

Establishing Spare Parts and Maintenance Workshop in 'Tikur Abay Transport PLC'

Yichalewal Goshime

ABSTRACT - This research focused on the establishment of spare parts production workshop in Tikur Abay Transport PLC. It has five broad chapters. The first section discussed about the existing problems of the company related to productivity/service-delivery capacity. Objectives were clearly stated, its scope was delimited and the expected benefit of the study was briefly highlighted. The second chapter elaborated about theory of spares parts production and principles of lay out design. Following this, the principal data which are crucial to analyze the problem (questionnaires, interviews, observation and secondary data), were collected, presented, analyzed, interpreted and their findings were summarized. In the fourth section, the basic equipments and tools of the new workshop were identified followed by layout design and cost estimation. Finally, outcomes of the study were concluded and possible measures were recommended by the researcher.

Index Terms – workshop, production, spares, layout design, equipments, tools;

1. INTRODUCTION

Any developmental organizations such as companies, industries or enterprises whether they are large, medium or small scale, have great role for fast and sustainable development of a nation. For instance; they support the agricultural sectors: by purchasing their products as inputs for industrial process and by manufacturing and supplying agricultural machineries and equipments. Moreover, companies facilitate foreign exchange by delivering transport services regionally, nationally and internationally and hence they contribute a lot for the Gross Domestic Product (GDP) of a country. In addition to this, they give job opportunity for citizens which have a great contribution for minimizing unemployment. In our age of growing competition, many enterprises are fast-coming up due to inventions and discoveries in the fields of science and technology. Efforts are being made to find out the best ways of doing a given job to economize effort, time and material. It necessitates that every companies should be effectively organized to achieve the best possible results.

In Ethiopia, there are a number of private and government owned companies those have their own contribution for the country's Gross Domestic Product (GDP). Out of those, transport companies take significant share of the market in foreign exchanges. The scarcity of resources has been a burning issue for manufacturers, producers and fabricators in the globe. This is especially critical for developed nations as they have already used their resources for manufacturing and construction industries. The need for resources as inputs to their industries has aggravated the alarming increment of expenses of products and services. It is because of this that the price of spares of different machineries and

equipments have been vibrated the wall of economy of different countries.

To alleviate the problem of both price and availability, many developed nations have been strived to produce spares by themselves and thereby satisfying the demand of local markets in general and their respective company in particular. Like other countries, the Federal Democratic Republic Government of Ethiopia set a strategy to transfer the country from agrarian to industrial economy. This goal can be achieved if a number of industries are established with in the country so that they can manufacture and produce different products such as machineries, equipments, goods and materials and they can deliver services. The equipment and machineries used to produce the output need different spares such as shafts, gears, pulleys, sprockets, bushings, etc.... These spares play a decisive role for effective functioning of the specified machines. Without the active involvement of these parts no work is done. However their price has been increasing geometrically from to time which has laid a shadow for the survival of different factories. Finding a solution to alleviate the above problems has been the work of mechanical and industrial engineers.

Tikur Abay transport PLC is one of the Known transports PLC in Ethiopia which has been established under Effort Investment Center to contribute its share on the transport sector since November 1993GC. The company is established with an aim of delivering land transport services to their respective customers. It has been established at Kombolcha town by considering the town as one of the economic corridor for economic growth. The initial capital during its establishment was about 18,344,097.00 Birr. Initially the company had 14 administrative, 4 finance, 17 professional and 66 technical employees. Now, the company has 460 permanent employees out of which 401 are male and the remaining female; 20 contract employees out of which 14 are male and the remaining female; and 15 new staffs which will be recruited after training. So, the company has a total of 495 employees.

• Yichalewal Goshime is currently working as Deputy Scientific Director in Kombolcha Institute of Technology, Wollo University, Ethiopia.
PH: +251 912689098
E-mail: yichmena@yahoo.com

As far as its organizational structure is concerned, the company is organized with six departments, two service delivery offices, two branches (at Kombolcha and Adama), two coordinating offices (at Djibouti and Gondar) and a marketing department at Addis Ababa. Services that are delivered by the company include:

- Import and export services using the existing trucks.
- Training of driving licenses using up to date driving techniques and technologies.
- Maintenance and repairing of company vehicles.
- Establishing general garage services
- Importing of machineries

2. PROBLEM STATEMENT

Tikur Abay Transport has strived to achieve its mission by delivering quality transport services to the community thereby improving the living standard of its employees and making the company profitable and competent to the world market. However, the company has not served the community in its full potential for the last 19 years due to lack of sustainable supply of genuine spares.

