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Analysis of Tools Usage by Automobile Mechanics at SIWDO KOKOMPE

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Abstract
The selection of appropriate tools for all types of automobile engineering servicing is very vital. Servicing of automobiles as done by the automobile mechanics at Siwdo-Kokompe involves the repairs and maintenance activities such as changing filters, belts and hoses replacement, tune –ups, lubrication, re-fixing new parts among other. This area was chosen for this research due to the cluster of mechanics. Data collection was base on administering well structured questionnaires and interviews for 99% of these mechanics. Conclusively, the condition of wrenches, screw drivers and pliers are all excellent, very good and good. A large number of hammers, mallets, dies, files, punches and pry bar are in good and excellent conditions whiles less than a quarter of them are in poor conditions. Also electrical and pneumatic tools are in poor and bad conditions whiles hydraulic and electrical equipment are in relatively good conditions.
Keywords: Tools, Fastener, Automobile, Servicing, Power

1. INTRODUCTION

The practice of the profession of automobile engineering, involves the proper size determination of tool to their corresponding fasteners which leads to measurements playing vital roles or measurement are very necessary. Therefore, the selection of appropriate tools for all types of automobile engineering jobs is the major consideration for this research. Furthermore, all automobile mechanics irrespective of their background must master hand tools as the most basic tools. For these mechanics hand tools are operated manually by their hands and have no power simply from an external source. The hand tools commonly use by the automobile mechanics at Siwdo-Kokompe in Cape Coast are wrenches, screwdrivers pliers, hammers and mallets, chisels and punches, piles, taps and pry bars. Hand tools are designs to fit only one size of fasteners, that is why measurements are important to determine the proper size of tools to be use to prevent damage of fasteners or automobile parts. Comparatively, power tools receive power from external sources for their operation.

2. REVIEWED LITERATURE

2.1 History and location of Siwdo-Kokompe

Automobile artisans working on all aspects of automobiles were formally located at the present day Ewim Nurses Flat at Kotokoraba in the Central Business Center of Cape Coast of the Central Regional Capital. At that time the area has seen springing up of cluster of workshops for craftsmen who do various types of repairs and services on automobiles. At this location there were shops selling everything on automobiles. These craftsman or artisans consist of automobile electricians, sprayer, vulcanizes, welders (gas and arch) and mechanics.

These workers were relocated in the year 1968 to their present premises at Siwdo-Kokompe to pave way for the construction of the Ewim Nurses Flats. The Siwdo-Kokompe cluster of artisans is located between the Adisadel Estate and the Robert Mensah Sport Stadium, thus on the right side of the John Mensah Sarbah dual carriage road when going to the stadium from the Pedu Junction.

Initially a little over 40 shops were found at Siwdo-Kokompe but now close to 20 shops can be seen at the place including machine shops, wind screen repairs shop, upholstery shop, blacksmith shops and iron casting shops. Light and heavy duty automobile mechanics as well as specialized mechanics including automobile gears box specialist carburetor specialist among others. On the average, about three hundred vehicles visit Siwdo-Kokompe on daily

basis for all types of repairs. The activities at Siwdo-Kokompe is said to be the main factor for the pollution of the Fosu Lagoon. These activities are welding, spraying automobile electrical works, automobile mechanical works, fabricating, vulcanizing, and blacksmithing among others.

2.2 Automobile mechanic practices at Siwdo-Kokompe

Mechanically, the automobile consist of many different parts that work together to provide motion. The basic components of the automobile are the engine, classis, drive train and body. Servicing of automobiles as done at Siwdo-Kokompe involves the repairs and maintenance activities. Automobiles function effectively if they are regularly maintained. The mechanical aspect of automobile maintenance practice involves the care and up-keeping of the mechanical parts according to schedules. These procedures or activities are oil and filter changes, belt and hoses replacement, tune – ups, lubrication among others. The repairs involve re-fixing of new parts, bolts, nuts among others.

2.3 Wrenches

These are one of the common type of hand tools use by the automobile mechanics at Siwdo- Kokompe in Cape Coast. They use these set of tools to either loosen or tighten automobile parts. One or both ends of a wrench may be an opening that is placed over a fastener and the angle of the opening is significant for normal working conditions. Wrenches have handles that the automobile mechanics can grip or to move the tool. The types of wrenches these mechanics normally are open end, adjustable open – end box end, combination, socket, alien and torx and special purpose.

2.3.1 Open- end

A wrench with an opening or head at one or both ends is an open – end wrench. Operationally the open end slides over a bolt or nut to tighten or loosen it. To allow the wrench to be use in two directions the handle of often place at convenient angles. This type of wrenches is manufactured in many sizes and shapes as shown below.

2.3.2 Adjustable open – end

Whenever the appropriate wrench sizes are not available then adjustable open end wrench are been use by these automobile mechanics to work on fasteners. The adjustable wrenches can fit many different sizes for these automobile mechanics. To use adjustable open end wrench these mechanics must always make sure that both jaws of the wrenches are adjusted tightly.

