,41%	Waste
2	More Operation units	33.33%	Waste
3	Output Power	33.33%	Waste
4	Diesel Fuel	33.33%	Waste
5	Waste $12,000/day	33.33%	Waste

Table (9.1) results discussion

2. Regarding Preventive maintenance.

Regarding Preventive maintenance that is applied to power generating units, electricity in Timor-Lest Regarding preventive maintenance applied to power-generating units, Timor-Leste has 18 job descriptions with an even number of K.

By analyzing the schedule of activities with an even number of K, it is identified,

1. there are 8 K, even numbers, each of which has only 1K members, namely: 2K, 6K, 10K, 14K, 20K, 26K, and 30K. That is an even K number that has only 1K members.
2. An even number K, which has only 2 members, is 4K because it has 2K and 1K members.
3. The even numbers that have elements of 3 are 8K, 12K, 20K, 28K, 34K, and 36K. One thing that is confusing is the even number 36K, the deadline for preventive maintenance, so it is necessary to carry out preventive maintenance overhaul activities.
4. Even numbers that have elements of 4 are 16K and 24K. In activity 16K and activity 24K, replace new engine components, such as pistons, crankshaft, metal seats, and others.
5. There is only one even number K, which has 5 elements, namely 32K. The same thing is ineffective and efficient in this 32K even number activity, doing a lot of replacement of new components in the machine. With a span of short engine working hours, up to an even number of 36K, carrying out overhaul activities. In carrying out overhaul activities, all engine components must be replaced with new ones. Activities like this, which is not desirable in doing, preventive maintenance activities.

Regarding preventive maintenance applied to power generating units, in Timor-Leste, according to the researcher, according to the results of the discussion above, preventive maintenance, based on machine working hours, is implemented in the two EDTL centers, in Timor-Leste. From the standpoint of the method being applied it is very detrimental, the only state-owned EDTL company in Timor-Leste todays. Because seen from the activity of changing machine components, with such a short span of time, the cost of preventive maintenance is very high. From the data analysis, the researchers saw that the wastage occurred because the replacement of machine components based on machine hours was very inefficient. This can be predicted, through group member K, with an even number, which the researcher divided into 18 groups of preventive maintenance activities. This can be seen in the 32K preventive maintenance activities, which replaced many new engine components. In a relatively short span of time, up to the overhaul activity, at 36K. In the overhaul activity, will replace the engine components, total. Therefore, the researcher saw that in 17 preventive maintenance activities out of 18 activity patterns, the preventive maintenance that was applied, as long as the preventive maintenance took place, was just in vain.

8. Conclusion

1. The management is very unsuitable.
2. The policy is very detrimental to the Government of Timor-Leste,
3. The government of Timor-Leste, incurs a daily loss of $12,000. (twelve thousand American dollars)
4. Preventive maintenance costs are very expensive.
5. The preventive maintenance system, based on working hours machines, is not suitable for the two EDTL centers in Timor-Leste.

6. One of the preventive maintenance tasks, is to avoid, overhaul activities as much as possible.

7. What must be done frequently, monitoring the smooth running of preventive maintenance activities, and identifying and anticipating failures that will occur.

9. Suggestion

1. Change the operational Manager in both EDTL centers.
2. Replace the operating system of the electric energy generation unit at the EDTL central district in Timor-Leste.
3. Replaced the preventive maintenance system based on machine hours, for the two EDTL centers in Timor-Leste.
4. Use local experts to handle all activities at the two EDTL centers in Timor-Leste.

10. Nomenclature

EDTL=Electrical Diesel Timor-Leste
K=Symbol 1000 hours
MW=Mega Watt

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