FOREWORDS

This proceeding aims to disseminate valuable ideas and issues based on research or literature review in the field of vocational, technical and engineering studies, which have been presented in 4th International Conference on Technical and Vocation Education and Training. This conference has taken place in Hospitality Center Universitas Negeri Padang, November 9-11, 2017.

The theme of Conference focused on the perspective of technical and vocational education and training for sustainable society to face the challenges of 21st century, globalization era, and particularly Asian Economic Community. To overcome the challenges, we need the innovation and change in human resources development. Technical vocational educational and training have essential roles to change the world of education and work in order to establish sustainable society.

Undoubtedly, TVET need to enhance the quality of learning by developing various model of active learning, including learning in the workplace and entrepreneurship. Create innovation and applied engineering as well as information technology. Improvement of management and leadership in TVET Institution, and development of vocational and technical teacher education.

Many ideas and research findings have been shared and discussed in the seminar, more than 176 papers have been collected and selected through scholars, scientists, technologist, and engineers'. as well as teachers, professors, and post graduates students who participated in the conference.

Eight keynote speakers have taken a part in the conference, namely Prof. Intan Ahmad, Ph.D. (Director general of learning and student affairs, Kemenristek Dikti) and Prof. Josaphat Tetuko Sri Sumantyo, Ph.D. (CEReS Chiba University) and Prof. Dr. Maizam Alias (UTHM Malaysia) and Prof. Ganefri, Ph.D. (Rector of UNP) and Prof. Dr. Ramlee bin Mustapha (UPSI Malaysia) and Prof. Nizwardi Jalinus, Ed.D. (Chair of TVET doctoral program, FT UNP) and Prof. Michael Koh, Ph.D. Dr. Fahmi Rizal, M.Pd., MT (Dean of FT UNP). They all have a great contribution for the success of the conference.

Finally, thank a million for all participants of the conference who supported the success of 4th International conference on TVET 2017 and most importantly, our gratitude to all scholars who support and tolerated our mistake during the conference.

Padang, 9 November 2017

Prof. Dr. Nizwardi Jalinus, M.Ed
Chair of Scientific Committee

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A MODEL PREVENTIVE MAINTENANCE CONTROL OF MACHINE TURNING IN THE MACHINING WORKSHOP

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ABSTRACT: The use of machines in relatively long conditions result in decreased engine capability. Avoiding the occurrence of such preventive maintenance is necessary as an attempt to prevent early onset of sudden damages. this paper aims to produce preventative maintenance of Turning Machine. This descriptive research using survey method to Machine Tool Machining, which make Model of maintenance with PMC System. Data retrieval begins by creating a Machine layout plan. Record the machine is done by giving a code or symbol on the location of the machine, machine name, machine type, machine number. Data collection by generating the main Component number, writing the name of Component Part, includes maintenance actions: checking, cleaning, lubrication, locking, adjusting, replacing the consumable components, determining the time duration schedule, tools and materials used. The result of the research is a table of PMC system maintenance model used as a guidebook or guidance in doing preventive maintenance of Machine Turning in Workshop of Engineering Technique of Engineering Faculty of State University of Padang. So officers are not negligent in doing Machine Turning maintenance with the manual of care.

Keywords: Model, Preventive Maintenance Control, Machine Turning, Workshop.

1. INTRODUCTION

The Production Technology Laboratory has of Machine Tools such as Turning Machine, Frais Machine, Shaping Machine, Drilling Machine, and Grinding Machine. To maintain machining machine Turning condition found in Workshop, a controlled care model is needed. The model is a reference that can be an example to judge a particular system of things to be produced or a plan or description that describes an object or concept in the form of simplification.

To be able to perform an effective and efficient achievement in care it is necessary to model the care and anticipate when it is necessary to repair machinery or equipment and when necessary maintenance to prevent damage to machinery or tools for production [9]. Disorders on the machine can also arise due to the inability of the operator to perform the maintenance activities of the machine simply, the operator does not have sufficient technical knowledge about the machine operated, unable to control the machine at work and negative mental attitude, such as consider machine not own so operation is not really.

Treatment is an activity necessary to maintain or maintain the quality of maintenance of a facility so that the facility can still function properly in ready-to-use conditions [1]. In order to avoid damage, a well-planned lathe maintenance model is planned and it is expected that the lathe in the mechanical engineering workshop is always in good condition and suitable for use according to the standard [5].

