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Maintenance of Dry Organic Fertilizer Mixer Machine of Tobacco Agriculture

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ABSTRACT

The purpose of this study was to make a preventive maintenance plan for the dry organic fertilizer mixing machine for tobacco farming with the Inspection, Small repair, Medium repair, Overhaul which is called ISMO method. The steps of the study carried out were data collection by observation and literature studies, then component identification, maintenance schedules, maintenance procedure plans and expert validation. The results of the study are the preventive maintenance schedule for the mixer machine consisting of a monthly schedule and an annual schedule using the ISMO method. The total time required for inspection maintenance activities is 240 minutes, small repair is 210 minutes, and medium repair is 20 minutes. Based on the validation results, the maintenance schedule has been feasible to be applied to a dry organic fertilizer mixer machine for tobacco farming and total maintenance time used along a year are inspection 240 minutes, small repair 214 minutes and medium repair as 20 minutes.

Keywords: ISMO, Preventive Maintenance, Organic Fertilizer, Mixer Machine

INTRODUCTION

In agriculture, organic fertilizers are needed for the growth process of plants to be cultivated. Organic fertilizer is made from the remnants of animals, plants, and decomposable domestic waste with help from decomposers [1][2]. Organic fertilizer can restore lost fertility of soil and boost crop production [3][4]. Subang Regency has around 20 tobacco farmers with planting locations in several areas including Dusun Pasir Malang, Hamlet Cupunagara, Hamlet Gandasoli, Hamlet Panyongsong, Hamlet Sukakerti Cisalak, and Hamlet Kata Jaya. Tobacco farmers in Subang regency are still experiencing difficulties in the processing of organic fertilizers because the process of mixing the ingredients is still stirred manually using a hoe and tarpaulin. This process takes a long time and is exhausting to get good result.

Along with advances in appropriate technology, many farmers' tools are found that aim to ease the work. Based on the description above, in the process of mixing organic fertilizers, a machine that can work optimally and efficiently is needed, such as a mixer, this mixer machine is useful for mixing organic fertilizer ingredients.

Maintenance is an activity to maintain and protect existing facilities as well as repairing, adjustments or replacements required to obtain a condition production operating suitable with existing plans [5]. Maintenance is activities carried out repeatedly with the goal that the equipment always has the same condition with the initial state [6]. According to Corder [7], machine maintenance is divided into two, namely planned maintenance and unplanned maintenance or emergency maintenance (breakdown maintenance), planned maintenance (planned maintenance) is a maintenance activity carried out based on prior planning [7].

Maintenance is an activity carried out to maintain and update the function which is in an infrastructure [8][9]. The preventive maintenance method is a form of implementing maintenance that scheduled. Classification of maintenance in preventive maintenance, according to [10] divided into four namely: inspection, small repair, medium repair and overhaul.

Determination of duration maintenance and repair planning is influenced by: (1) the demand for machine/equipment performance up to the planning period; (2) manual service book; (3) Anticipating stuck tools; (4) Availability of funding period for maintenance activities; (5) Production department schedule, so that opportunities can be estimated free time for maintenance department schedule. The maintenance of machine is needed to maintain the condition of the vehicle engine, the main point is a competent technician [11][12].

Inspection has general working limitations, which are as follows: (1) Checking the function of the rotating speed

and cutting speed mechanism; (2) Inspect and adjust friction clutches, gear clutches, main shafts, bearings, launchers, brakes, carrier nuts, and more; (3) Clean the lubricating oil filter and coolant, oil system and oil supply, as well as dirt and dust powder from the guide; (4) Tighten the nuts and bolts, replace if necessary.

Small repair has general working limitations are: (1) Carry out all activities on inspection; (2) Disassemble 2 to 3 units of equipment parts that are likely to break out or dirty and clean it, if needed apply oil, replace the damaged part then assemble and set; (3) repairs when necessary or those that have been recorded at inspection. Medium repair consists of: (1) do all maintenance activities in small repair, disassemble all parts that are likely to break out and must be replaced or repaired; (2) painting damaged machine surfaces; (3) Re-calibrate by leveling the machine.

Overhaul has general working limitations: (1) repeat all maintenance activities on the repair medium, but disassembly involving each unit, all damaged components and worn out replaced with new components; (2) machine foundation inspection (foundation depth installation) and repair if required; (3) grind all guide surfaces; (4) Paint all surfaces that need to be painted with new paint.

In the use of an organic fertilizer mixer machine, it is necessary to carry out preventive maintenance to maintaining the quality of production that also increases the life of the machine. ISMO method is usually done when engine performance begins to decline, the history of the machine is limited and lack of information from the machine manual [13]. Therefore, a maintenance schedule and procedures or work steps are made to carry out maintenance according to the ISMO method (Inspection, Small Repair, Medium Repair and Overhaul) on the organic fertilizer mixer machine dry farming to maintain the quality of machine production and also increase service life or minimize major damage that will occur to the machine. The aim of this study was to make preventive maintenance using inspection, small repair, medium repair and overhaul or ISMO method for the dry organic fertilizer mixer machine of tobacco agriculture.