The shortage of spares has been existed continuously in the company due to:

- Closing of some outdated spare production factories.
- High prices of spares which in turn due to lack of resources.
- Unwise utilization of resources
- Lack of skilled labors.
- Lack of spare production workshops.

3. OBJECTIVE OF THE STUDY

3.1 General Objectives:

- To conduct study on the establishment of spares parts production for maintenance workshop at Tikur Abay Transport PLC and other clients.
- To analyze the impact of establishing spares parts production workshop on the overall quality and service delivery of the company.

3.2 Specific Objectives:

- To show the significance of establishing spares parts production workshops for the company, by comparing the existing system with the new.
- To identify critical spares which is needed by the company as well as external clients so that it can be produced using the new workshop.
- To suggest and design appropriate lay out for the spares parts production workshop together with its necessary equipments, tools and qualified personnel.

- To show the economical benefits of the company from the new workshop.
- To supply spares and maintenance services to any external clients in general and to the company itself in particular.
- To reduce down time through sustainable supply of spare parts, those enhance service-delivery capacity.
- To convince the management of Tikur Abay transport PLC on the implementation of the new design through seminars and workshops.

4. RESEARCH METHODOLOGY

The methods of study that will be used throughout this research comprises the following:

- Sight survey and interviews
- Literature survey and internet browse
- Softwares such as Auto CAD and CATIA
- The collected data will be organized, analyzed and interpreted
- Modelling and lay out of appropriate spares parts workshop that will be linked to the vehicles of both the company and the community will be recommended
- Economical analysis will be conducted

5. DATA COLLECTION

5.1 Primary Data Collection

As we have already discussed in the research methodology, the methods of study/data collection tools/ that is used by the researcher throughout this research comprises: Sight survey, interviews, literature survey, internet browser, and Soft ware specifically Auto CAD.

Through visit of the plant site especially the two garages at Kombolcha and Adama, the researcher has tried to evaluate the performance of the company from the views of basics of manufacturing, plant design, Just in Time as well as inventory management. In fact, the observation had carried out in two phases and with the help of check lists.

The observations of the plant were conducted both at Kombolcha and Adama branch using the following check lists:

- Site selection of the plant: general and specific site
- The existing available workshop tools and equipments
- Organizational structure of the company
- Quality and quantity of trucks.
- The demand for the service delivery.
- Shop organization and management.

A semi-structured interview was conducted with the concerned officials of the company, that is: about thirteen questions for General Manager of the company, eleven

questions for Head of marketing Management and twelve questions for Head of Technique Department.

5.2 Secondary Data Collection

Secondary sources are previous related works (which were already done in the previous three chapters/ and past documents of the plant. Those documents include: average annual expense of spare parts of trucks which can be manufactured in the new spares production workshop of the company, the new site plan of the company, strategic plan of the company and brushes about the profile and main activities of the company.

6. DATA INTERPRETATION AND FINDINGS

As we discussed in the former section, a total of fifty-six (56) questions, which could be divided in to questionnaires and interviews, were conducted. For ease of understanding the data were interpreted and summarized by grouping similar questions of different respondents in the following manner.

- a. Strength and opportunity of the company
- b. Current status of the company
- c. Encountered problems, causes and possible solutions
- d. Demands for spares of trucks and other machineries
- e. Existing condition of mechanical work shop
- f. Establishment of spares production and maintenance workshop

6.1 Data Interpretation

6.1.1 Strength and opportunity of the company

Although Tikur Abay Transport PLC has already identified that its productivity/service-delivery capacity/ is not as such attractive, measures have been taken to scale-up its capacity by implementing Quality Management System (QMS), Business Processing Re-engineering (BPR) and 5 year strategic plan. Besides, the opening of higher institution near the company has created favorable situations to extend performance of the enterprise.

6.1.2 Current Status of the company

The current status of the company is not in its full potential due to lack and high price of spares which increase down time. The performance of trucks especially the outdated ones is usually low due to lack of sustainable and defect-free supply of spares and obsolescence of the available few machineries in the workshop.