2.3.3 Socket

Normally, the socket wrenches these automobile mechanics use consist a handle and drive hold socket. The socket fits over a fastener and surrounds it. The inside of these socket or points are made up of six to about twelve grooves which grip or hold the corners of the fasteners when in use. Also inside the socket is a squared hole which is in line with the grooves. This squared hole is known as the drive opening and this is where the socket is attached or connected to the drive. The drive is the square peg connected to the socket and the handle may a ratchet mechanism built in to operate the drive. Thus the ratchet is a mechanism inside the handle that allows drive action in either turning direction. A lever located near the drive end can be positioned to switch the ratchet's operations direction to either clockwise or anticlockwise direction. The best indicator of the strength of a socket wrench is the difference in drive size. The diameter of the drive in the handle is known as the drive size. Thus a half (½) inch drive is heavy – duty, three-eight (3/8) inch drive is medium duty and one-quarter (¼) inch drive is light duty. But socket wrench drives can be as large as one (1) inch. There are different types of handles use by the mechanics with socket wrench and the common ones are named as speed handle, breaker bar, T – handle and extension. Pre occupationally, adjustable wrenches must be use by these mechanics only when the box – end or open – end wrenches will not fit the work piece.

2.3.4 Box end

This type of wrench use by the mechanics has head which are all closed and the heads have different sizes at each end. The heads have six or twelve grooves that grip the fasteners. Due to the design of the head, these automobile mechanics apply more force on the box end wrenches without the wrenches slipping.

2.3.5 Combination

These automobile mechanics use wrenches which have open – end and box end built in a single wrench and they are known as combination wrenches. Usually, both ends of these wrenches have same size. Sometimes the box – end have an angled head to make it more useful. These mechanics use specialized handle on the socket wrenches to loosen or tighten the fasteners. Thus the speed handle is long crank with a handle that turns freely to remove or loosen fasteners for the mechanics. A long and hinged bar which they call breaker bar gives them greater turning

force as well as enough turning angle. When they are working in areas where there is little or no space, they use T – handle which is more flexible and provides more turning force with the extension. They use the extension with the socket wrenches because they provide greater length and versatility. Also they use extensions of different lengths to connect the drives to sockets. Adopters are use to change drive angles and permits their use of half (½) inch drive socket with one-quarter (¼) inch drive handles.

2.3.6 Special purpose and torque wrenches

These types of wrenches are not commonly use by the mechanics at Siwdo-Kokompe in Cape Coast. Thus due to the special head design of some fasteners, special wrenches such as alien and torque are needed to tighten or loose such fasteners. A torque wrench which is not commonly used at Siwdo-Kokompe consists of a long flexible bar and a socket drive. When a beam torque wrench is in use, the torque reading is shown on an indicator on the handle. A micrometer type torque wrench may be adjusted to the required torque and clicks when that torque is reached. Also if a bolt and nut holding a part must be torque to specification, a torque wrench indicates how much or turning resistance a fastener receives.

2.4 Screwdrivers

The automobile mechanics at Siwdo-Kokompe normally use screw drivers which is a shaft or shank of metal with a handle at one end and a blade at the other end. The shank is embedded in a plastic or metal or wood handle. The blade fits and turns the head of the fastener. When a s screw driver blade is too large or too small than the work to do, both the screw driver and the fastener will be damage. Thus, always use the common types of screw drivers. These automobile mechanics also use special types of screw drivers such as tax, clutch-head and Philips which are use for special fasteners.

2.4.1 Locking

At Siwdo-Kokompe, these automobile mechanics use locking pliers to hold in position parts and fasteners. At the handle end of one of the jaws is an adjustable screw which they alter or turn to adjust the jaws. They lock the adjusted jaws in position by pulling in the lower handle.

2.4.2 Needle nose

Whenever these automobile mechanics need to work with long pliers, they use needle nose type of pliers because these pliers have relatively long narrow jaws to fit tight working spaces. Thus the length, shape and thickness of needle nose jaws depend upon the requirements of the work to be done.

2.4.3 Diagonal out

Diagonal out is the type of pliers that these automobile mechanics use to cut electricity connections among others. This is because these pliers have extra-hard cutting edges at the jaws suitable for cutting.

2.4.4 Special purpose

These are mostly pliers they use at Siwdo-Kokompe at Cape Coast to remove snap rings, brake-shoe springs among others.

2.5 Pliers

Pliers are one of the power tools that these automobile mechanics at Siwdo-Kokompe use. They use these pliers to effectively hold, bend, cut and fasten Meanwhile pliers must also be use for loosing or tightening of bolts or nuts. The common types of these pliers they use are slip – joint adjustable, arc- joint, diagonal cut, needle nose (long nose) locking and special – purpose. Almost all the pliers' used by these automobile mechanics work on the mechanism of joints. These joints are extended to hands.

2.5.1 Slip – joint – adjustable pliers

This type of pliers use by Siwdo-Kokompe automobile mechanics has a ship joint which holds two jaws of pliers together and allows the jaws to move. A slot on one jaw allows the slip joint to cover resulting to changes in the space between the two jaws. These types of pliers are sometimes called combination pliers and depending on the chosen slot adjustment they can securely hold either small or large parts.