The use of machines in relatively long conditions will result in decreased engine capability. To avoid such occurrence, preventive care is required. Preventative care is good, then the sudden damage can be reduced, and emergency work can be avoided. Preventive care is an effort undertaken to prevent premature occurrence of sudden damage with the aim of reducing the cost of repair, improving the quality and quantity of the work, and emergency care work can be avoided [7]. Damage to the engine hinders the officer to complete the tasks assigned. Preventative preventive maintenance is the maintenance of machines carried out under a program of Care made in a planned manner with a computer system. A planned maintenance system applied to mass industry such as preventive maintenance control (PMC) and total productive maintenance (TPM) [3]. TPM is a maintenance program that is done based on the amount of production or reaches the specified production target while PMC is a maintenance program that is done based on machine layout, machine type, machine type, machine name, machine name or part number and maintenance action to be performed. Each machine and component gets a maintenance turn in accordance with specified time intervals in such a way that major damage can be avoided. The importance of the PMC model can control the

engine and engine components so that the engine conditions are ready for operation or road [2].

The purpose of this research is to Produce Preventive maintenance control on Turning machine to keep machine condition optimally, prevent fatal damage, minimize maintenance cost and extend machine life or age.

2. BASIC PRINCIPLE OF TURNING MACHINE

The machine is a composite or arrangement of various parts of machine elements each of which has a certain role, which is then together to gether so that it can function as a tool or machine. While the so-called equipment is a series of components both main and auxiliary parts, whose form consists of several series of components mechanically and electrically. Equipment is lightweight, can serve as a tool, and can be carried or moved.
Machinery and equipment for laboratory and workshop practice have some basic characteristics, namely:
1) The driving force.
2) Control system or controller.
3) Sled track system.
4) Lubrication system.
5) Machine foundation system.

Viewed from the system works machine and workshop equipment can be divided into:
1) Work system uses mechanical principles.
2) Work system uses electrical principles.
3) Work system uses hydraulic and pneumatic principles.
4) Work system using optical principles.
5) Work system uses a combination of mechanical and electrical principles.
6) Work system uses a combination of mechanical and hydraulic and electrical principles.
7) Work system uses complex composite principles.

2.1 Machine Turning Construction

Machines and equipment using mechanical principles are found in many workshops. The main driving force of these machines comes from electric power. Construction of Turning Machine as follows:
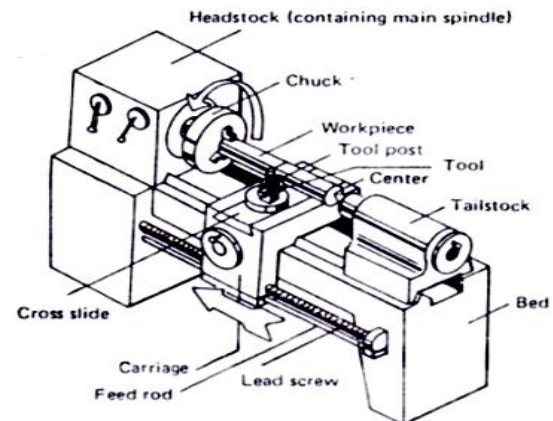

Figure 1. Main Machine Turning Components

2.2 Maintenance Objects

The main objective of machine maintenance is to take care of all machine components, in general the machine components consist of two groups:

2.2.1 Fixed component groups
That is a silent component that does not move when the machine is operated.

2.2.2 Group of moving parts
That is the machine component that moves (straight or spinning) when the engine road. This component is also called a transmission component that serves to continue the movement of a straight direction or a rotating direction movement.

2.3 Role Of Maintenance

Position or position of care as a supporter of smooth production by reducing the bottlenecks as small as possible so that the system can work efficiently. Position of the role of care as follows:
1) The maintenance function is related to the production process.
2) Position of care as supporting or supporting.
3) Production equipment can be used continuously, this is the result of treatment.
4) Maintenance activities will always be related to equipment, machinery, and other facilities.
5) Maintenance activities should always be controlled.
6) Treatment work is generally required when:
   a) The lowest facility quality limits are allowed.
   b) The duration of use of the facility or referred to as the life of the wearer.

2.4 Machine Turning Engineering Techniques

2.4.1 Corective maintenance
That is the method of maintenance of the machine by repairing the damaged component one

or several components (heavily damaged until the machine can not operation).

2.4.2 Preventive maintenance

That is the method of treatment performed to prevent the occurrence of sudden machine damage or activities to maintain and maintain equipment facilities before going crashed when operated or are in production.