6.1.3 Encountered problems, causes and possible solutions

Low service-delivery capacity, high down time of trucks and less customer satisfaction are bottle necks of the company which have been occurred due to lack of spares, lack of skilled labor, lack of quality awareness, obsolescence of the existing trucks and employees have not been motivated through incentives and rewards. Solutions to minimize problems and upgrade service-delivery capacity include: organizing the company with the modern management system, manufacturing spares within the company, upgrade the skill of employees via training, conducting regular maintenance program, organizing the mechanical workshop with well-equipped machineries and skilled labour, extending the scope of the market and establishing research and development centre.

6.1.4 Demands for spares

According to the annual report of the supply division (2011), the annual budget allotted for spares consumption of the company is about 18,000,000.00 (eighteen million) birr. Since the company is established in the economic corridor of the country, there are huge factories out of which some of them are already established and some are under constructions. The need for spares in other factories is unquestionable. Hence, there is high demand for spares both in the company as well as from external clients. The productivity of these companies is inefficient due to lengthy procurement system and high cost. Moreover, they are unable to manufacture spares within their workshop due to lack of financial capacity and skilled man power. It is assured that if the new workshop is capable of producing spares, they will be benefited.

6.1.5 Existing condition of mechanical workshop

The mechanical workshop of the company was established with an aim of repairing and maintaining heavy trucks, giving garage services and producing some spares. However, the workshop has not been working with its full capacity due to absence of design sections and lack of well equipped machineries. Moreover, the few spares of trucks that have been manufactured in the workshop do not satisfy the required mechanical property due to lack of heat treatment. Nevertheless, these can be solved by offering training for workers, recruiting better skilled professionals, repairing damaged machines, controlling raw materials quality and strengthening heat treatment process.

6.1.6 Establishment of spares production and maintenance workshop

Establishing spares production and maintenance workshop enables the technical division of the enterprise to produce spares with short time and affordable cost. Consequently; it saves labour, time and money; serves as

income generating department for the company; minimizes problems of foreign currency; improves creativity of the worker; increases customer satisfaction; reduces manufacturing cost, increases productivity and enhances wise resource utilization.

In addition to this, research works should be conducted to improve quality of spares on one hand and to minimize cost of the product on the other which increase customer satisfaction and assure sustainability of the company.

6.2 Findings

The bottlenecks of Tkur Abay Transport PLC are: low service-delivery capacity and less customer satisfaction due to high down time of trucks which in turn due to lack of sustainable and defect-free supply of spares, low performance of the existing mechanical workshop machineries, poor working system and lack of skilled professionals.

There is high demand for spares both within the company and from external clients. Since it doesn't work with its full capacity due to shortages of skilled labour and equipments, customers are dissatisfied in delivery as well as cost.

The problems of the company can be alleviated by: manufacturing majority of spares within the company, establishing good management system, giving capacity building training for employees, organizing the mechanical workshop with well-equipped equipments, extending market capacity of the company and strengthening research and development centre.

The establishment of spares production and maintenance workshop enhances the production of intricate and large sized spares at the right time and with affordable cost, there by:

- Saves labour and money,
- Generates income for the company,
- Solves the problems of foreign currency,
- Improves workers creativity,
- Increases customer satisfaction,
- Increases service-delivery capacity and
- Enhances wise resources utilization.

7. REQUIRED RESOURCES

7.1 Physical resources

A number of physical resources which need high capital are essential for efficient and Just-In-Time service delivery of the company. The most common resources are listed here under as:

- Machines
- Hand tools
- Layout tools
- Cutting tools and measuring tools

The detailed specifications the equipments are stated with average estimated current price of the global market. Based on the activity plan of the researcher, the cost doesn't consider transportation, offloading, installation, commissioning and training costs. These need further investigation and study.

7.1.1 Machines

Machines which are incorporated in the new workshop are listed here below:

- Forging Blower (Forger)
- Heat Treatment Furnace
- Bench Work Machines
- Surface Grinding Machine
- Sheet Metal Forming Machines
- Universal Cylindrical Grinding Machine
- Lathe Machines
- Crank shaft grinder
- Hydraulic press
- Tool cutter grinder
- Power hacksaw
- Universal milling Machine
- Drilling Machines
- Welding Machines and
- Grinding Machines
- Shaper.