2.5.2 ***Arc – joint pliers***

This type pliers uses by these automobile mechanics, the jaws is connected by way of groove or channels. The channels in the jaws are shaped in an arc and can be adjusted to different settings to do verity of work.

2.5.3 Locking pliers

At Siwdo-Kokompe, these automobile mechanics need to work with long pliers; they use needle nose type of pliers because these pliers have relatively long arrow jaws to fit tight working spaces. Thus the length, shape and thickness of needle nose jaws depend upon the requirements of the work to be done.

2.5.4 Diagonal out pliers

Diagonal cut is the type of pliers that these automobile mechanics use to cut electrical connections. This is because these pliers have extra – hard cutting edges at the jaws suitable for cutting.

2.5.5 Special purpose pliers

These are mostly pliers they use of Siwdo-Kokompe at Cape Coast to remove snap rings, brake – shoe spring among others.

2.6 Hammers, mallets, chisel and punches

The hammers and mallets these automobile mechanics use are mostly made of handle and head. Most of the handles are wooden only few are plastic. The head are mostly made of metal and only few mallets have plastic heads. They use the hammers and mallets when pounding on machined surfaces, trimming parts such as wheel covers and striking cylindrical ends with chisels to cut off rivets or to loosen fasteners that can not be removed normally.

A flat chisel is tapered at one end and cylindrical at the opposite end. They use starting punches to drive out pins and aligning punch is use to align holes in two parts that will be connected.

2.7 Files, taps, die and pry bars

During overhauling and over services, these automobile mechanics use files of different types to remove metals, smoothing and polishing of surfaces of parts. Generally, the file is a hardened steel tool with rows of teeth and a pointed end or tang that fits into a handle. The teeth of a file may be single cut or double cut and the distance between the cutting teeth determines how the file works effectively. Thus a file with teeth close together is use for polishing and smoothing.

The use of taps to repair damaged threads inside a part is a common practice by these automobile mechanics. The taps are cutting tools. The proper size must be selected, mounted into tap wrench and inserted into the hole to be threaded.

They use the dies to repair external threads which are also cutting tools. Also they select the proper size of die and place at in a die stock so as to turn the die stock to start the die. They use long thick steel lever called pry bar to position or break free some automotive or systems to pave way for servicing

2.8 Electrical impact wrench

This tool is not normally use by these automobile mechanics. It has an electric motor that drives a socket and gives sharp bursts of power that helps to loosen parts. There may be a switch that will control the direction of operation.

2.9 Portable electric drill

This tool is portable that is why it can be move around easily. At the end of the drill is the chuck which holds the drill bit. This drill is made of hardened steel shaft that has a sharp, spiral groove and cuts into metal when turned. Power is provided by electric motor or an electrical source and operated by the trigger on the drill handle. The common automobile drill sizes are ¼, 3/8 and ½ inch. Reamers are either power or hand tools that have sharp edges designed to remove only small amounts of metal when turned with a wrench. When a broken fastener is below the surface, a hard steel tool that grips a drill hole in the fastener called screw extractor is use. When a hole can be drill into the fastener, and then the screw extractor is driven into the drilled hole and turned with wrench to loosen and remove the broken fastener.

2.10 Pneumatic tools

These set of tools are also not commonly use by the automobile mechanics at Siwdo-Kokompe in Cape Coast. These are tools that are powered by compressed air. The air is compressed by an electric motor which is drawn into and stored in a tank. The compressed air is dangerous so all precautions must be strictly adhered to. The most common types of these tools are blowgun, air impact wrench, air ratchet, air chisel and air drill. Blowgun is used for blowing off parts during cleaning. Air chisel is a hammering tool used to cut off parts. The air drill performs the same functions as electric drill.

2.11 Hydraulic tools

Oil or liquid pressure is use to power hydraulics tools. Thus oil or liquid under pressure is pushed into a piston system where it acts to do work. The common hydraulic tools are floor jack, horst, engine lift and hydraulics press.

2.11.1 Floor jack

This is a common type of tool that most of the mechanics use. Thus for this tool, a special platform is use to handle powerful hydraulic forces when automotive parts are being assembled. A hydraulic press forces or presses two tight-fitting parts together and the table must withstand the applied force. A handle at the side of the hydraulic press is pumped to increase pressure.

2.12 Cleaning equipment

Cleaning equipment is not normally use by these automobile mechanics. Example of these is high pressure and steam cleaners, solvent cleaners, cold tank, hot tank and glass bead blaster.

2.13 Hoist

The hoist is not common hydraulics tool at Siwdo Kokompe. Thus these automobile mechanics do not often use hoist. The lift or hoist use to raise the entire automobile in order to create working space underneath for work. Hydraulic pressure and compressed air mechanisms are used to move hoist up and down.

2.14 Engine lift

This hydraulics tool is commonly use by almost all the automobile mechanics at Siwdo-Kokompe. They use this lift or crank to remove or install automobile engines. This tool operates when a hydraulics cylinder fluid pumped and pushed up on the long support arm. Some lifts are on wheel so they can be rolled.