1). Routine and priodic preventive maintenance
Preventive maintenance techniques can be divided into two ways, namely:
a) Routine preventive maintenance.
b) Priodic preventive maintenance.

2). Planned preventive maintenance
Maintenance of machines carried out under a carefully planned care program. The planned maintenance system applied to mass industry such as: Preventive Maintenance Control (PMC) and Total Productive Maintenance (TPM). The maintenance program is based on the location of the machine layout, machine type, machine type, name or machine number, the name or number of machine parts and maintenance actions to be performed. Precautionary treatment actions are: Lubrication, Cleaning, Setting, Checking, Replacement, Locking [6].

2.5 Preventive Models Of PMC System

Model is a plan or description that explains an object or concept in the form of simplification. PMC is a treatment performed on machine components in order to get a turn Controlled care is required Care job planning. Here is an example of assigning a machine identity:

M – T – 01

The Number Of Machine In The Group → 01

Machine type → Machine Turning

Locations → Machine Workshop
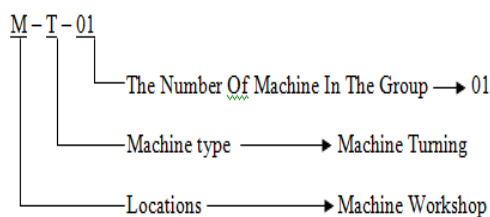
2.6 Lubrication

Efforts to reduce wear due to frictional forces, it is attempted between the two fringing surfaces to be lubricated. so that the surface does not occur direct contact. The lubricant has a function as a frictional refiner [10].

2.7 Concep Framework

Efforts to keep the engine condition optimally and maintain the work of the machine to be ready to use and prevent the fatal damage to the production process is not hampered then made Model (PMC) Preventive Maintenance Control to the components of the lathe to be treated, by determining the Maintenance action on each component machine turning.

3. RESEARCH METHODOLOGY
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3.1 Research Instruments

This descriptive researcher used survey method [8]. to the Turning Machine which is in need of preventive maintenance measures so that the possibility of damage can be minimized.

The planned care research with the PMC system is based on data such as the following:
1) Make layout plan layout and machine layout.
2) Record the machine by coding or symbolizing the location of the machine.
3) Record the machine by coding or symbolizing the name of the machine.
4) Record the machine by coding or symbol of the machine type.
5) Record the machine by coding or symbol of machine number.
6) Record the machine by naming the main component of the machine.
7) Record the machine by naming the machine part component.
8) Include maintenance measures: against each component part.

3. 2 Actions Maintenance

1. Examination.
2. Cleaning.
3. Lubrication.
4. Locking.
5. Setup.
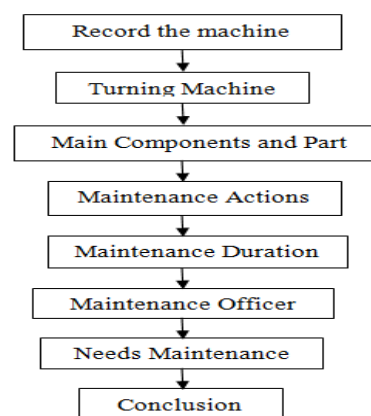6. Reimbursement.

3. 3 Research Procedures

Figure 2. Flow Diagram Of Research Procedure

4. RESEARCH RESULTS AND DISCUSSION

4.1 Recording and Identification Of Turning Machine Components

Record the machine is done each component of the machine to get treatment action. Identification of machine components means to know the machine and its main components [4]. How to recognize a machine like table 1.

Table. 1 Machine Turning Identity

No	Machine Location Code		Machine Name		Machine Type		Machine Number
	Workshop	Code	Name	Code	Name	Code	
	1	2	3	4	5	6	7
1	Machine Workshop	M	Turning	T	Marro	01	01
							02
							03
							04
							05
							06
							07
							08
2					Maxi mat super 11	02	01
							02
							03
							04
							05
							06
							07
							08
							09
							10

4.2 Main Components

The main components are parts of machine components that are still in the form of a series or a combination of several component parts.