RESEARCH METHOD

The study was conducted at Manufacturing Laboratory in Subang State Polytechnic, along January 2021 – July 2021. The stages of this study consisted of data collection techniques through observation and literature study, then component identification, writing maintenance schedule using the ISMO method which is one of preventive maintenance according to schedule consist of Inspection, Small repair, medium repair, and Overhaul. The next step was validation the schedule by experts. The validated schedule was implemented and the results of the schedule implementation were

analyzed descriptively. The stages of the research can be seen in Figure 1.

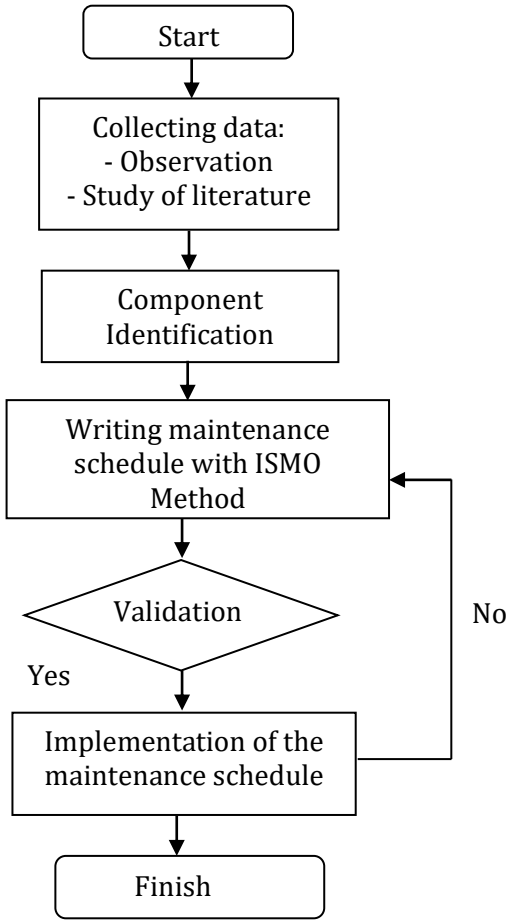

Figure 1. Flowchart of mixer machine

RESULTS AND DISCUSSIONS

Component from Dry Organic Fertilizer Mixer Machine of Tobacco Agriculture

Table 1. Component list

Unit	Total	Name of Components
B	1	Frame
E	1	Mixer container
G	1	Reducer
H	1	Pulley and V-Belt
I	1	Gasoline motor
J	1	Mixer knife
K	1	Clutch

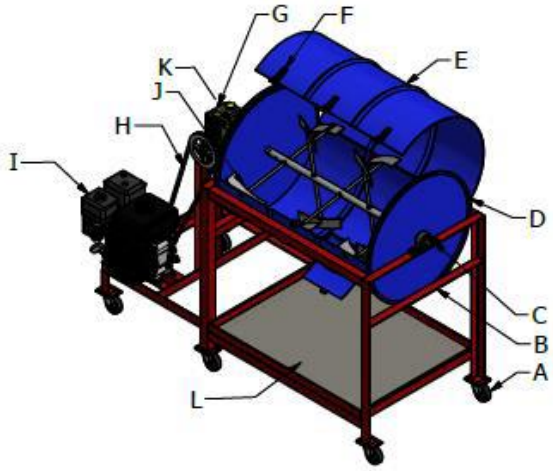

Figure 2. The design of dry organic fertilizer mixer machine of tobacco agriculture

Maintenance Schedule

The maintenance schedule is made based on observations and maintenance trials of each machine component as well as literature sources relevant to machine specifications [14]. The maintenance schedule has been validated by 2 experts with results that the schedule is feasible to apply. Inspection (I) is an activity of checking or visual inspection which is carried out periodically with the aim of knowing the problems that will occur and preparation for carrying out further activities on the components of the Dry Organic Fertilizer Mixer for Tobacco Farming. Such as inspection of the frame to see if there is a problem with welding joints, whether there is a problem with the blade connection, whether there is any noise that shouldn't be heard on the drive system, whether there is overheating during the operation of the

engine. At Table 2. There are Inspection maintenance time applied on the machine.

Table 2. Inspection maintenance time

Part	Monthly Time	Time Per Minute	Description
Frame	Once a month at the 2nd week	2 minutes	▪ Check the condition of the welding joint ▪ Check the condition of the bolt tightness
Knife	Once a month at the 2nd week	2 minutes	▪ Check the condition of the welding joint ▪ Check the condition of the bolt tightness
Drive system	▪ Once a month at the 4nd week ▪ Once a month at the 2nd week	2 minutes	▪ Check the condition of the pulley ▪ Reducer condition check
Motor	Once a month at the 4nd week	2 minutes	▪ Motor condition check

Small repair (S) and Medium repair (M) is a maintenance action after an inspection is carried out in the form of repairing the components on the Tobacco Farming Dry Organic Fertilizer Mixer Machine due to damage or wear found during the inspection. This action is carried out periodically according to the schedule with the aim of restoring the function of components that are damaged or worn so that they can work again according to their functions and do not hinder the operation process. Small repairs (S) carried out on the frame when the welding connection has problems, small repairs (S) on the blades when the welding connection is problematic, small repairs (S) on the drive system component of the reducer component oil filling routinely according to the maintenance schedule, small repairs on the driving motor parts such as filling gasoline and oil according to a predetermined maintenance schedule [15].