3. METHODOLOGY

The data collection of the research was dome at Siwdo-Kokompe because of the large cluster of artisans (automobile mechanic) at that place. As a result, collection of quantitative and qualitative data for analysis to substantiate the conclusion or claims was possible for the research to see the light of the day. The methodology adopted for the research was the quantitative approach since recommendations must be made to signify that there is the need for intensive safety education for on the use of tools for these automobile mechanics. Therefore, this data collection and analysis was the most efficient means of making this research a reality. Definitely, the target group for this research was the automobile mechanics at Siwdo-Kokompe. This method involves the use of structured questionnaires and interviews. In all 23 questionnaires were administered representing 98% of these mechanics.

Table 1A

SHOP NAME	SHOP MASTER'S NAME
GYE NYAME MOTORS	PHILIP WIREDU
AMEEN FITTING SHOP	AMEENALHASSAN
RANSFORD FITTING SHOP	MASTER RANSFORD
NII FITTING SHOP	MASTER NII
DABI WO BE KAE ME	MASTER KOFI
OKYESONYAME FITTING SHOP	DANIEL INKOOM
OBENG BOAT VENTURES	MASTER OBENG
SHALOM FITTING SHOP	HARISONATULINYAH
OBENG FITTING SHOP	MR. OBENG
YESU FITTING SHOP	MASTER OPPONG
OFIRNYAME FITTING SHOP	ANTHONY ACKON
EKOWACKON FITTING SHOP	GEORGE BONY
OPPONG FITTING SHOP	OPONGDANKWA
TONY MOTORS	MASTER ABU
BONY FITTING SHOP	MASTER KWAME
OPONG FITTING SHOP	MASTER MAWULI
ABU FITTING SHOP	MASTER CHRISTIAN
MASTER KWAME FITTING SHOP	MASTER CHRISTIAN
MAWULI FITTING SHOP	MASTER CHRISTIAN
CHRISTIAN MOTORS	KWEKU BADU
OKYESONYAME FITTING SHOP	BOAKYE AND OSANI
IF GOD BE FOR US NO ONNE IS AGAINST US	MASTER PEE

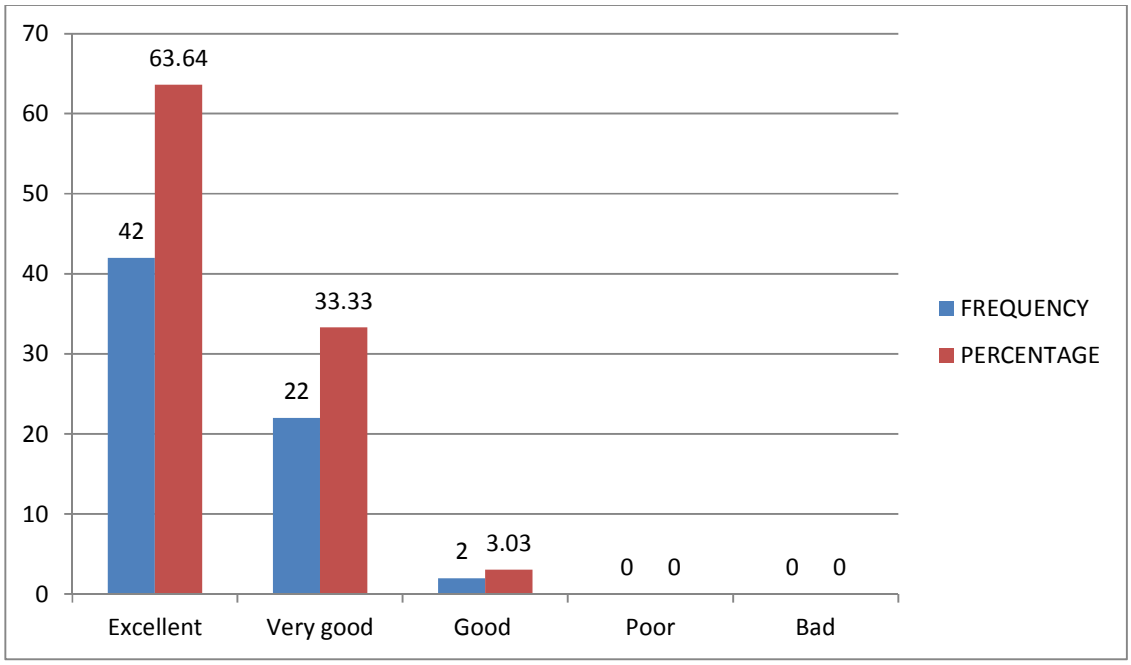
Source: Author's Field Work, 2012

Table 1B: Information on open-end, adjustable and box-end wrenches

STATEMENT	RESPONSE	FREQUENCY	PERCENTAGE
Condition and use of open-end wrench, adjustable open-end wrench and box-end wrench	Excellent	42	63.64
	Very good	22	33.33
	Good	2	3.03
	Poor	0	0
	Bad	0	0
Total		66	100