Table 2. Main Component Code of Turning Machine

No	Machine Name	Main Component		Part Component Name
	1	Name	Code	
		2	3	4
1	Marro Machine Turning	Electrical control	01	1. Electric circuit
		Energy shaker	02	1. Motor
				2. Couple
				3. Stakes (pen)
				4. Pully
				5. Binder bolts
		Transmission	03	1. Pully
				2. V-belt
				3. Stakes (pen)
				4. Binder bolts
		Gear box	04	1. Bake oil
				2. Lubricant oil
				3. Primary Spindle
				4. Bering
				5. Gear
				6. Gear shaft
				7. Stakes (pen)
				8. Transmission handles
				9. Binder bolts
		Lifting gears	05	1. Gear
				2. Binder bolts
				3. Gear shaft
				4. Support arm

4.3 Part Components

Components of parts are machine components that can not be separated from the main component circuit. In the component parts are included machine code and component parts. Like table 3.

Table 3. Part Component

No	Machine Code	Part Component
	1	2
1	M.T.01.01.01	1. Electric circuit
2	M.T.01.01.02	1. Motor
		2. Couple
		3. Stakes (pen)
		4. Pully
		5. Binder bolts
3	M.T.01.01.03	1. Pully
		2. V-belt
		3. Stakes (pen)
		4. Binder bolts
4	M.T.01.01.04	1. Bake oil
		2. Lubricant oil
		3. Primary Spindle
		4. Bering
		5. Gear
		6. Gear shaft
		7. Stakes (pen)
		8. Transmission handles
		9. Binder bolts
5	M.T.01.01.05	1. Gear
		2. Binder bolts
		3. Gear shaft
		4. Support arm

4.4 Maintenance Implementation

Implementation of the treatment is the scheduling of each treatment action on the machine parts part of the tool. Machine tool maintenance action is a job done in machine maintenance to prevent damage. Measures in preventative maintenance are checking, cleaning, lubrication, locking, adjustment and replacement.

Table 4. Preventive Maintenance Action Code

No	Machine Code	Part Component	Maintenance	
			Maintenance action	Code
	1	2	3	4
1	M.T.01.01.01	1. Electric circuit	Examination	01
			Cleaning	02
2	M.T.01.01.02	1. Motor	Examination	01
			Cleaning	02
		2. Couple	Examination	01
			Cleaning	02
		3. Stakes (pen)	Examination	01
			Reach	06
		4. Pully	Examination	01
			Setup	05
		5. Binder bolts	Examination	01
			Locking	04
3	M.T.01.01.03	1. Pully	Examination	01
			Setup	05
		2. V-belt	Examination	01
			Reach	06
		3. Stakes (pen)	Examination	01
			Setup	06
		4. Binder bolts	Examination	01
			Locking	04
4	M.T.01.01.04	1. Oil bath	Examination	01
			Cleaning	02
		2. Lubricant oil	Examination	01

The above machine tooling machine data is made in the form of PMC system tables to control the main components and machined parts of machine tool parts. So that the engine conditions remain optimal and avoid heavy damage. Table 5 is a model table of PMC system results.

Table 5. Machine Turning Maintenance Model

PREVENTIF MAINTENANCE SYSTEM PMC	PRODUCTION MACHINE
LAYOUT CODE MACHINE	M
MACHINE NAME	TURNING
TYPE OF MACHINE	MARRO
ENGINE NUMBER NUMBER	01
DATE OF EXAMINATION	28-5-2015

No	Machine Identity	Main Component Code	Part Component Name	Maintenance Action Code	Duration of maintenance		Maintenance Officer	Tool	Material	Control		Information
					Schedule	Time				Yes	No	
1	2	3	4	5	6	7	8	9	10	11	12
1	M.T.01.01	01	1. Electric circuit	01	Year	23 december every year	Member					
				02	Year	23 december every year	Member		Brush			
		02	1. Motor	01	Semesterly	1 feb and 1st of August	Technician					
				02	Semesterly	1 feb and 1st of August	Technician		Brush			
			2. Couple	01	Semesterly	1 feb and 1st of August	Technician					
				02	Semesterly	1 feb and 1st of August	Technician		Brush			
			3. Stakes (pen)	01			Member					
				06			Member		Stakes Pen			
			4. Pully	01	Semesterly	1 feb and 1st of August	Technician					

4.4 Discussion

The preventive maintenance model of the machine tool PMC machining system should be based on machine location data or machine location. The machine that was recorded in this research lies on the machine workshop (machining workshop). In the data collection that should be noted is the location of the machine, the name of the machine, the type of machine, the main component, the component parts, the maintenance measures, the duration of care, the maintenance officer, the tools, the materials, the control and the description.