7.1.2 Hand tools

- Mallet hummer
- Chipping hammer
- Snips
- Chisel
- Hack Saw frame
- Work bench
- Hand File

7.1.3 Layout tools

- Measurement Table Scriber
- Divider
- Outside caliper
- Inside caliper
- Hermaphrodite caliper
- Center punch
- Trammel

7.1.4 Cutting tools

- Twist drill bit
- Reamers
- Countersink tool
- Center drill

- Plane milling cutter
- Shell end mill cutter
- Dovetail cutter
- End mill cutter
- End mill holder with collets chucks (set)
- Double angle milling cutter set
- T - slot cutter
- Gear cutter
- HSS lathe cutter
- Carbide cutter
- Parting tool
- Knurling tool
- Boring tool
- V-thread tool
- Square thread tool
- Sand paper

7.1.5 Measuring tools

- Steel rule
- Steel rule
- Outside micrometer
- Inside micrometer
- Depth micrometer
- Vernier caliper
- Vernier height gauge
- Screw pitch gauge
- Radius gauge
- Dial indicator

8. LAYOUT DESIGN

Production workshop layout refers to location of various shops within the new plant. The layout should fulfill the following major requirements:

- It should be such that a minimum material handling is required to move the raw materials such as: ingots, plates, sheets of different metals.
- It should enable easy entry and exit of these materials.
- It should reduce the required movement of shop floor personnel
- It should cater for possible expansion of facilities.
- It should enable installation of safety and fume/dust extraction equipment
- It shows cater for support facilities such as metallurgy lab, Inspection lab, air compressor room, additional generator sets, etc...

The main shops to be considered for the layout are: Design Section, Raw Materials store, Production Store, Bench work shop, Sheet metal and Forging shop, Machine shop, Finishing Shop, Heat Treatment Room, Office, staff, Shower and Latrines.

9. CONCLUSION

This research /project work focuses on the study which was conducted with the aim of establishing spares Production workshop and analyzing its impact on the

overall quality and service delivery capacity of Tikur Abay Transport PLC, by identifying the root causes for the frequent down time of trucks and the alarming price increment of spares.

The research methodology followed in this research work includes: site and other related companies survey, interviews, questionnaires, information gathering and review of researches conducted on the productivity and quality of service delivery of the company were used as the basic sources of information. The author collected, analyzed, interpreted, and produced his findings that the urgent establishment of the spares production workshop is of paramount importance to increase the service delivery and financial capacity of the company.

In particular the current problems affecting the overall performance of the company were classified as: lake of spare parts for the existing trucks of the company, high foreign currency, unwise utilization of resources, unavailability of the required machines to produce spares in the workshops, lack of skilled man power and other problems related with quality management and production planning and control.

There are a number of spares that have been used by the trucks of the company. Those include: spur gears, pulleys, keys, shafts, pins, rack and pinion, drums, levers, beaters, cups, washers, bearings, flanges, frames or bodies, armatures, spacers, rings, clutches, discs, cams, shedding boxes, bevel gears, worm gears, worm shafts, cranks, etc...

After a thorough analysis of the bottleneck of the company, it was found that:

- Most of spares of trucks are unaffordable and critical to failure and stoppage of trucks
- Difficulty to import some of the spares for the existing trucks due to unavailability of these spares in the market, and lack of foreign currency resulted to high down time/lead time
- Lack of locally manufactured spares aggravated the price as well as quality of spares.
- Lack of systematic and regular maintenance schedule, resulted to failure of and ultimate stoppage of trucks.

Meanwhile, in addition the high demand for spares in the company it was found that external clients located in and around Kombolcha town have also similar demand for quality spare parts. Nevertheless the inability of the mechanical workshop of the company to meet this demand has resulted dissatisfaction of internal as well as external customers due to service quality, quantity, delivery time and expenses of the service.

The establishment of spares production workshop enhances the production of intricate and small sized spares at the right time and with affordable cost, there by: Saving labour and money, generating income for the company, solving the problems of foreign currency, improving workers creativity, increasing customer

satisfaction, increases service delivery and enhances wise resources utilization.

The questionnaires, the authors' observation and interviews conducted in and outside the company justified all agrees upon the establishment of the spares production workshop in Tikur Abay Transport PLC. Thus the following points were considered while designing the workshop:

- The capacity of the workshop was decided on the basis of the existing demand for spares of company's trucks by the company and by considering the external clients need,
- All the necessary and important equipment to establish the workshop were selected

In addition to being fully merging with the existing mechanical workshop the designed spares production workshop alleviates the acute shortage of spare parts and reduces the cost of purchasing spares by about 25-50%. Additionally the company may get additional revenue amounting 2,310,323.75 Birr from external clients. Thereby improving the overall service delivery capacity of the company and meeting the customers demand with regard to quality, quantity, delivery as well as cost.