Source: Authors Field Work, 2012

Figure 1B: Information on open-end, adjustable and box-end wrenches



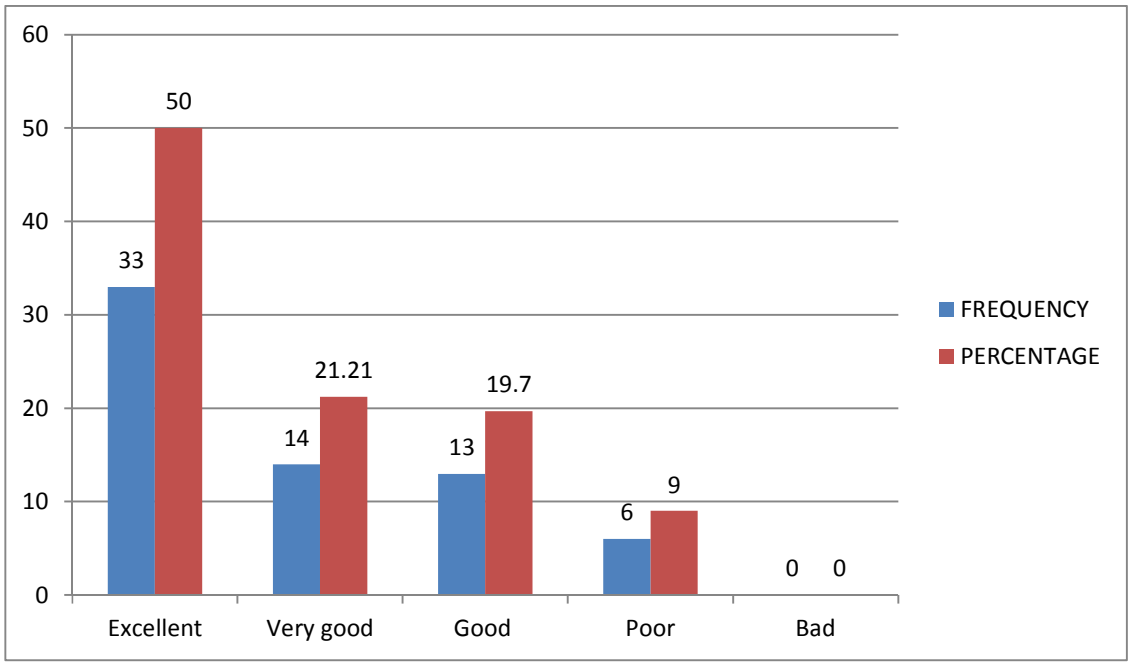
Source: Authors Field Work, 2012

Table 2: Information on combination, socket, special purpose and torque wrenches

STATEMENT	RESPONSE	FREQUENCY	PERCENTAGE
Condition and use of combination wrench and special purpose and torque wrench	Excellent	33	50.00
	Very good	14	21.21
	Good	13	19.70
	Poor	6	9.00
	Bad	0	0
Total		66	100

Source: Authors Field Work, 2012

Figure 2: Information on combination, socket, special purpose and torque wrenches



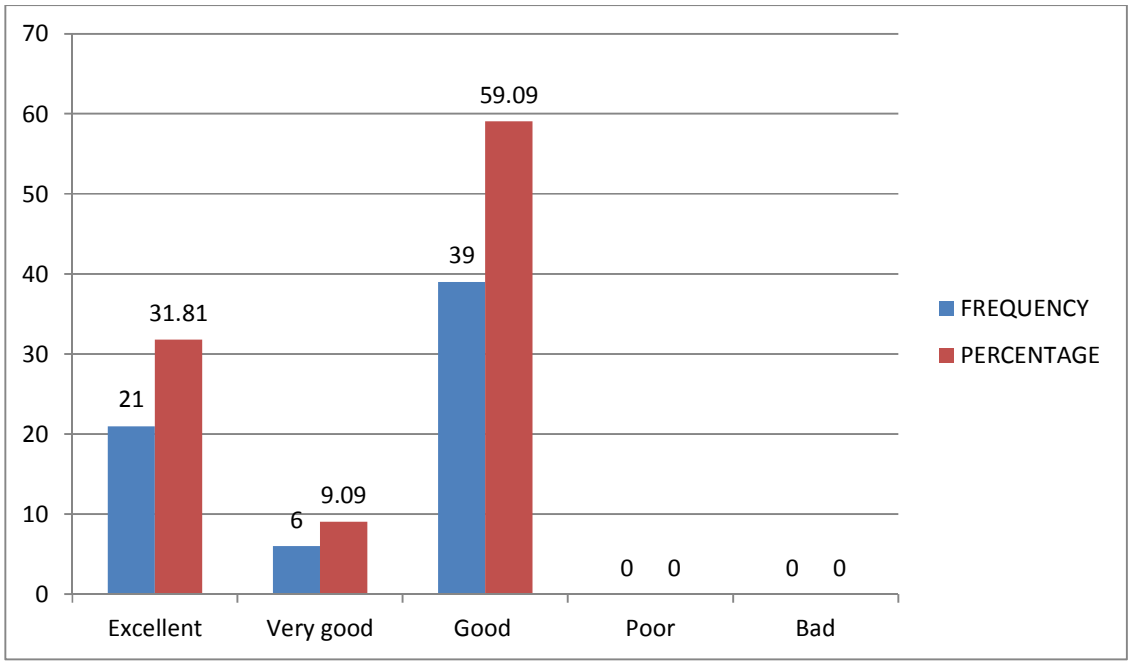
Source: Authors Field Work, 2012

Table 3: Information on screw drivers and pliers

STATEMENT	RESPONSE	FREQUENCY	PERCENTAGE
Availability, condition and usage of screw drivers, slip – joint adjustable pliers and arc-joint pliers	Excellent	21	31.81
	Very good	6	9.09
	Good	39	59.09
	Poor	0	0
	Bad	0	0
Total		66	100