Implementation of treatment is made based on preventive maintenance measures, such as checking the condition of the lubricant in the gearbox, checking the coolant in the container. Cleaning such as cleaning the parts of dirty or dusty engine components by using diesel and brushes include cleaning the body of the machine, cleaning the machine sleeve. Lubrication such as lubricate gears with oil, lubricate bering with gemuk. Locks such as locking bolts or longitious nuts include locking the foundation bolt, locking the bolt on the rotary handle. Setting such as setting the head off in line with the loose head cushion line, adjusts the pulley strain of the engine so that the v-belt is not lax.

Changes such as lubricating oils on the gearbox, changing pins (pen), and changing the coolant.

Preventive maintenance schedules are carried out on a regular or daily basis such as checking for bolts or nuts, cleaning the body after the engine is used, and lubricating the pads before the engine starts up. and periodic maintenance is done once every week such as giving gemuk on the rack teeth, giving gomok on the screw axis. Every six months like cleaning a dusty motor from dust, giving gums to bering, and setting the pulleys. And once a year like checking the electrical circuit, changing the lubricant oil and coolant. by scheduling maintenance, each machine will be controlled for maintenance, so the schedule should be continuous, so the maintenance time is done on one main component for one day of treatment.

Officers in the preventive maintenance of machine tool production is divided into three parts namely; The operator on duty after the machine is used then the machine immediately cleaned by using a brush to remove the bram attached to the machine. The machining technician is in charge of periodic machine maintenance such as cleaning the inner engine body and setting the pulley strain. Experts in preventative maintenance of machine tools are tasked with difficult parts such as cleaning and

checking electrical controls, replacing worn-out pens.

Equipment used in performing preventive maintenance of this machine tool is a brush that serves to clean the machine parts that are difficult to reach or irregular surfaces, such as cleaning the gear, clean the chips that is scattered on the engine body or tub container. The duster is to clean the easily accessible parts or a flat surface such as cleaning the body of the machine from dirt and dust, removing unclogmed sockets so that the smooth chips is removed from the sleeve. The lubricating gun serves to lubricate the engine components with oil to keep the oil from scattering while lubricating such as lubricating steel balls on a machine turning, lubricating the sleeve. Pressure gun serves for gemuk on machine components aimed at giving gemuk more neat, and not messy giving gemuk using pressure gun like giving gemuk on rack tooth, giving gemuk on threaded shaft. The wrench and the L lock are used to lock the bolt or nut on the machine components, use the wrench such as locking the bolts on the engine foundation, locking the bolts on the machine table and the use of L locks such as locking the bolts on the handle, locking the bolts on the bottom.

Materials used in preventive maintenance include: Solar that serves to clean the engine components of lubricants that are not feasible to use, it aims because the diesel easily lift the lubricating stick like cleaning the screw shaft from gemuk, cleaning table sill table drilling machine. gemuk is a lubricant in the form of thick, excessive use of g gemuk on the component parts of the machine, gemuk not easily melt or other words the stickiness gemuk such as giving gemuk on the screw shaft because the screw shaft slow movement and heavy load. Lubricant oil is a liquid lubricant that is easy to melt, the oil used is SAE 140 (society automotive engineering with viscosity 140) which is suitable for use on gear box, and heavy working shaft.

Control is carried out to find out the information there is or not carried out the treatment on the schedule that has been made. As if (yes) is implemented then the officer gives a check mark on the control table there and if it is not implemented then the officer gives a check mark on the controlling table (no) implemented.

Description is done to find out the reason if the control is not implemented as oil lubricants, because machine tools are not often operated and the oil is still good.

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

After doing research about model of preventive maintenance of PMC system at machine tool machine at machining workshop hence writer conclude:

1). Determine the location of machining machine tool done by making layout plan of machine.
2). Record the machine is done by including: machine workshop, machine name, machine type, machine number.
3). List the main components of machine tools by making: machine name, code and main component, part component name.
4). Data collection of part components is done by including: machine code and component part.
5). The maintenance model is made based on the maintenance measures of inspection, cleaning, lubrication, locking, adjustment, replacement of machine parts parts of machine tools.

5.2 Suggestions

Suggestions that writers can provide in relation to research on preventative models of PMC system are as follows:

1) Before making the layout of the machine need to know the type of machine tools and the number of machine tools.
2) In recording machine tools starting from machine tools that have few components to which many have machine components or in sort. So in the data retrieval makes it easier to know the components.
3) After listing the component parts in the preventive maintenance model the maintenance schedule must be thoroughly controlled, so that the maintenance time does not clash or there is no equal maintenance time on different machine tools.

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