10. RECOMMENDATION

The layout of spares production workshop has been designed for production workshop. So, interested researchers can design layout for maintenance, foundry and assembly workshop.

All employees of the company should strived for earning the revenue that is expected from external clients as well as the saving of expenses due to efficient functioning of the new workshop.

Transport sectors are a key motivator of fast and sustainable development to transfer the economy from agricultural to industrial era. If researchers focus their attention on alleviation of problems related to spares production, there will be radical developmental change on the GDP of nation.

The finding of this research has great impact on the service delivery and financial capacity of Tikur Abay Transport PLC. Therefore, the company should have to set a strategy for its implementation by:

- Establishing good working system such as TQM and BSC,
- Offering capacity building training for employees,
- Organizing the new production workshop with well-equipped equipments,
- Extending market capacity of the company, and
- Strengthening research and development centre.

ACKNOWLEDGEMENT

First of all, I would like to thank God, our Father, for what He has done to me throughout my life. Secondly, I have also a great appreciation and thanks for the management of Tikur Abay Transport PLC, especially: Ato Workneh Mekonnen, Manager of the company; Ato Kibret, Head of marketing and budgeting; Ato Awwaris, Head of Engineering Department; and all technical and administrative staff of the Company for their willingness in collecting data and relevant information for analyzing the problem under study. Moreover, I would like to express my great thanks to KIOT management, especially Ato Muluken Masresha in providing all the necessary supports for conducting the study. Lastly, but not least, I have deep-rooted and respectful thanks for my beloved wife W/o Tiruwork Beshir for her support, love and encouragement throughout the study. So I admire and respect her throughout my life.

REFERENCES

- [1] Adithan M and Pabla B. S, (2004), Production Engineering Estimating and Costing, First Edition, Shiba Offset Printing Press, Konark Publishers, New Delhi
- [2] Butterworth-Heinemann, (2001) Industrial Plants, USA.
- [3] Choudary R.B and Tagore G.R.N, (March, 2001), Plant lay out a Material Handling, second Edition, Khanna Publishers, New Delhi.
- [4] Daniel Kitaw (Dott-ing), Industrial Management & Engineering Economy, AAU Press, September 1994
- [5] Gebresenbet Tafesse (PHD), (2008), Automation, Compiled Lecture Notes, Addis Ababa University, Addis Ababa, Ethiopia.
- [6] Gopalakrishnan p and Banerji A. k, (October, 2006), Maintenance and Spare parts Management, Prentice-Hall, India
- [7] Humar B, (2002), Manufacturing Process and Technology, Fourth Edition, Kahanna Publisher, New Delhi, India.
- [8] Jain R.K, (2008), Production Technology (A Text Book of Engineering Students), 16th edition, Khanna Publishers, New Delhi
- [9] James A.Rehg & Henry W.Kraebber, (2001), Computer Integrated Manufacturing, Second Edition, Prentice Hall Press.
- [10] James B. Dilworth, (1991), Production and Operations Management, McGraw-Hill Companies
- [11] Kjell B, (2004), Industrial Engineering Hand book, Fifth Edition. McGraw-Hill
- [12] Marczyk G, Dematteo D and Festinger D, Essentials of Research Design and Methodology (2005), John Willey and Sons, Canada.
- [13] Martin-Vega Louis A, (2004), Industrial Engineering: Past, Present and Future, Natural Science Foundation, Mc Graw -Hill Companies, Arlington, Virginia.
- [14] Novortis Foundation for Sustainable Development, Hand Book of Project Management, (2005), Switzerland.
- [15] Phillip and Ostward F, (1997), Manufacturing Process and System, University of Colorado, USA.
- [16] Sharma S, (2003), Plant Layout and Material Handling, first edition, Kahanna Publisher, Delhi, India

[17] Tikur Abay Transport Management Team, (2010), Strategic Plan of Tikur Abay Transport PLC, Kombolcha.

[18] Tikur Abay Transport PLC, (2011), Annual Report of Supply Department, Addis Ababa

[19] Tikur Abay Transport PLC, (2013), List of spares for Euro-Truck, Sino-truck and Volvo, Kombolcha

IJSER