Source: Authors Field Work, 2012

Figure 3: Information on screw drivers and pliers



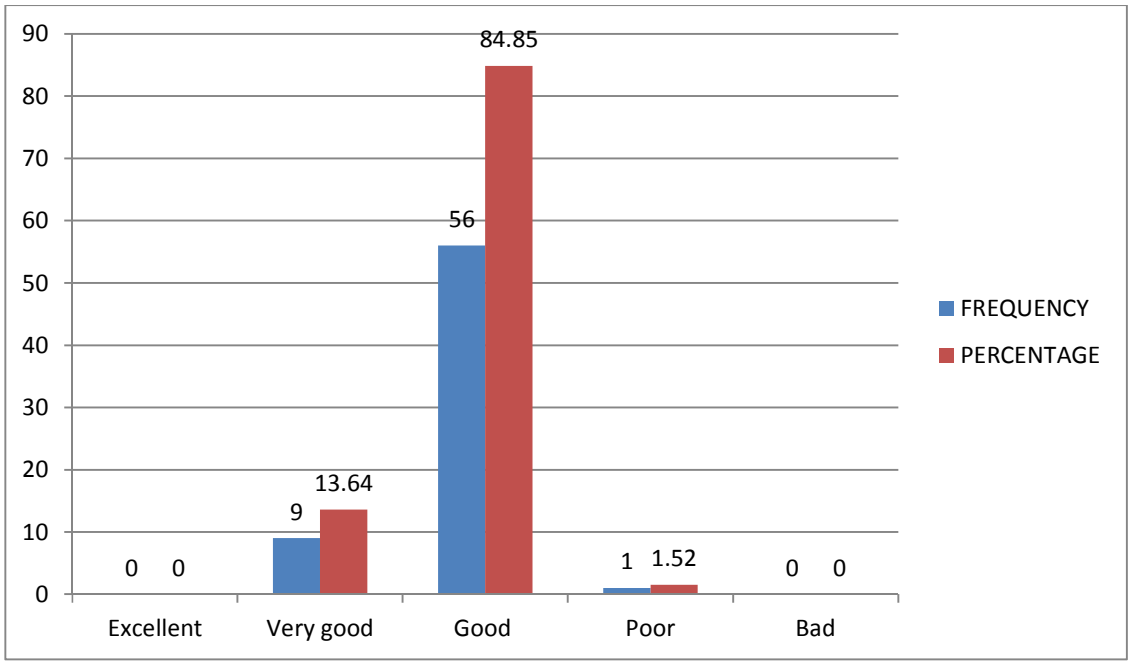
Source: Authors Field Work, 2012

Table 4: Information on locking nose and diagonal out pliers

STATEMENT	RESPONSE	FREQUENCY	PERCENTAGE
Condition and use of locking pliers, needle nose pliers and diagonal out pliers	Excellent	0	0
	Very good	9	13.64
	Good	56	84.85
	Poor	1	1.52
	Bad	0	0
Total		66	100