Table 3. Small repair maintenance time

Part	Monthly Time	Time Per Minute	Description
Frame	4 months every 4th week	5 minutes	▪ Re-welding ▪ Repaint
Knife	▪ 4 months every 4th week ▪ 5 months	5 minutes	▪ Re-welding ▪ Repaint ▪ Bearing lubrication

	every 4th week		
Drive system	1 month once the 4th week	5 minutes	Reducer lubrication
Motor	Once a month at the 4nd week	5 minutes	Oil change

Medium repair (M) is a maintenance action carried out on components that require regular replacement according to a maintenance schedule.

Table 4. Medium repair maintenance time

Part	Monthly Time	Time Per Minute	Description
Drive system	Once every 12 months on the 1st week	Medium repair for 10 minutes	Component replacement (v-belt/pulley)

Table 5. Below is a Monthly period maintenance schedule on a tobacco organic fertilizer mixer machine which is divided into 4 (four) weeks each month start from January until December. At Table 5, 6, and 7 the meaning of I_2 is inspection process carry out during 2 minutes, the meaning of S_5 which is at Table 2, 3, and 4 is small repair carry out during 5 minutes and M_{10} means the medium repair for 10 minutes. The monthly maintenance schedule period is carried out every month for 12 months i.e. from January to December 2021. The total maintenance time is showed in Table 8. The maintenance process carried out for one year from the organic fertilizer mixer machine consists of inspection (240 minutes), small repair (214 minutes) and medium repair (20 minutes).

Table 5. Monthly period maintenance schedule January-December

Part	Processing	Jan				Feb				Mar				Apr				Tools and Materials	Safety Tools
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
Frame	Cheeck-ing Weld joint		I_2				I_2				I_2				I_2		S_5	(Inspec-tion) Tools: Paint	Safety shoes, Wearpack,

	Cleanliness of surface frame and drum		I2			I 2				I2				I2			S5	brush Materials: Cotton waste (Small Repair) Tools: Weld machine, Screw driver + and – Slag hammer Wire brush Materials: Electrode Cotton waste Epoxy Paint/Pilo x	Mask Gloves Safety sho Welding h

Table 6. Monthly period maintenance schedule January-December

Part	Processing	Jan				Feb				Mar				Apr				Tools and Materials	Safety Tools
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
Knife	Cheeck-ing Weld joint		I2				I2				I2				I2		S5	Inspec-tion Tools: Paint brush Materials: Cotton waste Small Repair Tools: Weld machine, Screw driver + and – Slag hammer Wire brush Grease (Bearing)	Safety shoes, Wearp ack, Mask, gloves,, weldin g helm
	Clean liness of knife leaf		I2				I2				I2				I2		S5		
	Bearing condi-tion	I2				I2			S5	I2				I2			S5		

Drive system	Check-ing pulley condi-tion			I2				I2				I2				I2				Tools inspec-tion: *Tacho meter*					

Table 7. Monthly period maintenance schedule January-December

Part	Processing	Jan				Feb				Mar				Ap				Tools and Materials	Safety Tools
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
	Check-ing V belt condi-tion		S2		12				I2				I2				I2	Materials: cotton waste	Safety shoes, mask, gloves
	Check-ing reducer condi-tion			I2	S5			I2	S5			I2	S5			I2	S5	Small repair Tools : wrench 10,12,17 paint brush Materials: Cotton waste, Oil (reducer)	
Motor	Check-ing motor oil condition			I2	S5			I2	S5			I2	S5			I2	S5	Inspection : paint brush Materials: Cotton waste *Small repair* Tools: Cotton waste , wrench 12,17 Materials: Oil	

Table 8. Total maintenance time for a year

Part	Processing	I	S	M
Frame	Welding joint	24	15	-
	Surface cleanliness frame	24	15	-
	Surface cleanliness drum	24	15	-
Knife	Strength on welding joint	24	15	-
	Cleanliness on knife	24	15	-
	Bearing condition	24	15	-
Drive System	Checking pully condition	24	-	10
	Checking V belt condition	24	4	10
	Checking reducer condition	24	60	-
Drive motor	Checking motor condition	24	60	-
Total		240 minutes	214 minutes	20 minutes

CONCLUSION

According to the result of study showed that (1) the schedule of preventive maintenance with ISMO method is made as a guide for doing maintenance regularly to maintain engine performance and increase its service life; (2) the ISMO method used are inspection, small repair and medium repair; (3) total maintenance time used along a year are inspection 240 minutes, small repair 214 minutes and medium repair as 20 minutes.

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