Source: Authors Field Work, 2012

Figure 4: Information on locking nose and diagonal out pliers



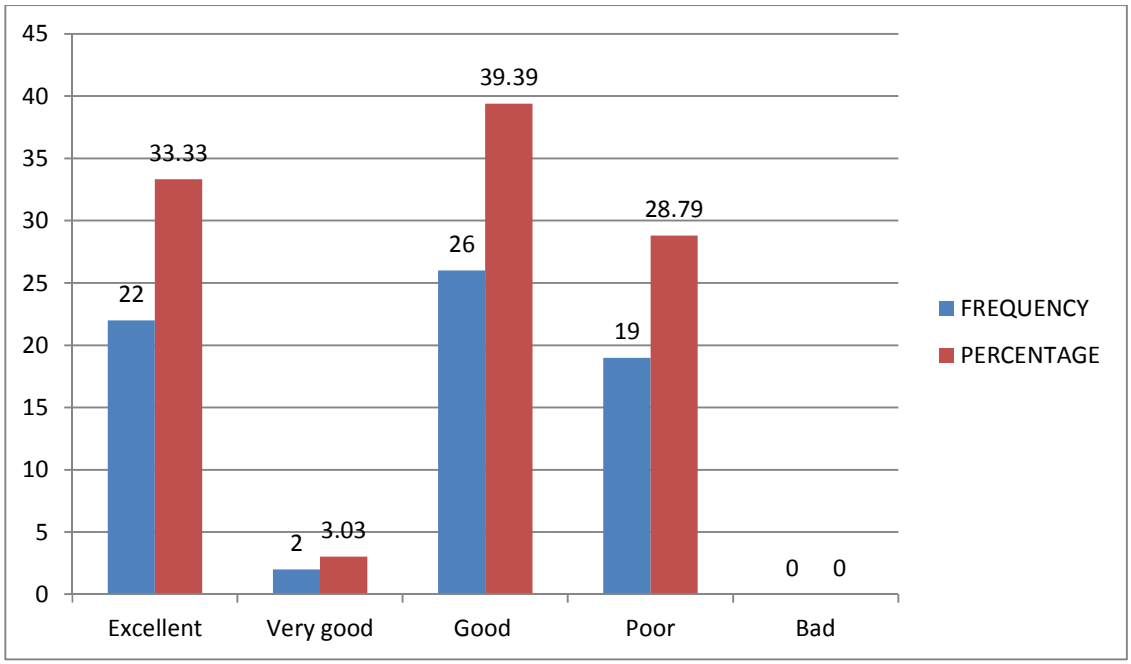
Source: Authors Field Work, 2012

Table 5: Information on pliers, hammers, chisel, files, taps, die and pry bars

STATEMENT	RESPONSE	FREQUENCY	PERCENTAGE
Availability, condition and	Excellent	22	33.33
usage of special purpose,	Very good	2	3.03
pliers, hammers, mallets,	Good	26	39.39
chisels, punches, files,	Poor	19	28.79
taps, dies and pry bars	Bad	0	0
Total		66	100

Source: Authors Field Work, 2012

Figure 5: Information on pliers, hammers, chisel, files, taps, die and pry bars



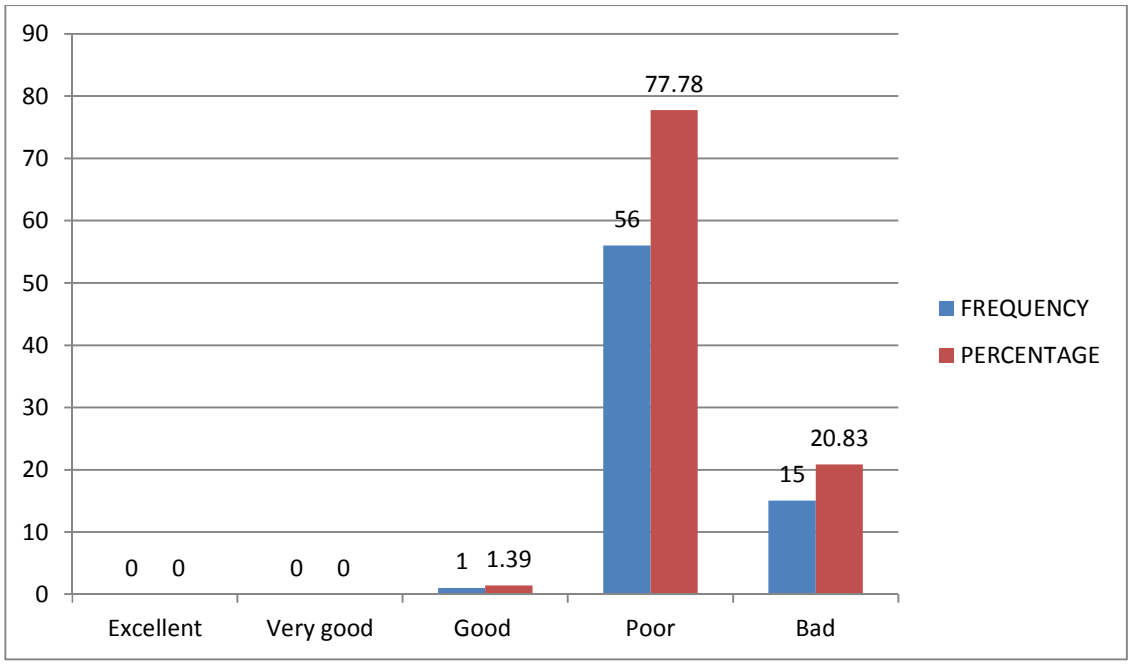
Source: Authors Field Work, 2012

Table 6: Information on portable electrical drill, electrical impact wrench and pneumatic tools

STATEMENT	RESPONSE	FREQUENCY	PERCENTAGE
Availability, condition and	Excellent	0	0
usage of portable	Very good	0	0
electricity drill, electrical	Good	1	1.39
impact wrench and	Poor	56	77.78
pneumatic tools	Bad	15	20.83
Total		66	100

Source: Authors Field Work, 2012

Figure 6: Information on portable electrical drill, electrical impact wrench and pneumatic tools



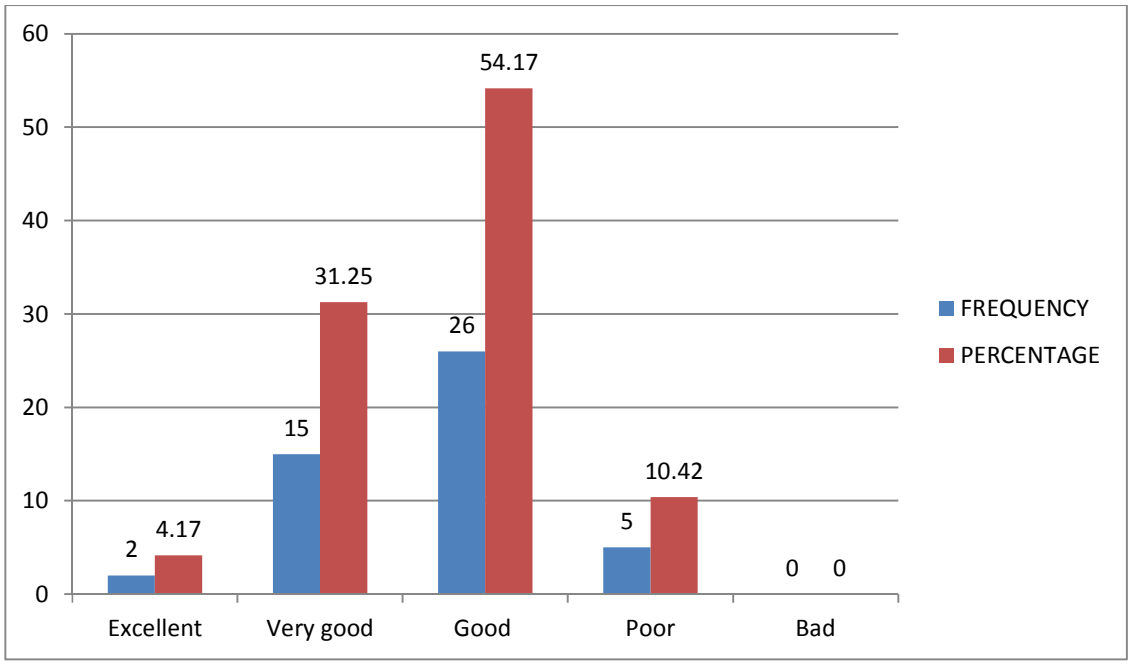
Source: Authors Field Work, 2012

Table 7: Information on hydraulic tools and cleaning equipment

STATEMENT	RESPONSE	FREQUENCY	PERCENTAGE
Availability, condition and usage of hydraulic tools and cleaning equipment	Excellent	2	4.17
	Very good	15	31.25
	Good	26	54.17
	Poor	5	10.42
	Bad	0	0
Total		48	100

Source: Authors Field Work, 2012

Figure 7: Information on hydraulic tools and cleaning equipment



Source: Authors Field Work, 2012

4. DISCUSSIONS

63.64 And 33.33% of open – end adjustable and box – end wrenches usage and condition are excellent and very good respectively. There is 0% bad and poor for such wrenches with only 3.03% good. Condition and usage for combination, socket, special purpose and torque wrenches are 50% excellent, 21.21% very good, 19.70% good, 9.09% poor and 0% bad. Availability, condition and usage of screwdrivers, slip – joint adjustable pliers and arch – joint pliers are 37.5% excellent, 9.09% very good, 59.09% good whiles 0% for both poor. Condition and usage of locking pliers, needle nose pliers and diagonal out pliers are 0% excellent, 13% very good, 84.85% good, 1.52% poor and 0% bad. Tools such as special purpose pliers, hammers, mallets, chisels, punches , files, tape, dies and pry bars score 33.33% for excellent, 3.03% very good, 39.39% good, 28.79% poor and 0% bad for availability, condition and usage collectively. Availability, condition and usage of portable electrical drills, electrical impact wrenches and pneumatic tools score 0% for excellent, 0% for very good, 1.34% for good, 77.78% poor and 20.83% bad. Availability, condition and usage of hydraulic tools and cleaning equipment score 4.17% for excellent, 31.25% for very good, 54.17 for good, 10.42% for poor and 0% for bad.

5. CONCLUSION

Tools such as manually operated wrenches are properly used and are in the right condition with only a very small fraction that is in poor condition. A lot of the pliers are in good category for availability, condition and usage, whiles only very few are excellent, very good and poor with none being in bad state. Hammers, mallets, chisels, punches files, taps dies and pry bars spread from excellent to very poor proportionally for availability, condition and usage. Portable electric drills and pneumatic tools are in the poor and bad condition and not available. Averagely, hydraulic tools and cleaning equipment are in the category of good for availability, condition and usage. Very few of them are excellent and poor with a quarter of them very good.

6. RECOMMENDATIONS

On the basis of this research, the author deems it absolutely important to recommend that there must be professional education on some of the tools and equipment as well as health:

a. Pneumatic tools
b. Portable electricity drill
c. Hydraulic tools
d. Cleaning equipment
e. Pliers
f. Proper cleaning of hands before and after eating
g. Proper disposal of solid and liquid waste

Furthermore, the Ghana Association of Garages, Association of Ghana Industries, Ghana Employers Association, Technical and Vocational Education and Training, Ghana Institution of Engineers and other benevolent organization must assist these automobile mechanics in the proper usage of such tools.

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